WILTON JOUBERT Ltd
Consulting Engineers
PO Box 11381 Ellerslie
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e:jobs@wjl.co.nz

CONQRA RAFT FLOOR SYSTEM

Job Details: Lot 32 19 Titch Place Job Number: 15193 19/9/08

Working Loads	Dead	5.14	kN/m
	Live	2.70	kN/m
Ultimate Loads (1.2G + 1.5Q)	Dead	6.16	kN/m
	Live	4.05	kN/m
Total Ultimate Load on Internal	w =	10.21	kN/m

Internal Rib Details

Rib Width =	160	mm
Pod Depth =	200	mm
Top slab Depth =	100	mm
Self Weight =	0.77	kN/m
Construction Type	Standard Raft	

Standard Raft Construction

Dependable Bearing Capacity: 100 kPa

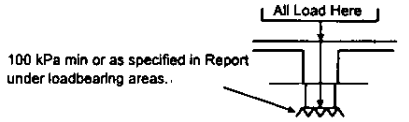
Bearing Check = OK!
Working Pressure = 39 kPa

Steel Requirements - As Per CONQRA Std Drg's

Btm Steel: 1HD12

Continuous Piers

(N.B. All Interal Load in to 'strip' footing)
Assume 100 kPa Bearing Under Loadbearing Rib,
unless a Soil Report indicates otherwise.



Bearing Capacity: 100 kPa

Bearing Check =
Pressure = kPa

Steel Requirements - As Per CONQRA Std Drg's

Btm Steel:

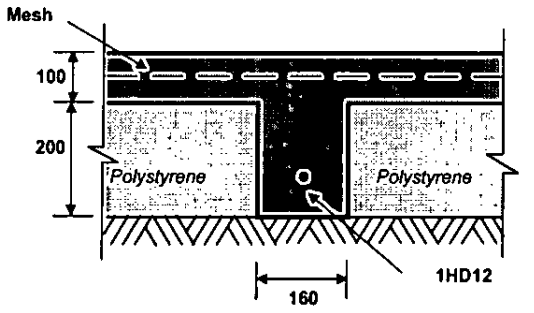
The prescribed internal rib design is:

Location (ie: which wall):

Standard Rib

Standard Raft Contruction,

160 wide Rib required with 1HD12 in bottom



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BRIDGING BEAM DESIGN

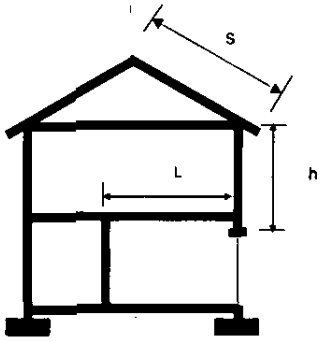
<Job No.>:	15193	Date:	19/9/2008
<Job Title>:	Lot 32 19 Titch Place	Designer:	BR
<Description>:	Capping edge beam	Checker:	DBL

Geometry and Lintel info.

L = 2.4 m
b = 180 mm
h = 300 mm
d = 244 mm

Reinforced Concrete

Loading info.



Tributary Roof and Floor Lengths

MASONRY WALL ABOVE

HOTBLOC — 800 crs
Light — (North/South Taupo)

	=	40	kg/m²
	=	0.39	kPa
Height (h)	=	5.00	m
Load/m	=	1.96	kN/m

OTHER WALL ABOVE (Specify Wall Weight)

Weight	=	150	kg/m²
	=	1.47	kPa
Height (h)	=	2.50	m
Load	=	3.68	kN/m

FLOORS Tributary Length L/2

Unit/Floor	=	Timber	
Topping	=	N/A	
	=	0.38	kPa
Live Loading	=	1.50	kPa
Super Imposed Dead	=		kPa
Tributary Span	=	2.50	m
Dead Load/m	=	0.95	kN/m
Live Load/m	=	3.75	kN/m

ROOF Tributary Length = S

Light	=	0.46	kPa
Live Loading		0.25	kPa
Tributary Span	=	4.20	m
Dead Load/m	=	1.93	kN/m
Live Load/m	=		kN/m
Self Weight:	=	1.30	kN/m

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BRIDGING BEAM DESIGN

Capping edge beam Job: 15193 Title: Lot 32 19 Titch Place

Loadings Summary

Walls	5.64	kN/m	Dead
Floors	0.95	kN/m	Dead
	3.75	kN/m	Live
Roof	1.93	kN/m	Dead
		kN/m	Live
Self Weight:	1.30	kN/m	Dead
Extra Dead	0.72	kN/m	Dead
Extra Live	0.45	kN/m	Live

Loads Summary

Dead	10.54	kN/m	
Live	4.20	kN/m	
Ultimate Loads (1.2G + 1.5Q)			
Dead	12.65	kN/m	
Live	6.30	kN/m	
Total Ultimate Load Lintel	w = 18.9	kN/m	

Design Parameters

ø =	0.85	
E_c or E_m =	20	GPa
E_s =	200	GPa
f'_c or f'_m =	20.0	MPa
f'_c or f'_m =	20.0	MPa

Design Bending Moment
Ultimate Moment Capacity

Beam Type: Fixed Ends $wl^2/12$

M^* = 9.09 kNm

$øA_sf_y(d-a/2)$ = øMu kNm

(Grade/size/No. of bars in *TENSION*)

2 | HD12

A_s = 226 mm^2
f_y = 500 MPa
d = 244 mm
ø = 0.85

$$a = \frac{A_s f_y}{0.85 b f'_c}$$

where f'_c is either f'_c or f'_m

b = 180 mm
f'_c or f'_m = 20.0 MPa

a = 37 mm
c = a/0.85 mm
= 43 mm

øMu = 21.7 kNm OK

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BRIDGING BEAM DESIGN

Capping edge beam *Job Number* 15193 *Title:* Lot 32 19 Titch Place

Yield check:

ϵ_s = f_y/E_s = 0.0025 (Yield Strain)
$\epsilon_c(d-c)/c$ = 0.0115 (Act. Strain @ Mu)
(ϵ_c assumed as 0.0025)

$\epsilon_c(d-c)/c - \epsilon_s$ = 0.0090 OK

Deflection check:

$I = bd^3/12$ = 217901760 mm^4

$\delta = \frac{1\ wl^4}{384\ EI}$ = 0.38 mm

δ/L = 0.000157 L

Shear check:

ϕ = 0.75 (Reinforced Concrete)
V_{max} = 22.7 kN
V* = 18.1 kN
v_n = 0.55 MPa
'b' = -1177.0
c = 178.95 mm
ϵ_s = 0.0011
s_x = 194 mm

β = 0.191
ϕV_c = 22.37 kN OK

ϕV_s > kN

d_b 6 mm
No. Legs 2
A_v 56.5 mm^2

Spacing, s = mm

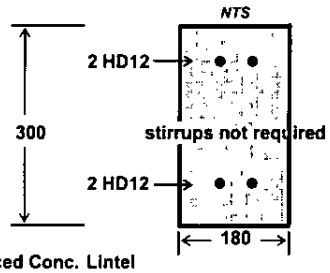
wl/2
$V_{max}(l/2-d)/(l/2)$
$(V^*/\phi)/(bd)$
M* = T (d-c/3)
T = ϵ_s E_s A_s, & solve for c
strain at M*
distance btw steel centres
n/a at M*
$= V_c/sqrt(f'c)b_v s_x$
$A_v f_y/V_s b$

Shear strength without stirrups based on research report by P. Adebar & M.P. Collins "Shear strength of members without transverse reinforcement", Canadian Journal of Civil Engineering, v.23, n.1, 1996, pg.30-41.

Note: minimum 4 bar longitudinal reinforcement required if width of beam > 100

The prescribed lintel design is:

Location on plan: (i.e. Bedroom window etc.)
Capping edge beam



Reinforced Conc. Lintel

Stirrup requirements: not required (d/2)

Stirrup Layout:

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Consulting Engineers
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PILE LOADING

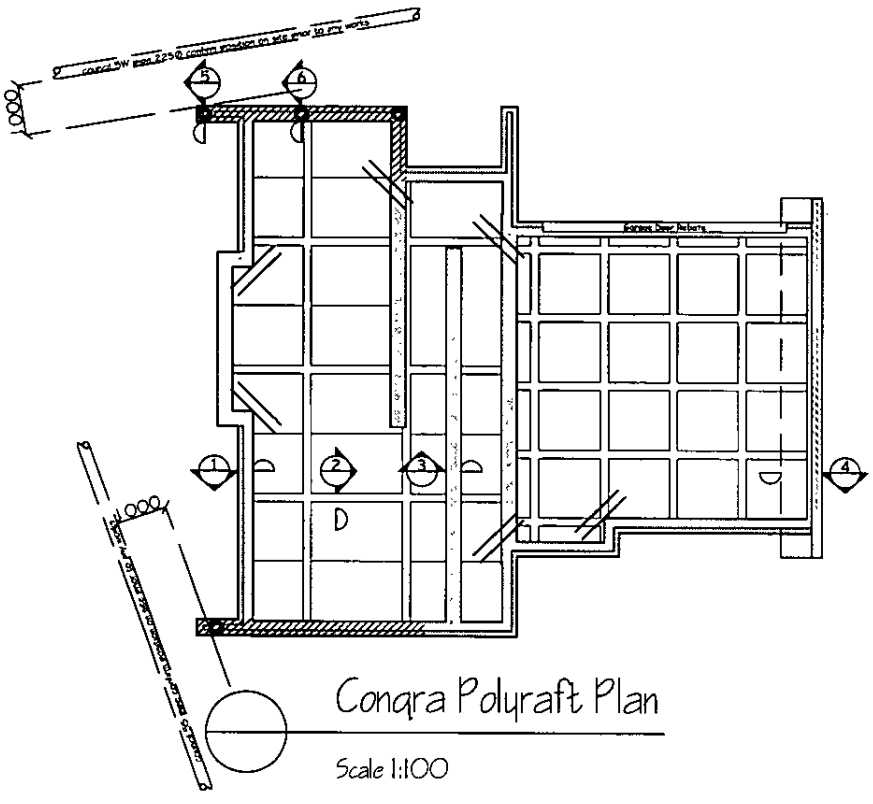
<Job No.>:	15193	Date:	19/9/2008
<Job Title>:	Lot 32 19 Titch Place	Designer:	BR
<Description>:	Pile design	Checker:	DBL

Line load from spreadsheet (ULS loads)	= 18.9	kN/m
Pile spacing	= 2.4	m
Point load	=	kN

$$Q_A = Q_s + Q_p = A\left[\frac{(9c_u + 4c_aD/D_p)}{F} + P_0\right]$$

Q_A =	allowable bearing capacity of a pile		
Q_s =	load applied to the top of the pile by the structure	= 45.36	kN
Q_p =	total mass of pile	= 3.33	kN
A =	area of pile at base or tip	= 0.07	m^2
c_u =	immediate undrained shear strength obtained by field measure	= 60	kPa
c_a =	adhesion between the soil and the pile obtained by suitable laboratory or field measurements, with a minimum value equal to the remoulded undrained shear strength.	= 30	kPa
D =	depth to base of pile	= 2	m
D_p =	average diameter of pile	= 0.3	m
F =	factor of safety	= 2	
P_0 =	total overburden pressure defined by the expression $P_0 = \gamma D$ where γ is saturated density of the clay.	= 36	kPa
	γ =	= 18	kN/m^3

Q_A = **49.90 kN** **OK!**



Conqra Polyraft Plan

Scale 1:100

Floor Area	Perimeter
97m²	53m

Legend:

Re Entrant corner steel 2/H012 x 1200mm at 200 crs

3000 Bored Concrete Pile. 1/H012 placed centrally, min. 2.5m into good natural ground or 1.5m below invert level whichever depth is greater.

NOTE:
Building platform shall be tested to ensure availability of min. 100kPa dependable bearing capacity

It is increasingly common for building consent authorities to require a "PS4" for specifically designed structures. For Wilton Joubert Ltd. to issue this, we need to inspect prior to concrete pour. Ring 09 579 1114 to arrange a booking. A local, qualified engineer may also be engaged to carry out the inspection & issue a PS4 subsequently
NO INSPECTION EQUALS
NO PS4 ISSUED.

Conqra Polyraft
##

NOTES:

Only Conqra polystyrene pods and R6 galvanised spacers to be used for this design.
Under no circumstances shall polystyrene spacers be used.
Where underfloor heating is installed, floor topping shall be increased to 120mm.
Unless otherwise noted;
All Concrete strength shall be minimum 25MPa in sea spary zone, 20MPa elsewhere (if in doubt check with local T.A.)
Do not scale from Drawings. Refer Architectural Drawings for overall dimensions.

Revision	Description	Date

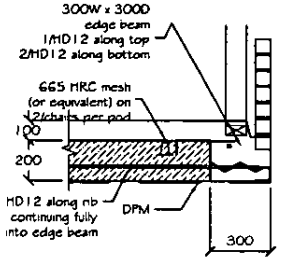
Structural Engineers:
WILTON JOUBERT Ltd
P.O. BOX 11-381
ELLERSLIE
AUCKLAND

Ph (09) 579 1114
Fax (09) 579 7778

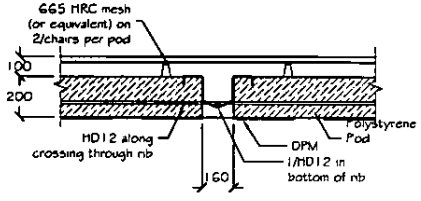
Job Title:
Proposed Residence
lot 32 of
Lot 2 : DP 339810
19 Titch Place

Sheet Title:
Conqra Polyraft Plan

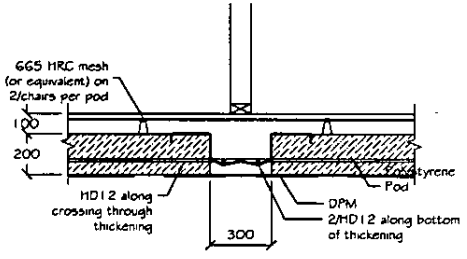
Drawn: BR	Chkd: TE
Design: DL	
Scale: 1:100	Date: 19-03-08
JOB # WJ15193	S1



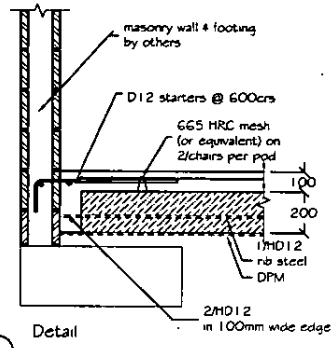
1 Detail
Conqra Polyraft
Perimeter Beam 300
Scale 1:25



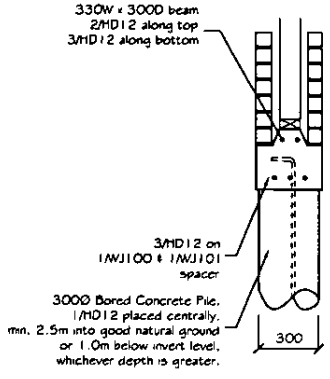
2 Detail
Conqra Polyraft
Internal Beam 160
Scale 1:25



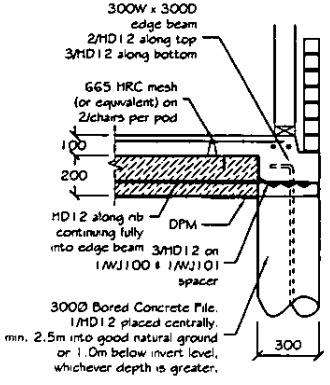
3 Detail
Conqra Polyraft
Internal Beam 300
Scale 1:25



4 Detail
Raftfloor to Wall
Scale 1:25



5 Detail
Wingwall Beam - 330 on
300Ø BCP
Scale 1:25



6 Detail
Raftfloor Edge Beam - 300
on 300Ø BCP
Scale 1:25

Conqra Polyraft
##

NOTES:

Only Conqra polystyrene pods and RG galvanised spacers to be used for this design.
Under no circumstances shall polystyrene spacers be used.
Where underfloor heating is installed, floor topping shall be increased to 120mm.
Unless otherwise noted;
All Concrete strength shall be minimum 25MPa in sea spary zone, 20MPa elsewhere (if in doubt check with local T.A.)
Do not scale from Drawings. Refer Architectural Drawings for overall dimensions.

Revision	Description	Date

Structural Engineers:
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Job Title:
Proposed Residence
lot 32 of
Lot 2 : DP 339810
19 Titch Place

Sheet Title:
Conqra Polyraft
Details

Drawn	BR	Chkd	TE
Scale	DL		
	1:25	Date	19-03-08
JOB # WJ15193			S2

Babbage®
CONSULTANTS

West Coast Road (No.423-429), Housing Development Stage 1

for

New Zealand Housing Foundation

Earthworks Completion Report

Ref: 42608/GE
October 2007

Architects Consulting Engineers Surveyors Project Managers

Client: New Zealand Housing Foundation

Project: West Coast Road

Job Number: 42608

Report Title: Earthworks Completion Report

Document Reference: BDOC03675709

Report Date: October 2007

Issue	Date	Status	Prepared By	Reviewed By
-	15/10/07	First Issue	W E Campton / R Allison	N.S. Luxford

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- 3.2 Road Subgrades 3
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- 3.5 Retaining Walls 4

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Appendix A : Drawings

Site Location Plan	Drawing No. 42608 G01
Cut and Fill Isopac As Built Plan	Drawing No. 42608 AB05
Fill Test Location Plan	Drawing No. 42608 G06
Wetland & Detention Basin 1	Drawing No 42608 C17
Retaining Wall Plan	Drawing No. 42608 C50
Retaining Wall Detail	Drawing No. 42608 C52

Appendix B : In Situ Test Results

Fill Test Result Summary Table

Appendix B : In Situ Test Results

Statement of Professional Opinion

1.0 INTRODUCTION

Babbage Consultants Ltd (Babbage) were engaged by New Zealand Housing Foundation to monitor the construction of earthworks and retaining walls for the West Coast Road Subdivision carried out in the 2006/2007 earthworks season.

The development covers Lots 2 & 3 DP 339810, 423 – 429 West Coast Road, Henderson, as shown on the Site Location Plan in Appendix A. The site is bound to the south by West Coast Road and to the east by Woodbank Drive and associated residential development. Most of the western boundary is generally marked by Parrs Stream that flows northwards into the Waikumete Stream that flows approximately parallel to the northern boundary. However, in the south west the boundary extends westward of Parrs Stream to the existing residential development off Albionvale Road.

A walkover survey of the site was undertaken as part of our geotechnical investigation prior to development. No apparent signs of previous slope instability were observed.

The site covers an area of approximately 5.7ha and the subdivision will result in the creation of 61 residential lots to be developed in three stages. Lots 1 to 61 inclusive are building platforms, and Lots 62 to 71 are drainage and road reserves. The majority of the proposed residential dwellings are understood to comprise two-storey structures. In addition a new stormwater pond and a footbridge link to the neighbouring subdivision to the west were developed.

This report presents the results of the work carried out by Babbage to verify the Stage 1 earthworks and construction of the associated ponds and retaining walls. Stage 1 comprises Lots 1 to 35 and Lots 65 to 71, as shown on Drawing 42608 AB05 in Appendix A. However, Lots 19 to 22 will be subject to a supplementary report since they were occupied by the contractors site offices and a topsoil stockpile.

2.0 CONSTRUCTION SEQUENCE SUMMARY

The contractor, Earthco Civil, was engaged to commence earthworks on site in December 2006 and began with the construction of the permanent stormwater pond on the northern portion of the site. An earth crossing was needed over the main gas line that bisects the site to allow heavy machinery to access the stormwater pond area without damaging the pipeline. This had been completed by early January 2007, and topsoil was stripped from the mid and northern slopes (Stage 1). Material was then cut off the higher ridge and placed along the northeastern edge of Parrs Creek to build up land along this boundary. The road carriageways on Stage 1 were cut down at this time, and building platforms along the eastern boundary were formed with minor cut to fill operations.

Access to the site was formed from Titch Place, and the lower portion of Woodbank Drive.

A localised area of the site at the southern end of Lot 23 where the topsoil was found to be contaminated with pesticides from previous land use and zinc from neighbouring buildings was remediated during the earthworks. Pesticide affected soils were removed from site and samples taken to confirm that all materials had been removed. This work is reported separately by Babbage in the Site Validation Report dated March 2007 (BDOC03434211).

3.0 CONSTRUCTION MONITORING AND TESTING

3.1 GENERAL

The stripped gullies in all fill areas were inspected by Babbage during earthworks construction. Underfill drainage was placed and observed during these regular inspections. Approval was given to commence filling once we were satisfied that all deleterious material had been removed from the fill areas, and vegetation had been removed.

The specification for placement of earthworks fill material was prepared by Babbage. The specification required that the fill be placed in layers up to

200mm thick and compacted by at least 6 passes of a 10 ton self-propelled or a towed tamping type steel wheeled roller. We understand that a total of approximately 10,000m^3 of material was placed in all fill areas in the 2006/2007 earthworks season, with approximately 5,600m^3 in Stage 1.

The relative compaction, determined by comparing the in-situ density with that of a sample compacted in the laboratory accordance with Test 4.1.1 of NZS4402:1986, was to be greater than 95%. The specification also required that the maximum in situ air voids of the fill was to be 8%. The minimum average in situ shear strength of the fill was required to be greater than 120kPa with no individual value less than 100kPa.

The in situ density of the fill material has been determined using a nuclear densometer. The nuclear densometer has been calibrated in accordance with NZS4407:1991, Test 4.2.3 by using three density blocks in an accredited testing workshop. The in situ moisture content has been determined by testing a sample recovered from the test site in our laboratory in accordance with NZS4402:1986, Test 2.1. The in situ dry density and air voids have been calculated using the laboratory moisture content. The in situ shear strength of the fill was measured using a hand held Pilcon Shear Vane. Areas of fill that failed to meet the specified criteria were reworked and retested or observed by a Babbage representative and identified as being satisfactorily compacted.

The site was visited by Babbage to undertake fill testing on 9 days during the 2007 construction season. A total of 31 in situ density tests were completed during these visits, of which 8 were carried out on the fill in Stage 1.

The location of in situ density tests are shown on Drawing No. 42608 G06 in Appendix A. The dates that the fill testing has been undertaken and results of the fill testing are presented on the Fill Test Result Summary included in Appendix B.

3.2 ROAD SUBGRADES

The specifications for pavement design under roads called for 250mm of basecourse on top of lime stabilised subgrade. An alternative design of 200mm sub-basecourse and 150mm basecourse was considered if lime stabilisation did not improve the subgrade. Scala penetrometer readings were taken on all road

subgrades after lime stabilisation and these confirmed that substantial improvement had occurred.

3.3 BUILDING FOUNDATIONS

The near surface materials exposed in the cut areas are typically stiff to very stiff and support the passage of construction plant when dry.

Lots 4, 5, 6 and 7 along the eastern boundary were developed early on and had minor cut to fill operations to create level building platforms. These fill areas were tested once platforms were completed. Most other platforms were either entirely in cut, or controlled fill areas. We understand that most units will be two-storey buildings, with waffle-slab floors. It is recommended that footings for these units should extend at least 600mm below finished level to accommodate the potential affects of shrinkage and swelling.

3.4 STORMWATER POND

The stormwater pond was constructed in accordance with the details as shown on Drawing 42608 C17 in Appendix A. An initial request was made by Watercare Services Ltd for the placement of a 1m thick clay liner on the base of the pond to prevent stormwater from leaking into the adjacent underground utility trenches. However, since the natural soils encountered in the base of the pond were already fully saturated, it was agreed with Merv Popham of Watercare that such a liner was not required and therefore not installed.

3.5 RETAINING WALLS

A number of site visits were made to inspect the post holes for the timber pole retaining walls. The hole diameters, spacing and embedment depths confirmed to be all in accordance with the minimum requirements for the specified wall types.

Hand shear vane tests were carried out within selected post holes and the results generally indicated the natural in situ soils to have a minimum undrained shear strength of 80kPa.

4.0 SUMMARY AND RECOMMENDATIONS

4.1 GENERAL

In our opinion, based on our site observations and testing, the fill materials on Stage 1 of West Coast Road (Nos. 423 – 429) as shown on Drawing 42608 AB05, including those associated with stormwater pond construction have generally been placed in accordance with the Specification and NZS4431:1989 Code of Practice for Earthfill for Residential Development, except that the minimum requirement for the peak in situ shear strength of the fill materials are as detailed in Sections 3.1 of this report. In our opinion there is no evidence to indicate that land formed on this part of the subdivision will be subject to any instability unless future earthworks create such instability.

Any dwellings created under the normal items of NZS3604:1999 within the normal building envelope will in our opinion be within stable land in the lots.

Our geotechnical assessment of the subdivision classified most soils as Class M from AS2870:1996. We have not undertaken any testing to confirm this. However our fill testing and observations during earthworks lead us to recommend that strip footings be taken to 600mm depth to allow for shrinkage – swell movements. This will not restrict uplift of "waffle-slab" foundations constructed from polystyrene packed concrete. As such we recommend that any such proposed foundation be placed after thoroughly wetting up of the soil to minimise the risk of swelling and that the perimeter of each slab is extended to a minimum depth of 600mm below finished ground level or piled to minimise the affects of shrinkage and swell. Prior to construction it is recommended that the subgrade is inspected by a Geotechnical Engineer to confirm the shrinkage/swell potential.

4.2 SUITABILITY OF EARTHFILL

In our opinion, based on our site observations and testing, the fill materials as shown on Drawing 42608 AB05, are generally suitable for the development of light timber framed buildings designed in accordance with NZS3604:1999. We recommend that combined floor loads be less than 15kPa, including the weight of any proposed slab and fill.

We note that footings should be taken to at least 600mm below finished ground level to minimise the effects of shrinkage / swell movements. This includes the perimeter footings of waffle-slabs.

In the case of structures located on the fill adjacent to the 100 year flood level, shallow foundations at a minimum depth of 600mm are considered suitable for structures located no closer than 1.2m from the crest of the 1(v) to 2(h) batter slope. This is to ensure that the foundation is located no closer than a line at a gradient of 1(v) to 3(h) from the toe of the batter and therefore minimise the risk of loss of support should localised frittering / minor creep and movement of the batter slope occur.

Where structures are located closer than 1.2m to the crest of the 1(v) to 2(h) batter along the 100 year flood level, the use of piled foundations is recommended in order to minimise the risk of loss of support should localised frittering and slumping of the batter slope occur.

4.3 RETAINING WALLS

Retaining walls adjacent to vehicle accessways have been designed and constructed to support a 5kPa surcharge. All other walls have not been designed and constructed to support a surcharge and therefore it is recommended that no additional fill or structure is located at the top of such walls within a minimum horizontal distance equal to the retained height of the wall.

4.4 ROAD SUBGRADES

Testing of road subgrades after lime stabilisation confirmed that the design CBR criteria was met in both cut and fill areas. Roads were constructed using basecourse at the specified metal depths.

4.5 STORMWATER PONDS

The stormwater pond was constructed in accordance with the details as shown on Drawing 42608 C17 in Appendix A.

5.0 LIMITATIONS

5.1 RESTRICTION OF INTENDED PURPOSE

This report has been prepared solely for the benefit of New Zealand Housing Foundation as our client with respect to the brief and the benefit of the Waitakere City Council. The reliance by other parties on the information or opinions contained in the report shall, without our prior review and agreement in writing, be at such party's sole risk.

5.2 LEGAL INTERPRETATION

Opinions and judgements expressed herein are based on our understanding and interpretation of current regulatory standards, and should not be construed as legal opinions. Where opinions or judgements are to be relied on they should be independently verified with appropriate legal advice.

5.3 RELIABILITY OF INFORMATION

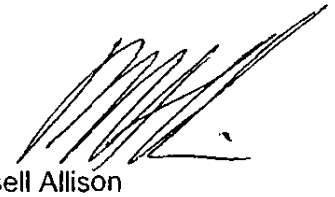
Recommendations and opinions in this report are based on data from our Investigation and control testing on this site. As we were not on site full time during earthworks, the nature and continuity of subsoil conditions could vary from the assumed model.

During excavation and construction the site should be examined by an Engineer or Engineering Geologist competent to judge whether the exposed subsoils are compatible with inferred conditions.

Babbage Consultants would be pleased to provide this service and believe that the development would benefit from this continuity. In any event it is essential that Babbage Consultants Ltd be contacted if there is any significant variation in subsoil conditions from those described in this report.

This report has been prepared by Wayne Campton and Russell Allison and reviewed by N.S. (Paddy) Luxford.

Respectfully submitted
Babbage Consultants Limited



Russell Allison
Senior Geotechnical Engineer

Appendix A

Drawings

Appendix B

In Situ Test Results

Job Number: 42608/GE	Project: 423 – 429 West Coast Road, Henderson	FILL TEST RESULT SUMMARY

Test No.	Test Date (Report No.)	Bulk Density (t/m^3)	Dry Density (t/m^3)	Moisture Content (%)	Air Voids (%)	Field Shear Strength (kPa)	Relative Compaction (%)	Pass / Fail	Comments
1	11/12/06 (DFT1)	1.892	1.52	24.0	6.2	4 X UTP	-	pass	Testing of crossing over gas pipeline easement.
2		1.886	1.52	23.6	6.8	4 X UTP	-	pass	
3	15/1/07 (DFT2)	1.826	1.42	28.4	6.3	124, 134, 163, >225	-	pass	
4		1.785	1.32	35.1	4.1	121, 124, 141, 173	-	pass	
5		1.845	1.46	26.7	6.6	134, 140, 146, 148	-	pass	
6		1.819	1.26	44.7	0	111, 114, 121, 124	-	pass	
7	17/1/07 (DFT3)	1.772	1.32	35.0	4.9	124, 139, 194, UTP	-	pass	
8		1.853	1.46	26.9	6.0	226, 3 X UTP	-	pass	

Appendix C

Statement of Professional Opinion

To:	Waitakere City Council Private Bag 93 109 Henderson Waitakere City 1231

STATEMENT OF PROFESSIONAL OPINION AS TO SUITABILITY OF LAND FOR RESIDENTIAL DEVELOPMENT

Subdivision: **423-429 West Coast Road, Stage 1**
Lots 2 & 3 DP.339810

Owner/Developer: **New Zealand Housing Foundation**

Location: **Henderson**

I, **N S Luxford** of **Babbage Consultants Ltd**, hereby confirm that:

1. I am a Chartered Professional Engineer experienced in the field of geotechnical engineering and was retained by **New Zealand Housing Foundation** as the Geotechnical Engineer on the above subdivision.

2. The extent of my inspections, and the results of all tests carried out during construction, are described in my report entitled **"West Coast Road (No.423-429), Housing Development Stage 1 Earthworks Completion Report", Ref. 42608/GE, October 2007**.

3. In my professional opinion, not to be construed as a guarantee, I consider that:

   (a) The earth fills shown on **Drawing 42608/AB05** attached to the above referenced Earthworks Completion Report, except for Lots 19 to 22, have generally been placed in compliance with **NZS4431:1989 Code of Practice for Earthfill for Residential Developments.**

   (b) The completed works give due regard to land slope and foundation stability considerations.

   (c) The filled ground, except the fill on Lot 121, is suitable for the development of residential buildings, designed in accordance with NZS3604:1999, provided combined floor loads are less than 15kPa, including the weight of the slab and fill.

   (d) The original ground not affected by filling is suitable for the development of residential structures designed in accordance with NZS3604:1999, provided combined floor loads are less than 15kPa, including the weight of the slab and fill.

   (e) The earthworks associated with the roads and reserves have been carried out in a manner appropriate for their intended purpose.

   (f) The following special limitations should be observed:

      (i) The cut and fill platforms for Lots 19 to 22 have not been subject to specific inspection or density testing. Future development in these lots will require inspection by a suitably qualified geotechnical engineer and the fill to be certified.

      (ii) Any building foundation constructed above a gradient line of 1v to 3h from the toe of the fill slope should be the subject to specific design by a suitably qualified geotechnical engineer.

(iii) The excavations for foundations in natural materials should be inspected by a suitably qualified engineer to confirm the ground conditions and design parameters are as assumed in the Babbage supplementary geotechnical assessment report, dated November 2006.

(iv) The minimum depth of all perimeter foundations for future buildings, are to be 600mm below finished ground level to minimise the effects of shrinkage swell movements on the structure.

4. This professional opinion is furnished to the **Waitakere City Council and New Zealand Housing Foundation** for their purposes alone on the express condition that it will not be relied upon by any other person and does not remove the necessity for the normal inspection of foundation conditions at the time of erection of any dwelling.

Signed: ..... Date: **16 October 2007**

N S Luxford
Chartered Professional Engineer (CPEng No 41147)

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DRAWING NOTES

KEY

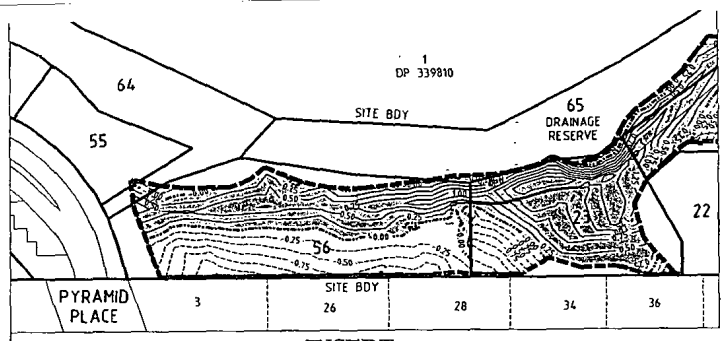
-1.75	CUT CONTOURS
1.25	FILL CONTOURS
-0.00	ZERO CUT/FILL
	EXTENT OF EARTHWORKS

NOTES

1. FILL AREAS ARE SHOWN SHADED
2. CONTOURS SHOWN ARE AT 0.25m INTERVALS.
3. LEVEL DATUM - LANDS AND SURVEY LEVEL DATUM 1946.

I KEVIN RAYMOND MEIKLE, LICENSED SURVEYOR, HEREBY CERTIFY THAT ALL AS BUILT DATA SHOWN ON THIS PLAN IS ACCURATELY PLOTTED IN RELATION TO LOT BOUNDARIES, IS IN TERMS OF GEODETIC DATUM 2000 (MT. EDEN CIRCUIT) AND LANDS AND SURVEY LEVEL DATUM 1946.

K.R. MEIKLE
LICENSED SURVEYOR
DATE: 30/10/07



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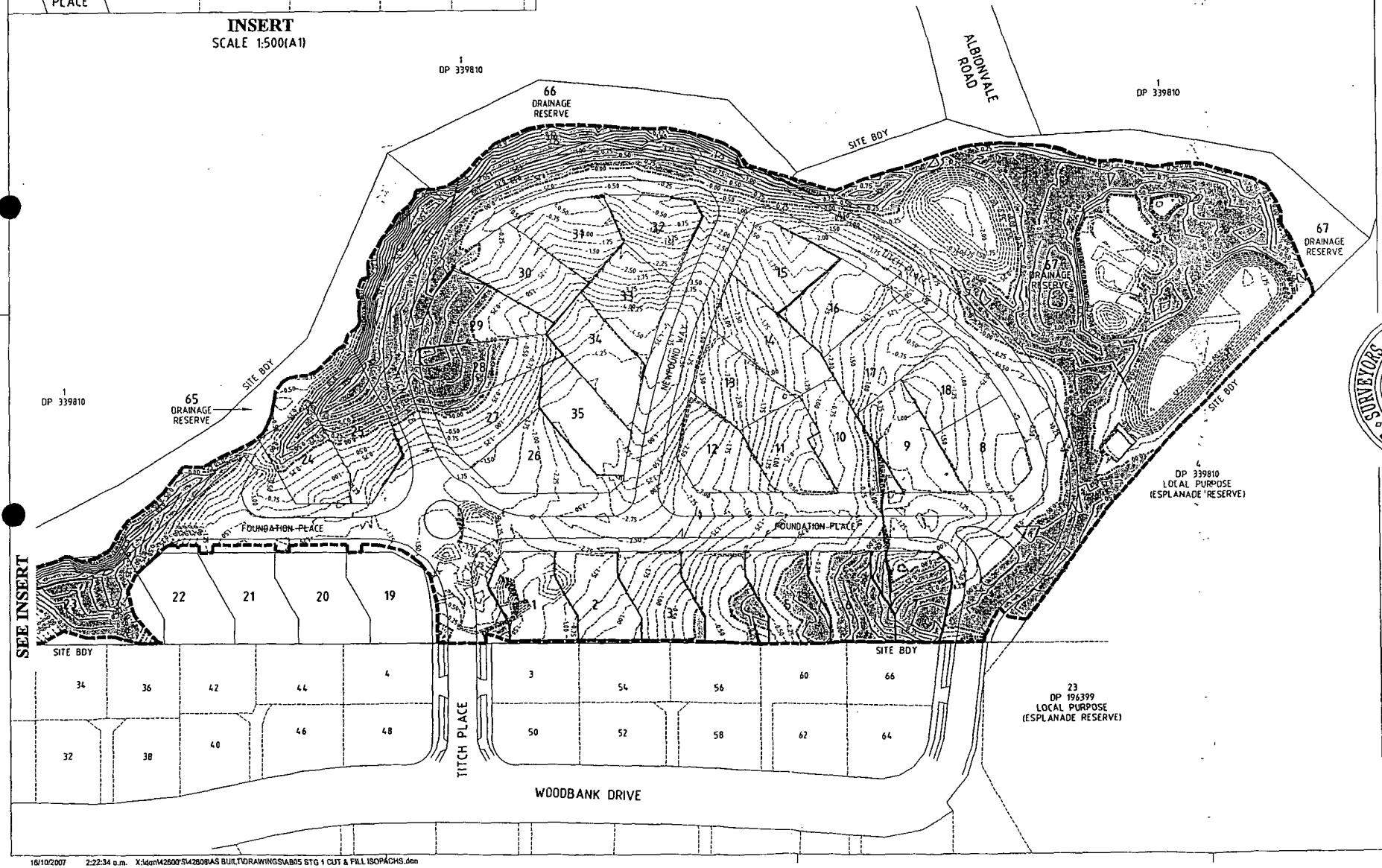

REV	DATE	DESCRIPTION	DRAWN	CHECK

DRAWING REVISIONS

109 FANSHAWE STREET
PO BOX 200
AUCKLAND 1 · NEW ZEALAND
PHONE 09 - 379 9990 · FAX 09 - 377 1571
admin@babbage.co.nz

CLIENT / PROJECT

423 - 429 WEST COAST ROAD
HOUSING DEVELOPMENT
FOR
NZ HOUSING FOUNDATION

DRAWING TITLE

STAGE ONE CUT AND FILL ISOPACH AS BUILT

	DATE	INITIAL
DESIGNED		
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APPROVED		

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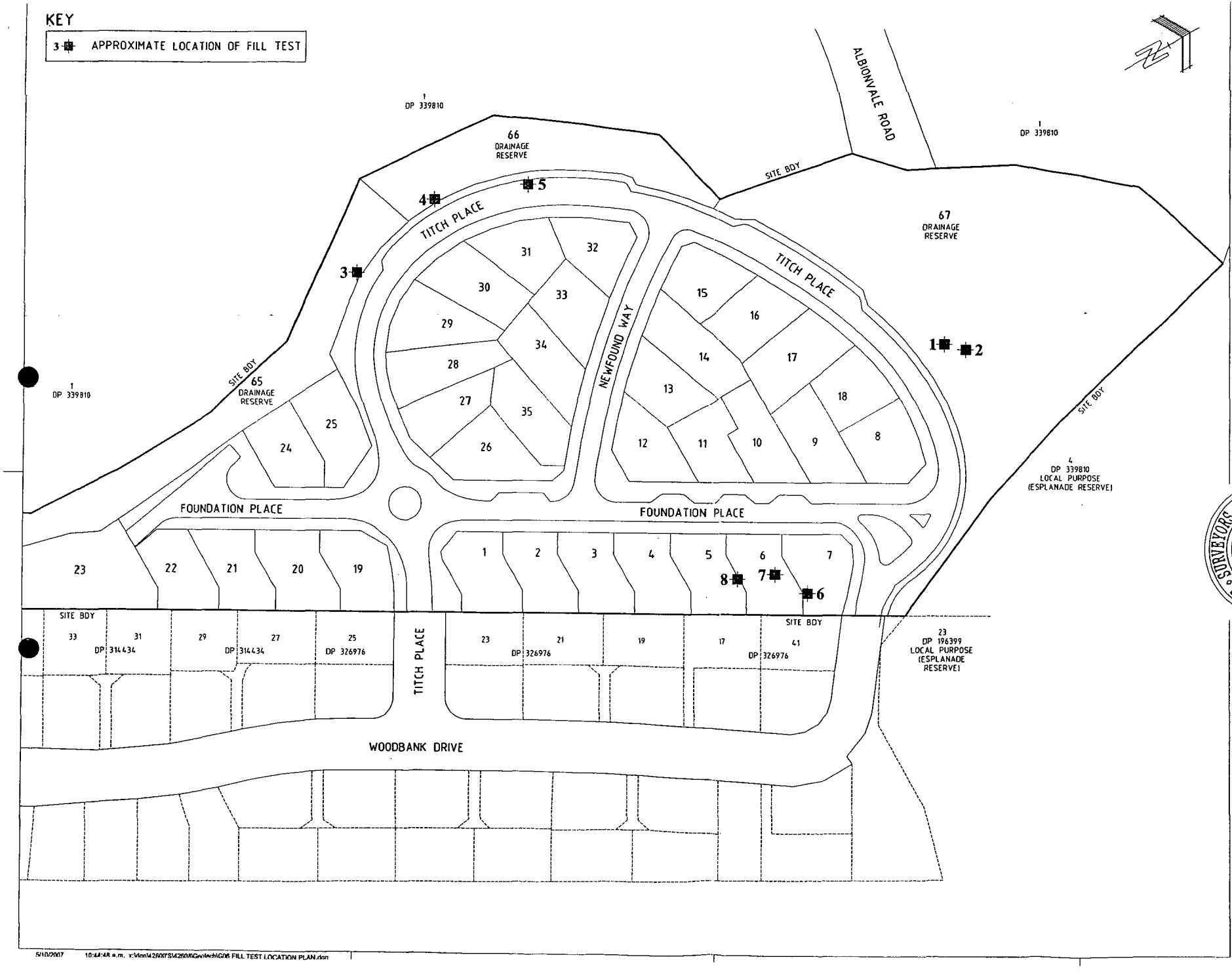
JOB NUMBER	DRAWING NUMBER	REVISION
42608	AB05	F



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PHONE 09 - 379 9980 · FAX 09 - 377 11
admin@babbage.co.

CLIENT / PROJECT

WEST COAST ROAD HOUSING DEVELOPMENT

FOR

NZ HOUSING FOUNDATIOI

DRAWING TITLE

FILL TEST LOCATION PLAN

	DATE	INITIAL
DESIGNED		
DRAWN	AUGUST 2007	MSO
CHECKED	AUGUST 2007	RA
APPROVED		

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JOB NUMBER	DRAWING NUMBER	REVISION
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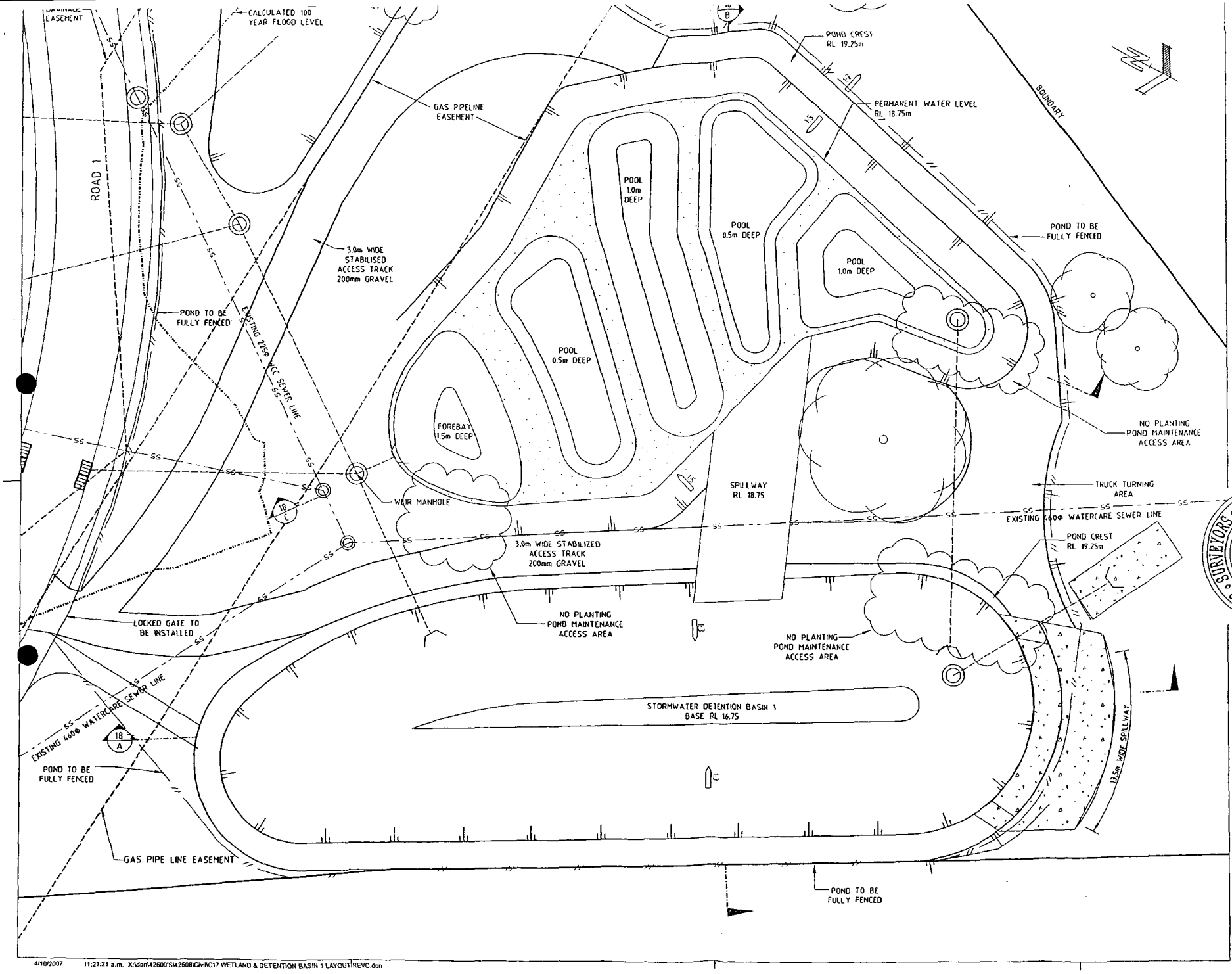

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DRAWING NOTES

1. ALL WORKS TO BE IN ACCORDANCE WITH WAITAKERE CITY COUNCIL'S (WCC) CODE OF PRACTICE FOR CITY INFRASTRUCTURE AND LAND DEVELOPMENT.
2. SAFETY SIGNS TO BE ERECTED AS WCC STANDARD DRAWING SD 4.22.

REV	DATE	DESCRIPTION	DRAWN	CHECK
C	220607	WETLAND AMENDED	FK	
B	020407	VARIOUS AMENDMENTS	FK	
A	0806	VARIOUS AMENDMENTS	FK	

DRAWING REVISIONS

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CLIENT / PROJECT

WEST COAST ROAD HOUSING DEVELOPMENT
FOR
NZ HOUSING FOUNDATION

DRAWING TITLE

WETLAND & DETENTION BASIN 1 LAYOUT

	DATE	INITIAL
DESIGNED	JUNE 2006	DMR
DRAWN	JUNE 2006	GW
CHECKED		
APPROVED		

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42608	C17	C

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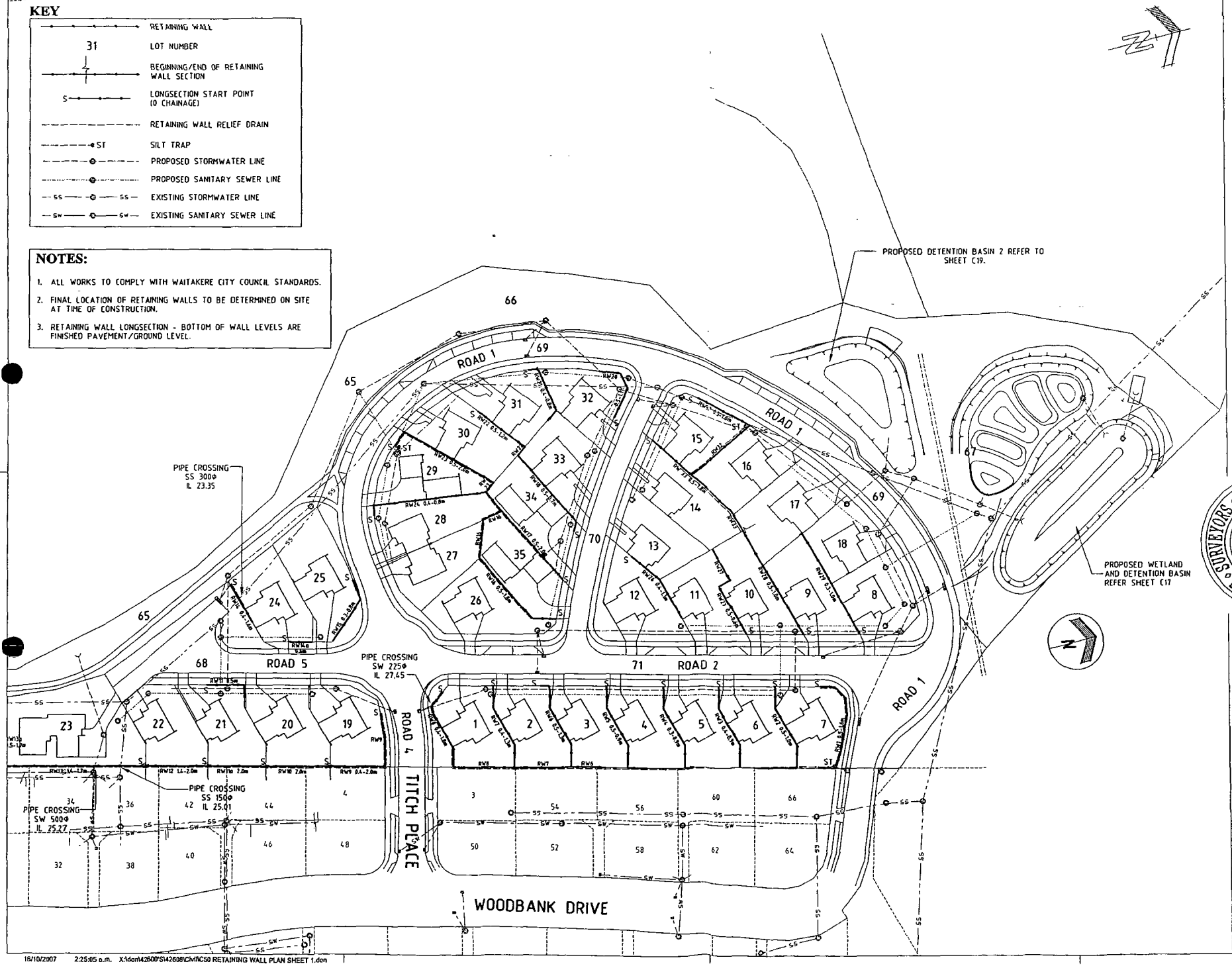
DRAWING NOTES

KEY

- RETAINING WALL
- 31 — LOT NUMBER
- BEGINNING/END OF RETAINING WALL SECTION
- S — LONGSECTION START POINT (0 CHAINAGE)
- RETAINING WALL RELIEF DRAIN
- ST — SILT TRAP
- PROPOSED STORMWATER LINE
- PROPOSED SANITARY SEWER LINE
- SS — EXISTING STORMWATER LINE
- SW — EXISTING SANITARY SEWER LINE

NOTES:

1. ALL WORKS TO COMPLY WITH WAITAKERE CITY COUNCIL STANDARDS.
2. FINAL LOCATION OF RETAINING WALLS TO BE DETERMINED ON SITE AT TIME OF CONSTRUCTION.
3. RETAINING WALL LONGSECTION - BOTTOM OF WALL LEVELS ARE FINISHED PAVEMENT/GROUND LEVEL.



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C	310107	RELIEF DRAINS AND SILT TRAPS ADDED	FK	
B	15/01/07	HOUSE PLATFORMS SHOWN	FK	
A	01/07	RW AMENDMENTS	FK	

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CLIENT / PROJECT

WEST COAST ROAD HOUSING DEVELOPMENT

FOR

NZ HOUSING FOUNDATION

DRAWING TITLE

RETAINING WALL PLAN (SHEET 1)

	DATE	INITIAL
DESIGNED	JUNE 2006	FK
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APPROVED		

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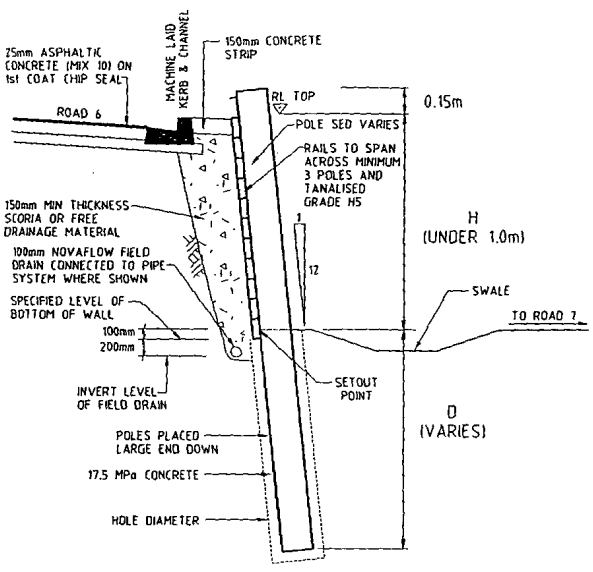
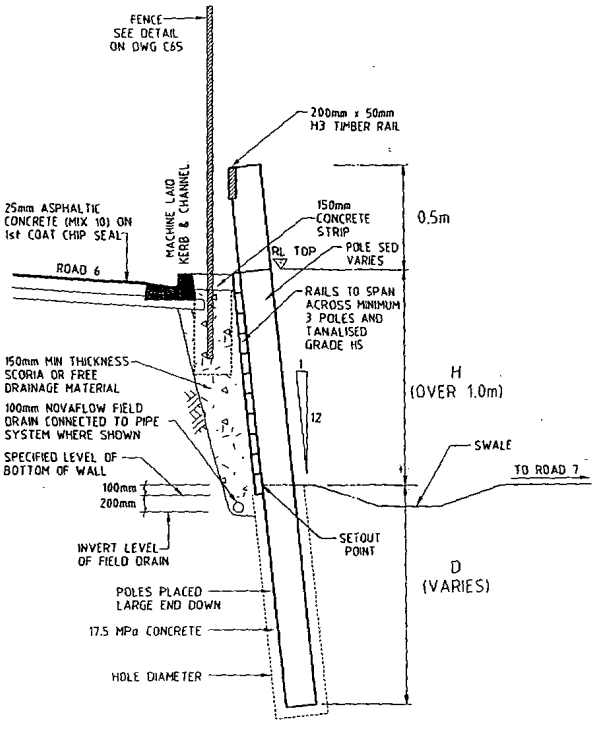
JOB NUMBER	DRAWING NUMBER	REVISION
42608	C50	D



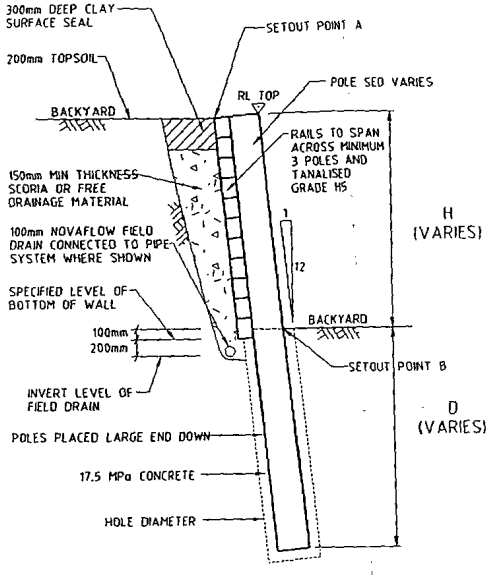
TYPICAL SECTION OF POLE RETAINING WALL UNDER 1.0m HIGH BETWEEN ROAD 6 AND SWALE

(NOT TO SCALE)



TYPICAL SECTION OF POLE RETAINING WALL OVER 1.0m HIGH BETWEEN ROAD 6 AND SWALE

(NOT TO SCALE)



TYPICAL SECTION OF POLE RETAINING WALL BETWEEN BACKYARDS

(NOT TO SCALE)

NOTES:

1. ALL WORKS TO COMPLY WITH WAITAKERE CITY COUNCIL STANDARDS.
2. ALL RETAINING WALL POLES TO BE HIGH DENSITY.
3. FINAL LOCATION OF RETAINING WALLS TO BE DETERMINED ON SITE AT TIME OF CONSTRUCTION.
4. RETAINING WALL LONGSECTION - BOTTOM OF WALL LEVELS ARE FINISHED PAVEMENT/GROUND LEVEL.
5. ALL TIMBER POLE RETAINING WALLS ARE TYPE A EXCEPT RETAINING WALL 50, WHICH IS TYPE B.

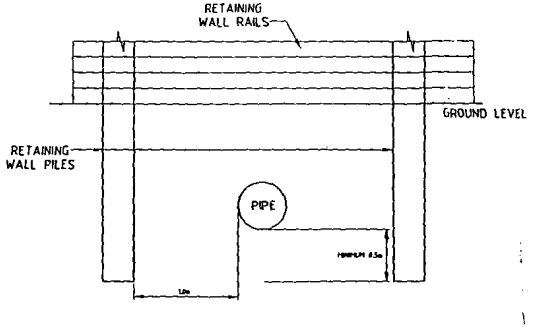
L PILE HOLES ARE TO BE PREDRILLED.

TYPE A (NO SURCHARGE)
(ALL POLE RETAINING WALLS EXCEPT RETAINING WALL 50)

MAXIMUM RETAINED HEIGHT (m)	POLE SIZE SED (mm)	HOLE DIAMETER (mm)	POLE SPACING (m)	EMBEDMENT DEPTH (m)	RAIL THICKNESS (mm)
0.00-1.00	100	300	1.0	1.0	45
1.00-1.50	150	350	1.0	1.5	45
1.50-2.00	200	400	1.0	2.0	45
2.00-2.50	250	450	1.0	2.5	90
2.50-3.00	300	600	1.0	3.0	90
3.00-3.50	350	600	1.0	3.5	90

TYPE B (5kPa SURCHARGE) (POLE RETAINING WALL 50)

MAXIMUM RETAINED HEIGHT (m)	POLE SIZE SED (mm)	HOLE DIAMETER (mm)	POLE SPACING (m)	EMBEDMENT DEPTH (m)	RAIL THICKNESS (mm)
0.00-0.80	100	300	1.0	1.0	45
0.80-1.30	150	350	1.0	1.3	45
1.30-1.80	200	450	1.0	1.8	45
1.80-2.30	250	450	1.0	2.3	50
2.30-2.70	300	500	1.0	2.7	50



TYPICAL CROSS SECTION DETAIL FOR PIPE CLEARANCE FROM PILES

(NOT TO SCALE)

NOTE:

SETOUT POINT A - SET OUT POINT BETWEEN HOUSE LOT BOUNDARIES
SETOUT POINT B - SET OUT POINT BETWEEN HOUSE LOT BOUNDARY AND ROAD RESERVE

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DRAWING NOTES

REV	DATE	DESCRIPTION	DRAWN	CHECD
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F	270707	TYPE B TABLE AMENDED	FK	
E	250607	TYPE B TABLE AMENDED	FK	
D	050307	PIPE CLEARANCE FROM PILES DETAIL ADDED	FK	
C	150107	VARIES AMENDMENTS	FK	
B	090107	VARIES AMENDMENTS	FK	
A	210906	TABLE B ADDED	FK	DMR

DRAWING REVISIONS

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CLIENT / PROJECT

WEST COAST ROAD HOUSING DEVELOPMENT

FOR

NZ HOUSING FOUNDATION

DRAWING TITLE

RETAINING WALL DETAILS

	DATE	INITIAL
DESIGNED		
DRAWN	19.07.06	GNB
CHECKED		
APPROVED		

SCALE (A1)

NTS

JOB NUMBER	DRAWING NUMBER	REVISION
42608	C52	G

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WEST COAST ROAD
WAITAKERE CITY
HOUSING DEVELOPMENT

for

NZ HOUSING FOUNDATION

SUPPLEMENTARY GEOTECHNICAL ASSESSMENT REPORT

Ref: 42608
November 2006

Architects · Consulting Engineers · Surveyors · Project Managers

Client: **NZ Housing Foundation**

Project: **West Coast Road Housing Development**

Job Number: **42608**

Report Title: **Supplementary Geotechnical Assessment**

Document Reference: **BDOC03004368**

Report Date: **November 2006**

Issue	Date	Status	Prepared By	Reviewed By
-	27/11/06	First Issue	R J Allison	M J D Stapleton

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2.2 AERIAL PHOTOGRAPHS 2

3.0 PROPOSED DEVELOPMENT **3**

4.0 SITE INVESTIGATION **4**

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Appendix A: Drawings

Site Location Plan	Drawing No. 42608/G01
Borehole Location Plan (Sheet 1)	Drawing No. 42608/G02
Borehole Location Plan (Sheet 2)	Drawing No. 42608/G03
Preliminary Cut and Fill Isopac Plan (Sheet 1)	Drawing No. 42608/G04
Preliminary Cut and Fill Isopac Plan (Sheet 2)	Drawing No. 42608/G05

Appendix B: *Geotechnical Investigations*

Summaries of Soil Profile and Testing
Explanation of Terms and Symbols

Appendix C: Laboratory Testing

Geotechnical Test Reports

Appendix D: Slope Stability Analysis

Summary of Graphical Output from G Slope Analysis

1.0 INTRODUCTION

Babbage Consultants Ltd (Babbage) were appointed by NZ Housing Foundation to carry out a geotechnical investigation to support subdivision and earthworks consent applications for the proposed residential development at 423 to 429 West Coast Road, Glen Eden in Waitakere City.

The results of the geotechnical investigation and recommendations for the development of the site were presented in a report by Babbage dated June 2006 (Ref: BDOC02880325). The recommendations included that an additional geotechnical investigation should be carried out to support detailed design of the earthworks in the vicinity of the proposed fill batter adjacent to the 100 year flood level. In particular, to determine the consolidation characteristics of the soils beneath the proposed fill batter within the Stage 2 development.

This report presents the results of the supplementary geotechnical investigation and provides recommendations for detailed design of the earthworks.

2.0 SITE DESCRIPTION

2.1 LOCATION AND TOPOGRAPHY

The site is located at 423-429 West Coast Road, Glen Eden in Waitakere City, as shown on the Site Location Plan in Appendix A.

The site covers an area of approximately 5.7 hectares and is bound to the south by West Coast Road and to the east by Woodbank Drive and associated residential development. Most of the western boundary is generally marked by Parrs Stream that flows northwards into the Waikumete Stream that flows approximately parallel to the northern boundary. However, in the south west the boundary extends westward of Parrs Stream to the existing residential development off Albionvale Road.

The site generally comprises rough grassland with areas of scrubby bush and exotic trees in the vicinity of the stream with small localised areas of thicker

bush in the southern and northern parts of the site. A line of mature pine trees trend east west across the southern part of the site. A stormwater pond is located in the south western part of the site to the west of Parrs Stream.

The land generally slopes gently downwards towards Parrs Stream. The existing ground levels in the southern part of the site reduce from approximately RL32m in the south east to approximately RL24m in the vicinity of the stream. Over the southern and central part of the site the existing slope gradients are typically between 1(v) in 3.5(h) to 1(v) in 6(h).

In the northern part of the site the ground level generally reduces from approximately RL29m close to Titch Place on the eastern boundary to approximately RL18m adjacent to the northern boundary.

From the walkover survey there are no apparent signs of significant previous slope instability, although much of the site is heavily vegetated with grass and bush and therefore this may mask such features as shallow scarps.

2.2 AERIAL PHOTOGRAPHS

To assess possible previous areas of fill placement on the site, aerial photographs from 1940, 1959 and 2001 were viewed. The photographs indicate the site has remained largely unchanged, with the exception of some minor residential development in the south eastern part of the site and the construction of the stormwater pond in approximately 2001. The residential development appears to have comprised a single dwelling in 1940 with additional outbuildings being evident in 1959. These buildings are not evident in 2001.

Minor areas of fill appear to have been placed in the vicinity of the eastern boundaries in the central and northern part of the site, associated with the construction of the residential dwellings along Woodbank Drive. Fill also appears to have been placed to form the eastern side of the existing stormwater pond.

No significant signs of instability were identified in the air photos reviewed for this report.

3.0 PROPOSED DEVELOPMENT

The proposed development is for a residential subdivision of approximately 60 lots, to be constructed in three stages. Stage 1 includes the northern part of the site, Stage 2 the south eastern and Stage 3 the south western. In addition it is proposed to replace the existing stormwater pond in the south western part of the site with swales and construct a new stormwater pond in the north western corner of the site.

A footbridge is also to proposed to link the Stage 1 area to the land to the west of Parr's Stream.

A preliminary development layout is shown on the Borehole Location Plans (Sheets 1 and 2) in Appendix A.

The majority of the proposed residential dwellings are understood to comprise two storey structures, although Stage 3 is understood to comprise two and three storey structures with basement level parking although the parking space may not be enclosed.

Significant earthworks are to be carried out to develop the site to form a series of building platforms rising from the 100 year flood level adjacent to the stream. In Stage 1, preliminary earthworks design indicate cut depths of approximately 4.5m over the central part of the site and the placement of up to 1.5m of fill adjacent to the 100 year flood level along the margins of the stream.

In Stage 2, it is proposed to construct a significant fill platform above the 100 year flood level between a new access road and the stream. The proposed fill heights range from approximately 1.5m in the southern end to 3.5m in the northern end of the fill. Some cut of the land adjacent to the eastern boundary is proposed, with the depth of cut ranging from approximately 2.75m in the south east corner to 1m in the north west corner.

In Stage 3, maximum cut depths are anticipated to be approximately 3.0m with maximum fill heights of approximately 2.0m.

It is understood that no retaining structures are permitted to be constructed immediately adjacent to the flood plain and therefore fill batters are proposed along the 100 year flood level. Remote from the flood plain, retaining structures are proposed to support areas of cut and fill where significant changes in ground level occur between the various building platforms and access roads.

The preliminary earthworks plan is shown on Drawing No's 42608/G04 and G05 in Appendix A.

4.0 SITE INVESTIGATION

The initial fieldwork was carried out between the 22nd and 25th May 2006 and comprised 23 No hand auger boreholes to depths of between 0.8m and 3.15m below ground level (bgl), designated HA1 to HA23.

The additional fieldwork was carried out between the 18th and 25th July 2006 and comprised 4 No machine boreholes to depths of between 9m and 14m bgl , designated BH1 to BH4. The approximate location of the boreholes is shown on the Borehole Location Plan (Drawing No's 42608/G02 and G03) included in Appendix A.

The machine boreholes were sunk using rotary open barrel techniques with water flush. Undisturbed tube samples were taken at selected depths within the machine boreholes. The soil and core recovered from the boreholes was logged by a Babbage Engineering Geologist. The core and bagged disturbed samples recovered from the machine boreholes were returned to the Babbage Geotechnical Laboratory for inspection and testing.

In situ testing in the boreholes consisted of standard penetration tests (SPT) at selected intervals. In addition, the in situ shear strength of the materials encountered in the boreholes was measured at selected depths using a hand-held Pilcon Shear Vane. The stratigraphy encountered in the boreholes and the

results of the in situ tests are presented in the Borehole Summaries in Appendix B.

5.0 LABORATORY TESTING

The following tests were carried out on samples recovered from the boreholes:

- Moisture Content 22 No
- Plasticity Index 3 No
- Quick Undrained Triaxial Compression 2 No
- One Dimensional Consolidation 3 No

The results of the above tests are presented in the Babbage Geotechnical Laboratory Report in Appendix C. In addition, the results of the moisture content and plasticity indices are included on the Summaries of Soil Profile and Testing in Appendix B.

6.0 GEOLOGY AND STRATIGRAPHY

6.1 GEOLOGY

The IGNS's Geological Map of the Auckland Urban Area, 1:50,000, Sheet R11, 1992 indicates the geology at the site to generally comprise deposits of the Puketoka Formation comprising pumiceous muds, sands and gravels with muddy peat and lignite.

6.2 STRATIGRAPHY

The ground conditions, as indicated in the machine boreholes, generally confirm the anticipated geology, and generally comprise a sequence of clays with organic horizons, interbedded with silt and sand horizons.

In BH1 and BH4 the clay is generally firm / firm to stiff between approximately 2m to 3m and 5m to 6m below ground level (bgl). These clays are generally

highly plastic and range in colour from light brownish grey and orange to blue grey. In BH2 and BH3 the results of the vane shear tests do not indicate a similar reduction in peak undrained shear strength, the clays generally being stiff / stiff to very stiff in consistency.

A 0.6m to 0.9m thick layer of fine to medium grained sand was encountered in boreholes BH2, BH3 and BH4 at depths of between 3.2m and 8.0m bgl. The results of Standard Penetration Tests (SPT's) carried out within the sands indicates them to be loose to medium dense.

7.0 GROUNDWATER CONDITIONS

Groundwater strikes were not recorded in the boreholes since water flush was used in the drilling process which masked any seepages. However, groundwater seepages were recorded in the previous adjacent hand auger boreholes at depths of between 0.1m and 1.6m bgl during the fieldwork.

No long term monitoring of the local groundwater regime was carried out.

8.0 DISCUSSION

8.1 GENERAL

Previous discussion and recommendations is included in our Geotechnical Assessment Report dated June 2006 referenced in Section 1 and should be read in conjunction with this report.

8.2 STABILITY

From a previous review of aerial photographs and observations made during the walkover survey, there do not appear to be any signs of significant instability on the site.

The proposed fill embankments along the 100 year flood level are indicated to be at gradients of 1(v) to 2(h) and range in height from approximately 1.5m to

3.0m. The findings of the machine boreholes indicate the soft to firm material previously encountered in boreholes HA7, HA11 and HA12 between approximately 1m and 2m bgl appears to be localised. In BH1 the clays were generally firm to stiff / stiff to 2.5m depth and firm from 2.5m to 5.5m bgl, with no soft material being encountered. However, the result of a single triaxial compression test carried out on a sample of clay from BH1 at 1.5m bgl indicates the undrained shear strength to be 27kPa. This is approximately half the value measured with the hand shear vane at the same depth and may be partly attributed to sample disturbance. However, the result does correlate with the values obtained at similar depths from the hand shear vanes carried out within boreholes HA11 and HA12.

In boreholes BH2 and BH3 the clays were generally stiff / stiff to very stiff in consistency.

Preliminary stability assessments using G Slope software have been carried out to assess / infer a factor of safety of the existing slope (Section AA on Drawing G03) and of the proposed embankment (Section BB on Drawing G03). Section AA was selected since it represents a steeper part of the site with an underlying layer of soft to firm clay, as indicated from the hand auger boreholes. Section BB was selected to represent a typical section through a higher part of the proposed embankment. Whilst the soft to firm layer of clay was not encountered in borehole BH2, it has been included to represent a "worst case" scenario.

The Bishop simplified method of analysis for circular failure has been used in the analysis. The soil parameters used in the analysis were based on our previous experience in similar soils and considered to be moderately conservative. They are summarised in the following table:

Soil Type	Unit Weight (kN/m^3)	Effective Cohesion c' (kPa)	Effective Friction Angle Ø' (degrees)
FILL	17	5	30
CLAY Soft to Firm	18	2	27
CLAY Stiff	18	5	30
CLAY Very Stiff	20	7	32

The results of the stability analyses indicate that the factor of safety against failure for the existing slope (Section AA') is greater than 1.5 for a partially saturated slope, which is considered to represent moderately conservative conditions. For a fully saturated slope the factor of safety is indicated to reduce to approximately 1.1. This is considered satisfactory since a fully saturated slope, in our opinion, represents worst credible conditions.

In the case of Section BB', the results of the stability analysis indicate the factor of safety against failure of the proposed embankment batter, assuming unsaturated conditions, is approximately 1.8. However, for a groundwater surface at the base of the fill, approximately coincident with the existing ground surface, the factor of safety reduces to approximately 1.4. Since the findings of the boreholes indicate the layer of soft to firm clay modelled in the analysis is not continuous beneath the proposed embankment, we consider that this represents worst credible conditions. It is therefore our opinion that the indicated factor of safety against failure is satisfactory.

A summary of the graphical output from the G Slope analysis is included in Appendix D.

In order to minimise surface erosion of the embankment batter from surface runoff and consequential frittering and localised surface creep and shallow slumping, we consider that a vegetative cover should be developed over the slope of the embankment. To protect the embankment surface until vegetative cover is established and aid the development of the vegetative cover we consider a biodegradable mat should be installed on the slope rather than a thick layer of mulch and / or topsoil. Both mulch and topsoil can, prior to the

establishment of a well rooted vegetative cover, cause surface saturation and near surface movement. We consider the use of matting to reduce infiltration should assist in short term protection of the slope.

In addition, overland flow over the slope will need to be controlled. Rather than permit sheet flow over the slope it is recommended that the flow is directed into drains at selected intervals along the slope. The base of the drains should be formed from low permeable material to prevent erosion of the underlying soil and their discharge should be directed away from the base of the slope.

8.3 EARTHWORKS

As discussed in Section 3, significant earthworks are proposed on site to achieve the required platform levels for the proposed structures and access roads. The maximum depth of cut is approximately 4.5m in the central part of the Stage 1 area whilst the maximum thickness of fill is approximately 3.5m along the 100 year flood level in the Stage 2 area.

In the case of the proposed fill batters to be constructed along the 100 year flood level, the placement of between 2m and 3.5m of fill will result in consolidation settlement of the underlying soils. The magnitude of this consolidation settlement and the rate at which it occurs will be largely controlled by the compressibility and permeability of the underlying soils. The findings of the hand auger boreholes indicate that in the Stage 1 area, the soils are likely to comprise stiff to very stiff sandy clays of moderate plasticity. However, in the Stage 2 area, the clays are indicated to be soft to firm, organic and of high plasticity. The results of laboratory consolidation tests carried out on samples recovered from the machine boreholes indicate the clays to be medium to high compressibility.

Based on the above, it is our opinion that whilst consolidation settlement beneath the proposed fill batters in the Stage 1 may generally be less than 25mm, assuming medium compressibility clays are present, in the Stage 2 area, preliminary calculations indicate consolidation settlement of approximately 50mm to 100mm may result beneath parts of the fill batters. The time period for 50% and 90% of this consolidation settlement to occur, is indicated from the

laboratory tests to be approximately 6 months and 30 months respectively. Therefore, it is anticipated that additional drainage will be required to reduce the drainage path and thereby reduce the period over which 90% consolidation occurs. Preliminary analysis indicates that for a drainage path of approximately 3m the period for 90% consolidation to occur may be reduced to approximately 12 months. Pre-loading the area would increase the rate of settlement and reduce the period over which 90% consolidation occurs.

In order to minimise the effect of consolidation settlement on the proposed structures, we consider that the fill in the Stage 2 area should be placed during the initial stages of development and subsequent construction delayed for a minimum period of 6 months. The settlement of the fill should be monitored during this period to confirm the rate and amount of settlement taking place, thereby providing confidence in the assessment of likely settlement after development to ensure that it is within acceptable limits.

The placement of up to 3.5m of fill and any additional preload, on the soft to firm clays will require to be carried out under strict control in order to avoid potential bearing capacity failure of the underlying clays. The clay is indicated to have an undrained shear strength of 18kPa at 1m bgl in HA11 0.2m below the underside of topsoil in that location. We note this strength will not support conventional construction plant and the topsoil would also require removal using a hydraulic excavator rather than a motorscraper. This soft to firm soil is susceptible to bearing capacity failure for applied bearing pressures in excess of approximately 35kPa. If the full height of fill is placed over a short period of time and no drainage is installed within the underlying clays, it is our opinion that localised bearing capacity failure of the soft to firm clays may occur.

In order to minimise the risk of bearing capacity failure beneath the fill batter it is recommended that additional vertical drainage is installed beneath the area of fill and the rate of filling is strictly controlled to permit the dissipation of excess pore pressures within the underlying clays. This may be achieved by installing vertical "wick" drains and a drainage blanket prior to filling. Alternatively, consideration may be given to installing counterfort drains or stone columns instead of "wick" drains. These would have the advantage of providing additional vertical support to the fill batter. In the case of counterfort drains, the

presence of shallow groundwater and low strength clays may make excavation of trenches to depths of between 3m and 4m problematic.

Preliminary analysis indicate counterfort drains should be installed at a maximum lateral spacing of 6m and be a minimum depth of 3m. They should be excavated parallel to the slope and extend 1m to 2m beyond the toe and crest of the slope batter. The drainage aggregate will require to be sufficiently graded to prevent clogging and maintain adequate flow and therefore a 20/7 aggregate is likely to be suitable. The arisings from the excavation are anticipated to largely comprise saturated highly plastic clays with organics and therefore be largely unsuitable for re-use. As such, the majority of this material may require to be disposed of off site.

Prior to the placement of fill it is expected that some form of subsoil drainage will be installed to ensure that groundwater seepage is not impeded by the placement of the fill.

Testing and certification of all fill will be required where the thickness exceeds 0.6m or where structures or roads are to be located on the fill.

8.4 FOUNDATIONS

8.4.1 Shallow Foundations

Based on the findings of the investigation it is considered that the foundations for the majority of the proposed structures may be designed in accordance with NZS 3604:1999 "Timber Framed Buildings". This recommendation applies only to foundations within in situ soil or certified fill and no foundations should be founded in topsoil or uncertified fill.

In the case of structures located on the fill adjacent to the 100 year flood level, shallow foundations at a minimum depth of 600mm are considered suitable for structures located no closer than 1.2m from the crest of the 1(v) to 2(h) batter slope. This is to ensure that the foundation is located no closer than a line at a gradient of 1(v) to 3(h) from the toe of the batter and therefore minimise the risk of loss of support should localised frittering / minor creep and movement of the batter slope occur.

In order to minimise differential and total settlements as a result of the variation in thickness of the fill material, it is recommended that strict control is placed on the quality and compaction of the fill beneath the proposed structures. In addition, it is recommended that a serviceability limit state bearing strength of 100kPa is not exceeded for strip or pad foundations constructed within the fill material and that pad sizes should not exceed 1.0m x 1.0m in plan and strip foundations not exceed 1m width. The timing of final development over the fill in the Stage 2 area will however be dependant on consolidation of the materials beneath the fill rather than the strength of the fill itself. Monitoring of the fill should confirm when development is appropriate.

In the case of the proposed structures to be located on Lot 61 to the west of the stream, we understand they are to be two and three storey structures with additional basement car parking. The building platforms for the structures are indicated to be in areas of cut ranging in depth from 0.5m to 3.0m, as shown on Drawing G05 in Appendix A.

The findings of boreholes HA3, HA4 and BH4 indicate the ground conditions in the vicinity of the proposed structures to comprise a 0.3m to 0.9m thick layer of topsoil and / or fill overlying a sequence of stiff and very stiff moderately plastic clays. The results of the hand shear vanes carried out within the uppermost 3m indicate the average undrained shear strength to be approximately 90kPa. However, at approximately 3m to 3.5m bgl the clays are indicated to become locally firm and highly plastic.

Based on the above, it is considered the stiff to very stiff clays are a suitable founding stratum for shallow foundations. However, in areas of proposed deep cut, the firm highly plastic clays may be encountered, and it is our opinion that shallow foundations constructed within these soils may be subject to unacceptable vertical movement post construction. As such measures are likely to be required to mitigate this potentially adverse movement. These measures may include limiting the width of the foundations and applied foundation loads and/or removing the firm clay and replacing with hardfill. Alternatively, the use of pile foundations may be considered.

In the case of shallow foundations founded within the stiff to very stiff clays, it is recommended that a serviceability limit state bearing strength of 100kPa is not exceeded for strip or pad foundations and that pad sizes should not exceed 0.8m x 0.8m in plan and strip foundations not exceed 0.6m width. To minimise the effect of shrinkage and swelling, it is recommended that shallow foundations are founded at least 450mm below finished ground level. Where highly plastic clays occur, the founding depth should be increased to 600mm. However, it is recommended that once formation levels are reached the surface is inspected by a Geotechnical Engineer familiar with this report to confirm the founding depths.

8.4.2 Pile Foundations

Where structures are located closer than 1.2m to the crest of the 1(v) to 2(h) batter along the 100 year flood level, the use of piled foundations is recommended in order to minimise the risk of loss of support should localised frittering and slumping of the batter slope occur. From the preliminary layouts included on Drawings G04 and G05 it is anticipated that Lots 23, 46, 47, 52 to 55, 57 and 60 will require piled foundations. The design of the piles should consider loss of lateral support from the batter slope below / downslope of the piles, as well as lateral loads that may be imposed from the fill and structure. As such, it is recommended that the total length of pile is at least equivalent to twice the combined unsupported length of pile and depth of fill and that the head of the pile is suitably restrained.

The findings of the boreholes indicate the soils at approximately 3m below the base of the proposed fill embankment generally comprise stiff or very stiff clays and silts / medium dense sands. However, in the case of Lots 46 and 47, the findings of BH1 indicate the presence of firm clay from approximately 2m to 6m bgl.

Based on the above, preliminary calculations to determine the ultimate vertical strength of a single timber pile installed within the firm clay and stiff clay have been carried out and are summarised in the table below:

Founding Stratum	Pile Diameter (mm)	Embedment Depth (m)	Ultimate Vertical Strength (kN)
Firm Clay	300	3.0	120
Firm Clay	300	6.0	215
Stiff Clay	300	3.0	190

The embedment depth above is the length of pile within the natural soils beneath the base of the proposed embankment. It is assumed that no skin friction is mobilised along the shaft of the pile within the fill.

The method of installation of the piles should consider the presence of shallow groundwater and low strength clays and silts, as well as the drainage blanket and vertical / counterfort drains. Collapse of bored piles within the natural soils is considered likely and as such, it is anticipated that pre-boring through the fill embankment and then driving into the underlying natural soils may prove suitable.

If driven piles are adopted then it is recommended the pile capacity is assessed in the field by using Hiley's pile driving formula. For bored piles, a static load test could be carried out.

9.0 CONCLUSIONS

Based on the fieldwork covered by this investigation it is considered that the site is suitable for residential subdivision in accordance with the proposed earthworks and subject to the recommendations contained within this report.

10.0 RECOMMENDATIONS

10.1 It is recommended that all fill be certified beneath areas where development takes place (e.g. beneath buildings, roads etc). In the case of the fill along the 100 year flood level in Stage 2, it is recommended that development planning allows for a delay between completion of earthworks and building development of at least 6 months in order to permit resulting consolidation settlement of the underlying clays. In order to increase the rate of consolidation settlement and minimise the risk of bearing capacity failure beneath the fill batter it is recommended that additional vertical drainage is installed beneath the area of fill and the rate of filling is strictly controlled to permit the dissipation of excess pore pressures within the underlying clays. The vertical drainage may include "wick" drains, counterfort drains or stone columns. The method of installation should consider the presence of low strength clays and high groundwater level..

10.2 It is recommended that subsoil drainage is installed beneath areas of fill and in particular to the rear of retaining structures. In addition, the results of the groundwater monitoring indicate that groundwater may be encountered at shallow depth within cut areas and therefore adequate provision for drainage will require to be made in these areas.

10.3 It is recommended that a biodegradable mat is installed on the slope batter in order to minimise surface erosion of the embankment batter and to promote a vegetative cover. In addition, overland flow over the slope should be controlled by the installation of drains at selected intervals along the slope. The base of the drains should be formed from low permeable material to prevent erosion of the underlying soil and their discharge should be directed away from the base of the slope.

10.4 It is recommended that the foundations for residential dwellings are designed in accordance with NZS 3604:1999, with the exception of those for Lots 23, 46, 47, 52 to 55, 57 and 60 and the two to three storey structures in Stage 3, where specific design will be required. It is recommended that a serviceability limit state bearing strength of 100kPa is not exceeded for strip or pad foundations constructed within the fill material and that pad sizes should not exceed 1.0m x 1.0m in plan and strip foundations not exceed 1m width. It is recommended

that the foundations are founded at least 450mm below finished ground level to take into account possible shrinkage swell affects. Where highly plastic clay forms the founding material then this depth should be increased to 600mm. It is recommended that once formation levels are reached the surface is inspected by a Geotechnical Engineer familiar with this report to confirm the founding depths.

10.5 Where structures are located closer than 1.2m to the crest of the 1(v) to 2(h) batter along the 100 year flood level, the use of piled foundations is recommended. The design of the piles should consider loss of lateral support from the batter slope, as well as lateral loads that may be imposed from the fill and structure. As such, it is recommended that the total length of pile is at least equivalent to twice the sum of the unsupported length of pile and depth of fill and that the head of the pile is suitably restrained.

10.6 It is recommended that shallow foundations for the proposed two and three storey structures on Lot 61 are founded within the stiff to very stiff clays and designed using a serviceability limit state bearing strength not exceeding 100kPa and that pad sizes should not exceed 0.8m x 0.8m in plan and strip foundations not exceed 0.6m width. We recommend however that once formation levels are reached the surface is inspected by a Geotechnical Engineer familiar with this report to confirm the founding depths.

11.0 LIMITATIONS

11.1 RESTRICTION OF INTENDED PURPOSE

This report has been prepared solely for the benefit of our client NZ Housing Foundation with respect to the proposed redevelopment of the site, as described in Section 3. The reliance by other parties on the information or opinions contained in the report shall, without our prior review and agreement in writing, be at such party's sole risk.

11.2 LEGAL INTERPRETATION

Opinions and judgements expressed herein are based on our understanding and interpretation of current regulatory standards, and should not be construed as legal opinions. Where opinions or judgements are to be relied on they should be independently verified with appropriate legal advice.

11.3 RELIABILITY OF INFORMATION

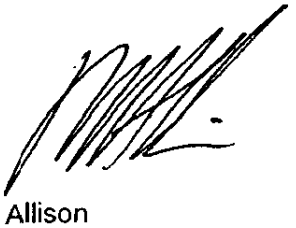
Recommendations and opinions in this report are based on data from the boreholes described in Section 6 of this report. The nature and continuity of subsoil conditions away from the boreholes are inferred and it must be appreciated that actual conditions could vary considerably from the assumed model.

During excavation and construction the site should be examined by a Geotechnical Engineer competent to judge whether the exposed subsoils are compatible with the inferred conditions on which the report has been based. It is possible that the nature of the exposed subsoils may require further investigation and the modification of the design based upon this report.

Babbage would be pleased to provide this service and believe that the project would benefit from such continuity. In any event, it is essential Babbage be advised if there is any variation in subsoil conditions from those described in the report as it may affect the design parameters recommended in the report.

This report has been prepared by Russell Allison and reviewed by Malcolm Stapleton.

Respectfully submitted
Babbage Consultants Limited



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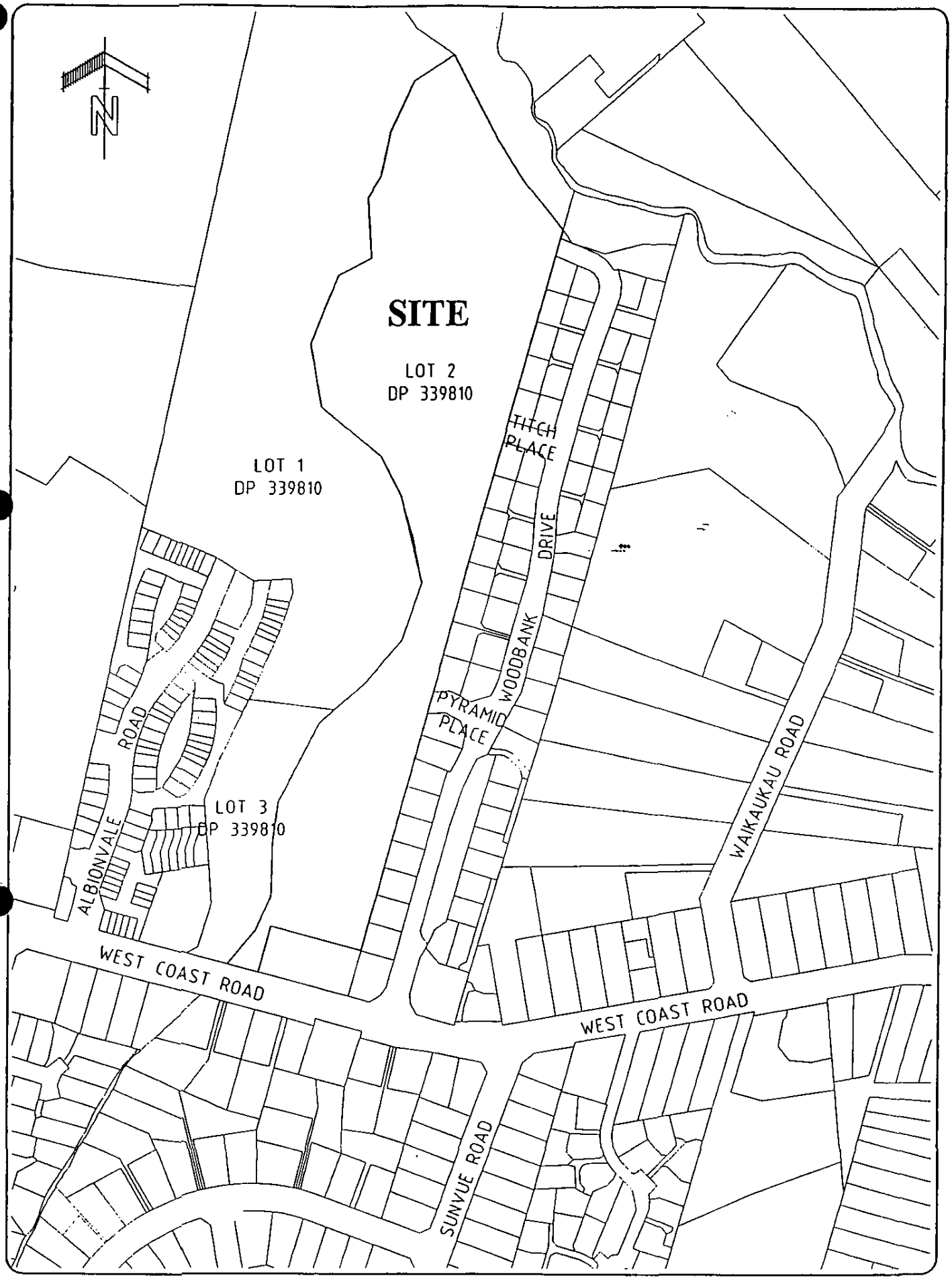
Appendix A

Drawings



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WEST COAST ROAD HOUSING DEVELOPMENT FOR NZ HOUSING FOUNDATION

JOB NO:	42608
TITLE:	SITE LOCALITY PLAN
SCALE:	NOT TO SCALE
DRAWING:	G01

Appendix B

Geotechnical Investigations

Babbage CONSULTANTS

SUMMARY OF SOIL PROFILE & TESTING

JOB No.	42608/GE
PROJECT: WEST COAST ROAD, HENDERSON	
HOLE No.	BH4

DATE STARTED: 25/07/2006	METHOD: OB/SPT/TU/WD	RIG: Kubota STV40 Tractor Rig	SHEET 1 of 3
DATE FINISHED: 25/07/2006	DRILLED BY: Prodrill (Auck) Ltd.	FLUID: water	LOGGED BY: J. Franklin

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

SAMPLES RECOVERED & TEST RESULTS

DEPTH (m)	SOIL DESCRIPTION	GEOLOGIC UNIT	GROUND WATER	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	MOISTURE CONTENTS = ● LIMITS: PLASTIC = X LIQUID = + (20 40 60) IN SITU VANE (kPa) = ✳ (50 100 150)	OTHER TESTS: Corrected Shear Vane Result ** U = peak / R = remoulded; SPT / Scala Penetrometer
	FILL: silt, clayey, very stiff, slightly to moderately plastic, dark brown with patches of orange clay, slightly moist.	FILL	NR			OB	80			unable to penetrate
	Core slipped out of core barrel when being retrieved, so 0.5 - 1.0m run was taken to 1.5m. Core slipped again, so run was taken to 2.0m.									
0.90										
1.00	CLAY, silty, minor fine sand, very stiff, moderately plastic, mottled orange and bright orange, slightly moist, worm burrows infilled with fill material, roots.	PUKETOKA FORMATION (TAURANGA FORMATION)				OB	85			
1.60	CLAY, fine to medium sandy, minor silt, pumiceous, stiff, moderately plastic, mottled orange, bright orange, light grey, grey and white, moist.									
2.00	Very sandy.				S1	SPT	100	5		81kPa (U) 32kPa (R) 1/2/3 N = 5
3.00	Mottled bright orange and grey.					OB	55			
3.20	CLAY, minor fine sand, minor silt, firm, highly plastic, brownish grey, very moist.									36kPa (U) 27kPa (R) 2/3/3 N = 6
3.60	CLAY, trace fine sand, trace silt, stiff to very stiff, highly plastic, light grey with faint black mottles, slightly moist.				S2	SPT	100	6		
4.00	With black mottles, occasional organics, very moist.									
	4.45m: 2cm dark brown organic band.					OB	90			
	Mottled grey and dark brownish grey.									
	4.7m: 2cm horizon of pumiceous sandy CLAY.									72kPa (U) 27kPa (R)

Remarks: The boundary between the Puketoka Formation and underlying Waitemata Group is very indistinct and is only approximate. IWGR = inferred Waitemata Group Rock.

** IN HOUSE METHOD BASED ON BS1377

Babbage CONSULTANTS	SUMMARY OF SOIL PROFILE & TESTING	JOB No.	42608/GE
	PROJECT: WEST COAST ROAD, HENDERSON	HOLE No.	BH4
DATE STARTED: 25/07/2006	METHOD: OB/SPT/TU/WD	RIG: Kubota STV40 Tractor Rig	SHEET 2 of 3
DATE FINISHED: 25/07/2006	DRILLED BY: Prodrill (Auck) Ltd.	FLUID: water	LOGGED BY: J. Franklin

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

DEPTH (m)	Description	GEOLOGIC UNIT
5.75	CLAY, with minor medium to coarse sand-sized lumps of cemented silt, very stiff, moderately plastic, dark grey with occasional white flecks, moist.	PUKETOKA FORMATION (TAURANGA FORMATION)
6.00	Assumed core loss.	
6.90	CLAY, trace fine sand, trace silt, stiff, highly plastic, light grey with occasional black mottles, moist, occasional organics.	
7.50	*ORGANIC CLAY, minor fine sand, minor silt, firm, highly plastic, dark brown with black mottles, moist, organic fragments.*	
7.70	CLAY, as at 6.9m	
8.05	SAND, fine to medium, some silt, minor clay, *non-plastic, light grey, slightly moist.*	
8.40	Very silty.	
8.75	ORGANIC CLAY, minor fine sand, minor silt, firm, highly plastic, dark brown with black mottles, moist, organic fragments.	
9.25	CLAY, trace fine sand, trace silt, very stiff, moderately plastic, light grey, slightly moist.	
10.00		

GROUND WATER

SAMPLES RECOVERED & TEST RESULTS

CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	MOISTURE CONTENTS = ● LIMITS: PLASTIC = X LIQUID = + (20 / 40 / 60) IN SITU VANE (kPa) = ✳ (50 / 100 / 150)	OTHER TESTS: Corrected Shear Vane Result ** (U = peak / R = remoulded); SPT / Scala Penetrometer
	S3	SPT	100	4		1/2/2 N = 4
		WD	0			
	T1	TU	100			
		OB	55			
						66kPa (U) 18kPa (R)
						105kPa (U) 27kPa (R)
	S4	SPT	100	5	94.1	2/2/3 N = 5
		OB	*100*			
	T2	TU	100			
						170kPa (U) 32kPa (R)

Remarks: The boundary between the Puketoka Formation and underlying Waitemata Group is very indistinct and is only approximate. IWGR = inferred Waitemata Group Rock.

** IN HOUSE METHOD BASED ON BS1377

Babbage CONSULTANTS	SUMMARY OF SOIL PROFILE & TESTING	JOB No.	42608/GE
	PROJECT: WEST COAST ROAD, HENDERSON	HOLE No.	BH4
DATE STARTED: 25/07/2006	METHOD: OB/SPT/TU/WD	RIG: Kubota STV40 Tractor Rig	SHEET 3 of 3
DATE FINISHED: 25/07/2006	DRILLED BY: Prodrill (Auck) Ltd.	FLUID: water	LOGGED BY: J. Franklin

DEPTH (m)	SOIL SYMBOL	SOIL/ROCK DESCRIPTION	GEOLOGIC UNIT	GROUND WATER	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	MOISTURE CONTENTS = ● LIMITS: PLASTIC = X LIQUID = + (20 40 60) IN SITU VANE (kPa) = ✳ (50 100 150)	OTHER TESTS: Corrected Shear Vane Result ** U = peak / R = remoulded; SPT / Scala Penetrometer
		DATUM: Ground Surface SURFACE ELEVATION: *For an explanation of the terms & symbols used see attached sheets.*									
		Increasing fine sand.	PUKETOKA FORMATION (TAURANGA FORMATION)				OB	100			
		Minor fine sand.									
		Trace fine sand.				S5	SPT	100	13		126kPa (U) 42kPa (R) 5/6/7 N = 13
		Grey with thin bands of fine sandy CLAY.					OB	67			91kPa (U) 44kPa (R)
12.00		Grades to CLAY, trace fine sand, trace silt, very stiff, moderately plastic, dark grey, slightly moist, with regular bands of fine sandy CLAY.	WAITEMATA GROUP SOIL			S6	SPT	100	12		116kPa (U) 31kPa (R) 4/5/7 N = 12
12.50											
12.60							OB	100			unable to penetrate
13.20											
13.30											unable to penetrate
13.50		Solid nose SPT at 13.5m				S7	SPT	0			12 / 20 / 30 blows for 90mm penetration
13.89		End of Borehole at 13.89 m	IWGR								

Remarks: The boundary between the Puketoka Formation and underlying Waitemata Group is very indistinct and is only approximate. IWGR = inferred Waitemata Group Rock.

** IN HOUSE METHOD BASED ON BS1377

Babbage CONSULTANTS

SUMMARY OF SOIL PROFILE & TESTING

JOB No.	42608/GE		
PROJECT: WEST COAST ROAD, HENDERSON		HOLE No.	BH3
DATE STARTED: 19/07/2006	METHOD: OB/SPT/TT	RIG: track mounted excavator rig	SHEET 1 of 2
DATE FINISHED: 19/07/2006	DRILLED BY: Prodrill (Auck) Ltd.	FLUID: water	LOGGED BY: J. Franklin / H. Singh

DATUM: *Ground Surface*

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

DEPTH (m)	SOIL SYMBOL	SOIL/ROCK DESCRIPTION	GEOLOGIC UNIT	GROUND WATER	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	MOISTURE CONTENTS = ● LIMITS: PLASTIC = X LIQUID = + (20 / 40 / 60) IN SITU VANE (kPa) = ✳ (50 / 100 / 150)	OTHER TESTS: Corrected Shear Vane Result ** U = peak / R = remoulded; SPT / Scala Penetrometer
0.00		SILT, clayey, minor fine sand, stiff, moderately plastic, dark grey, very moist.	PUKETOKA FORMATION (TAURANGA FORMATION)	NR			OB	90			
0.35		SILT, clayey, some fine sand, very stiff, moderately plastic, mottled orange and light grey, moist.								✳	69kPa (U) 24kPa (R)
0.70		*Grades to* CLAY, *minor silt, minor fine sand,* very stiff, moderately plastic, mottled orange and light grey, moist.					OB	60			
1.00		Brownish grey with faint orange mottles.								✳	112kPa (U) 70kPa (R)
		Moderately to highly plastic, moist.					OB	50		***	
		Stiff.								✳	84kPa (U) 48kPa (R) 1/1/2 N = 3
1.60		Becomes silty.				S1	SPT	100	3	●	
1.80		CLAY, minor silt, minor fine sand, firm to stiff, *highly plastic, light greyish brown, very moist.*									
2.00							OB	100			
2.15		CLAY, minor silt, very stiff, moderately plastic, mottled grey, orange and bright orange, slightly moist.								✳	110kPa (U) 32kPa (R)
2.45		CLAY, very stiff to hard, some silt, trace fine sand, slightly plastic, uniform grey, slightly moist.					OB	100			
3.00						S2	SPT	100	10	●	unable to penetrate 5/3/7 N = 10
3.25		SAND, fine to medium, some silt, non-plastic, grey, very moist to wet.									
3.55		SAND, fine to medium, some silt, non-plastic, light grey, wet.									
3.85		ORGANIC CLAY, minor silt, very stiff, moderately to highly plastic, dark greyish brown with black mottles, slightly moist, wood fragments.					OB	100			
4.00		CLAY, minor silt, trace fine sand, very stiff, moderately plastic, light grey, slightly moist.								✳	149kPa (U) 29kPa (R) 2/3/4 N = 7
						S3	SPT	100	7	●	
5.00											

Remarks:

** IN HOUSE METHOD BASED ON BS1377

Babbage CONSULTANTS	SUMMARY OF SOIL PROFILE & TESTING	JOB No.	42608/GE
	PROJECT: WEST COAST ROAD, HENDERSON	HOLE No.	BH3
DATE STARTED: 19/07/2006	METHOD: OB/SPT/TT	RIG: track mounted excavator rig	SHEET 2 of 2
DATE FINISHED: 19/07/2006	DRILLED BY: Prodrill (Auck) Ltd.	FLUID: water	LOGGED BY: J. Franklin / H. Singh

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

DEPTH (m)	SOIL SYMBOL	SOIL/ROCK DESCRIPTION	GEOLOGIC UNIT	GROUND WATER
		Minor fine sand.		
		Some fine sand.		
		Some fine to medium sand.		
6.00		Grades to CLAY, fine to medium sandy, minor silt, very stiff, moderately plastic, light grey with white flecks, slightly moist.	WAITEMATA GROUP SOIL	
6.70		SILT, clayey, hard, slightly plastic, light grey, slightly moist, weakly cemented.		
6.85		SILTSTONE, very weak, completely weathered, grey to dark grey.	WAITEMATA GROUP ROCK	
7.00				
7.10		SANDSTONE, fine, very weak, well cemented, completely weathered.		
7.30		SILTSTONE, very weak, completely weathered, grey to dark grey, some sub-vertical fractures.		
7.50		Solid nose SPT at 7.5m - material recovered in *core barrel appeared to be siltstone.*		
8.00				
8.20		SANDSTONE, fine, very weak to weak, very well cemented, highly weathered, grey, some sub-vertical white veins.		
9.00		Solid nose SPT at 9.0m		
9.08		End of Borehole at 9.075 m		

SAMPLES RECOVERED & TEST RESULTS

CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	MOISTURE CONTENTS = ● LIMITS: PLASTIC = X LIQUID = + (20 / 40 / 60) IN SITU VANE (kPa) = ✳ (50 / 100 / 150)	OTHER TESTS: Corrected Shear Vane Result ** U = peak / R = remoulded; SPT / Scala Penetrometer
		OB	95			149kPa (U) 40kPa (R)
	S4	SPT	100	9		110kPa (U) 36kPa (R) 2/4/5 N = 9
		OB	100			
	S5	SPT	0	23		10/11/12 N = 23
		TT	75			
	S6	SPT	0			50 blows for 75mm penetration

Remarks:

** IN HOUSE METHOD BASED ON BS1377

Babbage CONSULTANTS	SUMMARY OF SOIL PROFILE & TESTING	JOB No.	42608/GE
	PROJECT: WEST COAST ROAD, HENDERSON	HOLE No.	BH2
DATE STARTED: 18/07/2006	METHOD: OB/SPT/TU/WD	RIG: track mounted excavator rig	SHEET 1 of 2
DATE FINISHED: 18/07/2006	DRILLED BY: Prodrill (Auck) Ltd.	FLUID: water	LOGGED BY: J. Franklin / H. Singh

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

SAMPLES RECOVERED & TEST RESULTS

DEPTH (m)	SOIL SYMBOL	SOIL/ROCK DESCRIPTION	GEOLOGIC UNIT	GROUND WATER	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	MOISTURE CONTENTS = ● LIMITS: PLASTIC = X LIQUID = + (20 / 40 / 60) IN SITU VANE (kPa) = ✳ (50 / 100 / 150)	OTHER TESTS: Corrected Shear Vane Result ** U = peak / R = remoulded; SPT / Scala Penetrometer
0.00		SILT, fine sandy, some clay, stiff to very stiff, moderately plastic, dark brownish grey, moist.	PUKETOKA FORMATION (TAURANGA FORMATION)	NR							
0.20		SILT, fine sandy, clayey, stiff to very stiff, slightly to moderately plastic, banded orange and light grey, moist.					OB	90		✳	102kPa (U) 15kPa (R)
0.60		CLAY, fine sandy, some silt, stiff, moderately plastic, mottled grey, light grey and orange, moist.					OB	100			
0.90		CLAY, some fine sand, minor silt, stiff to very stiff, moderately plastic, mottled orange and light grey, slightly moist.								✳	116kPa (U) 42kPa (R)
1.00		Mottled light greyish brown and orange, moist.					OB	100		✳	
		Moderately to highly plastic.									
		Highly plastic.								✳	102kPa (U) 59kPa (R)
		Minor fine sand, mottled orange and light grey.					OB	80			
2.00		Trace fine sand.								✳	91kPa (U) 52kPa (R)
							OB	80			
2.90		CLAY, some silt, minor fine sand, stiff, highly plastic, mid-grey with black flecks, very moist, trace organics.								✳	60kPa (U) 22kPa (R)
3.00		CLAY, minor fine sand, minor silt, stiff, moderately plastic, light grey, moist.				T1	TU	100			
3.25		CLAY, minor fine sand, minor silt, stiff, highly plastic, light brown with black mottles, moist, organics.									
3.55		CLAY, minor fine sand, minor silt, stiff, moderately plastic, light grey, moist.									
3.70							OB	100			
3.95		SAND, fine to medium, clayey, slightly plastic, light grey, moist.									
4.00		SAND, fine to medium, some silt, non-plastic, light grey, moist.									
4.25		Dark grey, very moist. Wet.				S1	SPT	100	7	●	5/5/2 N = 7
4.90		ORGANIC CLAY, minor fine sand, minor silt.					WD	0			
5.00											

Remarks:

** IN HOUSE METHOD BASED ON BS1377

Babbage CONSULTANTS

SUMMARY OF SOIL PROFILE & TESTING

JOB No.	42608/GE
PROJECT: WEST COAST ROAD, HENDERSON	
HOLE No.	BH2

DATE STARTED: 18/07/2006	METHOD: OB/SPT/TU/WD	RIG: track mounted excavator rig	SHEET 2 of 2
DATE FINISHED: 18/07/2006	DRILLED BY: Prodrill (Auck) Ltd.	FLUID: water	LOGGED BY: J. Franklin / H. Singh

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

SAMPLES RECOVERED & TEST RESULTS

MOISTURE CONTENTS = ●
LIMITS: PLASTIC = X LIQUID = +
20 40 60
IN SITU VANE (kPa) = ✳
50 100 150

OTHER TESTS
Corrected Shear Vane Result **
U = peak / R = remoulded
SPT / Scala Penetrometer

DEPTH (m)	SOIL SYMBOL		GEOLOGIC UNIT	GROUND WATER	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	OTHER TESTS
		abundant organics, highly plastic, dark brownish grey, moist.								
5.25		CLAY, minor silt, trace fine sand, stiff to very stiff, moderately plastic, light grey with occasional black mottles, moist.				T2	TU	100		
							OB	100		162kPa (U) 48kPa (R)
6.00		Moderately to highly plastic.								
		Highly plastic, very moist.				T3	TU	100		78kPa (U) 24kPa (R)
7.00		Moist.	PUKETOKA FORMATION (TAURANGA FORMATION)				OB	70		103kPa (U) 31kPa (R)
		Minor fine sand, moderately plastic.								
8.00		Pocket of fine sandy clay.								81kPa (U) 24kPa (R) 4/5/5 N = 10
		CLAY, fine sandy, minor silt, very stiff, moderately plastic, light grey with occasional green mottles, slightly moist.				S2	SPT	100	10	
		Mid-grey with white speckles.								
9.00		Fine to medium sandy, grades to dark grey.	WAITEMATA GROUP SOIL				OB	81		167kPa (U) 42kPa (R)
		10cm fine gravelly horizon (siltstone gravel) and carbonaceous material.								unable to penetrate 7/8/10 N = 18
9.95						S3	SPT	100	18	
		End of Borehole at 9.95 m								

Remarks:

** IN HOUSE METHOD BASED ON BS1377

Babbage CONSULTANTS

SUMMARY OF SOIL PROFILE & TESTING

JOB No. 42608/GE

PROJECT: WEST COAST ROAD, HENDERSON

HOLE No. BH1

DATE STARTED: 18/07/2006	METHOD: OB/SPT/TU	RIG: track mounted excavator rig	SHEET 1 of 3
DATE FINISHED: 18/07/2006	DRILLED BY: Prodrill (Auck) Ltd.	FLUID: water	LOGGED BY: J. Franklin / H. Singh

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

DEPTH (m)	SOIL SYMBOL	SOIL/ROCK DESCRIPTION	GEOLOGIC UNIT	GROUND WATER
0.15		TOPSOIL.	TS	NR
		SILT, clayey, minor fine sand, stiff, moderately plastic, dark grey, moist.	PUKETOKA FORMATION (TAURANGA FORMATION)	
0.85		CLAY, minor silt, minor fine sand, firm to stiff, moderately plastic, mottled orange and light grey, moist.		
1.00		Highly plastic, brown with orange mottles, very moist, fine to medium sand-sized organics.		
2.00		Roots and organics.		
2.05		CLAY, minor fine sand, stiff, highly plastic, light bluish grey, moist. Occasional bright orange mottles and white specks, occasional siltstone gravel. Root.		
		Becomes firm.		
3.00		Trace fine sand.		
4.00		Occasional faint black mottles.		
5.00				

SAMPLES RECOVERED & TEST RESULTS

CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	MOISTURE CONTENTS = ● LIMITS: PLASTIC = X LIQUID = + (20 40 60) IN SITU VANE (kPa) = ✳ (50 100 150)	OTHER TESTS: Corrected Shear Vane Result ** U = peak / R = remoulded; SPT / Scala Penetrometer
		OB	80			66kPa (U) 18kPa (R)
		OB	90			91kPa (U) 52kPa (R)
		OB	100			52kPa (U) 26kPa (R)
	T1	TU	100			48kPa (U) 7kPa (R)
		OB	100			48kPa (U) 17kPa (R)
	T2	TU	100		10	60kPa (U) 27kPa (R)
		OB	100			45kPa (U) 18kPa (R)
	S1	SPT	100	5		1/2/3 N = 5

Remarks:

** IN HOUSE METHOD BASED ON BS1377

Babbage CONSULTANTS

SUMMARY OF SOIL PROFILE & TESTING

JOB No. 42608/GE

PROJECT: WEST COAST ROAD, HENDERSON

HOLE No. BH1

DATE STARTED: 18/07/2006	METHOD: OB/SPT/TU	RIG: track mounted excavator rig	SHEET 2 of 3
DATE FINISHED: 18/07/2006	DRILLED BY: Prodrill (Auck) Ltd.	FLUID: water	LOGGED BY: J. Franklin / H. Singh

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

SAMPLES RECOVERED & TEST RESULTS

MOISTURE CONTENTS = ●
LIMITS: PLASTIC = X LIQUID = +
20 40 60
IN SITU VANE (kPa) = ✳
50 100 150

OTHER TESTS
Corrected Shear Vane Result **
U = peak / R = remoulded
SPT / Scala Penetrometer

DEPTH (m)	SOIL SYMBOL		GEOLOGIC UNIT	GROUND WATER	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	OTHER TESTS
		Grades to mid-grey with black specks, some fine sand.					OB	100		42kPa (U) 11kPa (R)
6.00										70kPa (U) 18kPa (R)
6.25		CLAY, some fine sand, minor silt, stiff becoming very stiff, moderately to highly plastic, light grey to *mid-grey, moist.*				T3	TU	100		
							OB	100		70kPa (U) 24kPa (R)
7.00		Silty patches, mid-grey.				S2	SPT	100	13	134kPa (U) 31kPa (R) 5/6/7 N = 13
8.00										
8.05		Band of fine sandy CLAY with some fine siltstone gravel.								
8.15		CLAY, some fine sand, minor silt, very stiff, moderately to highly plastic, light grey to mid-grey, moist.	WAITEMATA GROUP SOIL				OB	90		
		Very stiff to hard, with white flecks.								
9.00						S3	SPT	100	16	unable to penetrate 6/7/9 N = 16
9.60		CLAY, fine sandy, some silt, trace siltstone gravel, hard, moderately plastic, dark grey, slightly moist, with pockets of fine sand.								
							OB	100		
10.00										

Remarks:

** IN HOUSE METHOD BASED ON BS1377

Babbage CONSULTANTS

SUMMARY OF SOIL PROFILE & TESTING

JOB No. 42608/GE

PROJECT: WEST COAST ROAD, HENDERSON

HOLE No. BH1

DATE STARTED: 18/07/2006	METHOD: OB/SPT/TU	RIG: track mounted excavator rig	SHEET 3 of 3
DATE FINISHED: 18/07/2006	DRILLED BY: Prodrill (Auck) Ltd.	FLUID: water	LOGGED BY: J. Franklin / H. Singh

SOIL/ROCK DESCRIPTION

SAMPLES RECOVERED & TEST RESULTS

DEPTH (m)	SOIL SYMBOL	DATUM: Ground Surface SURFACE ELEVATION: For an explanation of the terms & symbols used see attached sheets.	GEOLOGIC UNIT	GROUND WATER	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	MOISTURE CONTENTS = ● LIMITS: PLASTIC = X LIQUID = + 20 40 60 IN SITU VANE (kPa) = ✳ 50 100 150	OTHER TESTS Corrected Shear Vane Result ** U = peak / R = remoulded SPT / Scala Penetrometer
		Dark brown horizon, common sand patches, slightly plastic.	WAITEMATA GROUP SOIL			S4	SPT	100	25	●	7/10/15 N = 25
10.95 11.00		End of Borehole at 10.95 m								•••	

Remarks:

** IN HOUSE METHOD BASED ON BS1377

EXPLANATION OF TERMS AND SYMBOLS

These pages present an explanation of the terms and symbols used on the log sheets entitled "Summary of Soil Profile and Testing". The materials, boundaries and conditions have been interpreted at the test hole locations only and could differ elsewhere on the site.

1. DEPTH / ELEVATION

This column refers to the depth below the ground surface existing at the time of drilling. The corresponding elevations are shown with respect to the datum noted where survey information is available.

2. SOIL AND ROCK SYMBOL

This column contains the standard soil and rock symbols used by Babbage for the materials encountered in the boreholes as shown below:

Fill	Clay	Boulders
Asphalt	Silt	Sandstone
Concrete	Sand	Siltstone
Topsoil	Gravel	Volcanic Rock
Peat or Organic Soil	Cobbles	Uncertain Material

3. SOIL AND ROCK DESCRIPTION

The terms used to describe the soils and rocks are generally in accordance with the NZ Geomechanics Society's "***Guidelines for the Field Description of Soils and Rocks in Engineering Use***", Nov. 1988 and the NZ Geotechnical Society's "***Guidelines for the Classification and Field Description of Soils and Rocks for Engineering Purposes***" Feb 2003 (draft for comment).

The **soils** are generally described in the following order:

Major soil type, minor soil type/s, consistency (for cohesive soils) or density (for cohesionless soils), plasticity, structure and/or particle shapes, colour, moisture condition, minor inclusions, other significant aspects (e.g. geological description).

Where rock is encountered, the **rock material** and the **rock mass** are described in the following order:

Major rock type, texture and fabric, strength, weathering, colour, discontinuity type, discontinuity spacing, discontinuity orientation, discontinuity opening, discontinuity roughness, geological description (if this can be determined).

Where no field or laboratory tests are carried out, the soils and rock descriptions are based on handling and visual assessment of the recovered samples. **Any design based on such descriptions should allow for the generic nature of the descriptions.**

4. GEOLOGIC UNIT

This column divides the soil and/or rock encountered in the borehole into units that have been formally described and published by geologists (determined from geological maps), or informal units describing what general categories the materials belong to eg. *fill, weathered rock, alluvium, etc.*

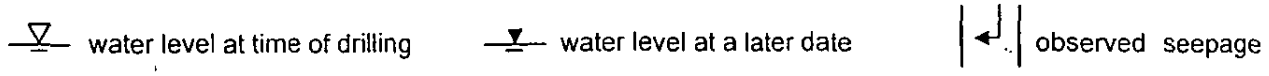
EXPLANATION OF TERMS AND SYMBOLS

5. PIEZOMETER

This column graphically displays what happens to the hole on completion of drilling – ie. whether the hole is backfilled, left open with a plug, or if a piezometer/standpipe is installed. Details of the installation are given in the "Remarks" section at the bottom of the log.

6. GROUNDWATER

The groundwater level, or the depth at which free water was observed in the borehole, or any seepage observed in the borehole, are denoted by the symbols given below.



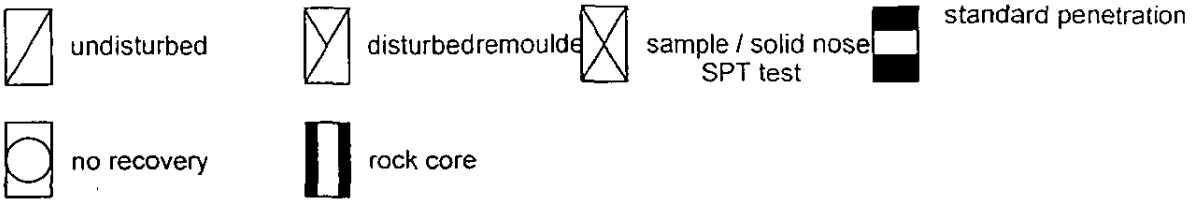
The level is the water level in an open hole unless otherwise indicated.

N in the column indicates the water level could not be recorded due to drilling water/mud, rain or hole caving.
NR in this column indicates that no record of the groundwater level was taken.
D in this column indicates that the hole was dry.
F in this column indicates when free water in the hole was first noticed.

7. SOIL SAMPLES

Condition

This column indicates the depth, length and condition of each sample taken. The following symbols are used to represent the condition of the samples.



Type (and sample number)

The type of sample and its sequential number is indicated in this column as follows:

A	auger sample	**P**	piston tube sample
B	block or bulk sample	**S**	standard penetration test (SPT) sample
D	disturbed sample (eg. open barrel core)	**T**	thin-walled tube sample
J	jar sample	**W**	wash or air return sample
GW	ground water sample	**O**	other (see text)

Disturbed soils samples are transported and stored in plastic bags. Machine borehole disturbed samples are transported and stored in core boxes. Tube samples are sealed with plastic bags in the field and with wax on return to the laboratory.

Method

This refers to the particular drilling/sampling technique:

HA	hand auger	**TU**	push-tube
HD	hand dug	**SSA**	solid stem machine auger
HSA	hollow stem machine auger	**SPT**	standard penetration test
EX	hydraulic excavator	**SP**	scala penetrometer
OB	open barrel	**TT**	triple tube
PP	pneumatic percussion	**WD**	wash drill

EXPLANATION OF TERMS AND SYMBOLS

Babbage CONSULTANTS

Recovery

This column gives the sample recovery as a percentage of the sampled length for open barrel and triple tube core runs, and also split spoon SPT tests. If nothing is shown, the sample recovery was not measured.

8. TEST RESULTS

Penetration Resistance

The Penetration Resistance is the number of blows required to drive either a 50mm (outside diameter) open end "spilt spoon" or "Raymond" sampler the final 300mm of a 450mm penetration using a 64kg weight falling 760mm. The number of blows required to drive the sampler the final 300mm is referred to as the **"N" value**. The test is referred to as the **Standard Penetration Test or SPT**. The number of blows for each 150mm penetration of the test, or part-penetration when driving is terminated due to hard ground, are given in the "Other Tests" column, e.g. 15, 36, 46 for 55mm would indicate 15 blows for the first 150mm, 36 blows for the second 150mm and 46 blows for a further 55mm penetration and a N value of greater than 50 would be reported.

In some cases a solid steel 60° cone is used for this test (a **solid nose Standard Penetration Test**). For these cases the penetration resistance is reported as an **"S" value** is reported in this column.

Water Content and Atterberg Limits

The moisture or water content, plastic limit and liquid limit of the recovered soil sample, as determined in the laboratory in accordance with the test procedures set out in NZS4402, is plotted against depth. The abbreviations and graphic symbols are defined as follows:

•	w	natural moisture content
×	w_P	plastic limit
+	w_L	liquid limit

Other Tests

The following abbreviations are used to indicate the type of test undertaken:

COM	Compaction Test	pp	Pocket penetrometer strength
*CON	Consolidation test	*Q	Consolidated undrained triaxial test
G	Specific gravity or solid density of particles	qu	Unconfined compressive strength
k	Permeability coefficient	*SB	Shear box test
LS	Linear shrinkage	SP	Scala penetrometer
OC	Organic content	*ST	Swelling test
*PSD	Particle size distribution	SV	Vane shear strength: (U) – undisturbed (R) – remoulded

*These tests are usually summarised separately.

9. REMARKS

Any additional observations or relevant information such as weather conditions, piezometer design, daily drilling progress, survey co-ordinates of the borehole, problems encountered during drilling, etc.

Appendix C

Laboratory Testing

Babbage Geotechnical Laboratory
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64-9-377 0554
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Please reply to: W.E. Campton

Babbage Consultants Limited
P O Box 2027
Auckland 1140, New Zealand

Job Number: 42608/GE/L
File:
Checked by: J.F.
JF
28th July 2006

Attention: **RUSSELL ALLISON**

Dear Sir,

Re: ***West Coast Road, Henderson***
SPT Moisture Content Testing
Report No. 42608/GE/L/SPT Moistures

The following table presents the results of moisture content testing on drill rig Standard Penetration Test (SPT) soil samples collected by this laboratory on the 18th, 19th and 25th of July 2006. Test Standards used are as follows:

Moisture Content NZS4402:1986:Test 2.1

Hole No.	Sample No.	Depth (m)	Moisture Content (%)
BH1	S1	4.50 – 4.95	61.8
	S2	7.50 – 7.95	37.4
	S3	9.00 – 9.45	34.6
	S4	10.50 – 10.95	33.4
BH2	S1	4.50 – 4.95	44.0
	S2	8.00 – 8.45	45.9
	S3	9.50 – 9.95	33.3
BH3	S1	1.50 – 1.95	72.8
	S2	3.00 – 3.45	76.4
	S3	4.50 – 4.95	42.6
	S4	6.00 – 6.45	38.1
BH4	S1	2.00 – 2.45	37.2
	S2	3.50 – 3.95	61.8
	S3	5.00 – 5.45	67.5
	S4	7.50 – 7.95	94.1
	S5	10.50 – 10.95	46.1
	S6	12.00 – 12.45	38.8

Thank you for the opportunity to carry out this testing. If you have any queries regarding the content of this report please contact the undersigned at your convenience.

Yours faithfully,

Wayne Campton
Signatory (Laboratory Manager)
Babbage Geotechnical Laboratory

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation. This report may not be reproduced except in full.

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Please reply to: W.E. Campton

Babbage Consultants Limited
P O Box 2027
Auckland 1140, New Zealand

Attention: **RUSSELL ALLISON**

Job Number: 42608/GE/L
File:
Checked by:
JF
7th August 2006

Dear Sir,

Re: ***West Coast Road***
Plasticity Testing
Report No. 42608/GE/L/AL

The following table presents the results of Atterberg Limits testing on soil push-tube samples collected by this laboratory on the 18th of July 2006. Our instructions were to determine the natural moisture content and plasticity index of these samples. Page two of this report shows where these samples plot on the Casagrande Chart.

Test standards used were:

Moisture Content:	NZS4402:1986:Test 2.1	Plastic Limit:	NZS4402:1986:Test 2.3
Liquid Limit:	NZS4402:1986:Test 2.2	Plasticity Index:	NZS4402:1986:Test 2.4

Sample Number	Depth (m)	Moisture Content (%)	Liquid Limit	Plastic Limit	Plasticity Index
BH1 T1	1.50 – 1.95	39.0	78	25	53
BH1 T2	3.00 – 3.45	60.4	110	30	80
BH2 T2	5.00 – 5.45	42.4	68	22	46

Note: The whole soil was used for these tests and was wet up & dried where required.
The test results relate only to the samples under test due to the sampling procedure.

Thank you for the opportunity to carry out this testing. If you have any queries regarding the content of this report please contact the undersigned at your convenience.

Yours faithfully,

Wayne Campton
Signatory (Laboratory Manager)
Babbage Geotechnical Laboratory

new zealand accredited laboratory

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation. This report may not be reproduced except in full.

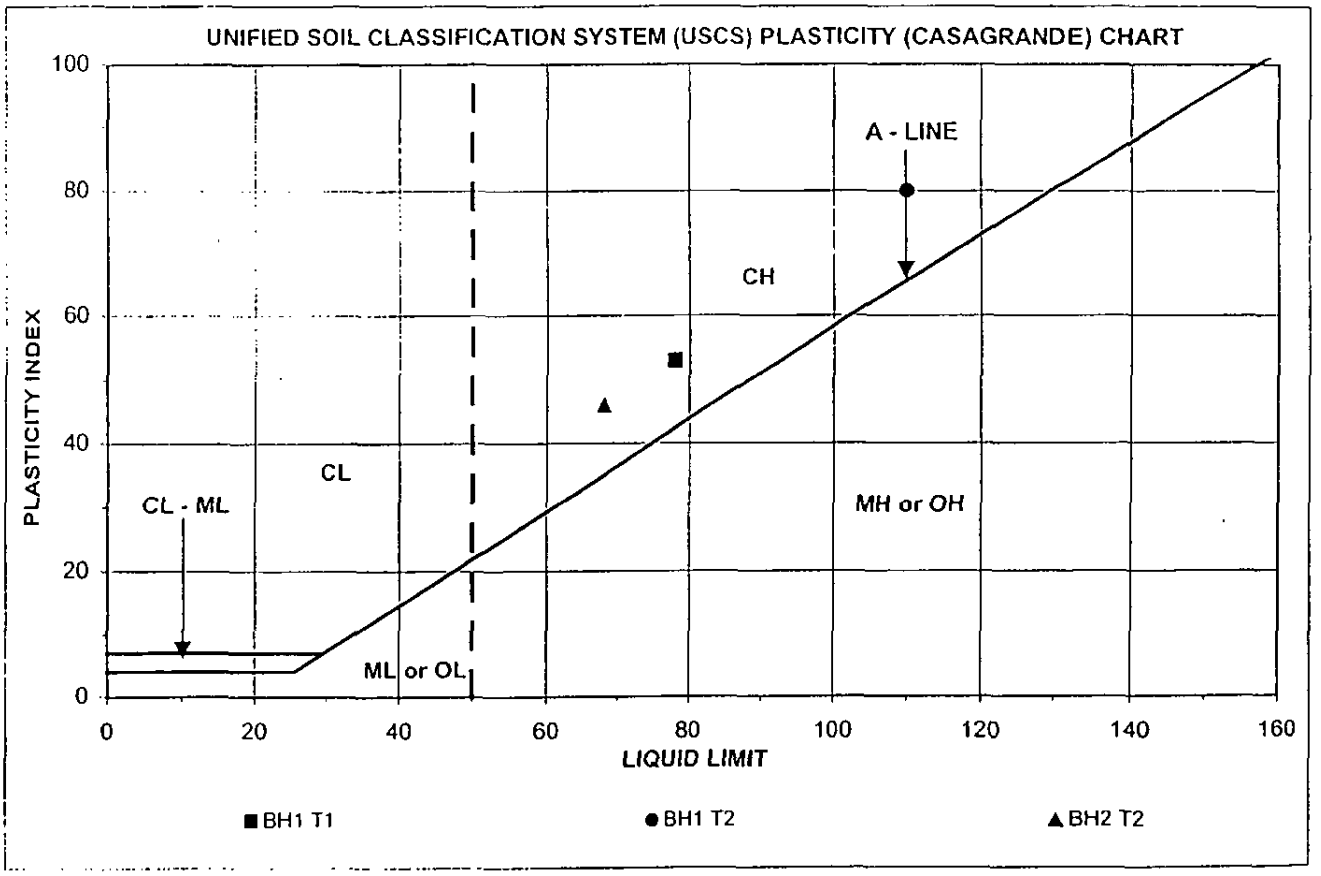
BGL Babbage Geotechnical Laboratory	Job No: 42608/GE/L Reg. No: 1503	Report No: 42608/GE/L/AL	Page 2 of 2 Issue Date: Feb-06 Rev: 0

PROJECT: WEST COAST ROAD, HENDERSON

		Initials	Date
Determination of the Liquid Limit, Plastic Limit, and the Plasticity Index Test Method: NZS4402: 1986: Test 2.2, Test 2.3 and Test 2.4	Tested By:	JF	4/08/06
	Compiled By:	JF	7/08/06
	Checked By:	JF	7/08/06

SUMMARY OF TESTING

SAMPLE NUMBER	Liquid Limit	Plastic Limit	Plasticity Index	Soil Classification
BH1 T1 / 1.50 - 1.95m	78	25	53	CH
BH1 T2 / 3.00 - 3.45m	110	30	80	CH
BH2 T2 / 5.00 - 5.45m	68	22	46	CH



LEGEND

CL	Clay - low plasticity	CH	Clay - high plasticity
ML	Silt - low liquid limit	MH	Silt - high liquid limit
OL	Organic Soil - low liquid limit	OH	Organic Soil - high liquid limit

NOTE: soil type descriptions are based on recommendations in the NZGS "Field Description of Soils & Rocks" (Draft for comment Feb 2003).

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Babbage Consultants Limited
P O Box 2027
Auckland 1140, New Zealand

Job Number: 42608/GE/L

Checked by:
JF
23rd August 2006

Attention: **RUSSELL ALLISON**

Dear Sir,

Re: ***West Coast Road***
One Dimensional Consolidation Testing
Report Number: 42608/GE/L/ODC

The following ten pages presents a summary of the results of one dimensional consolidation testing on 75mm and 60mm diameter push-tube samples collected by this laboratory on the 18th of July 2006. These push-tube samples were tested in accordance with the following standards:

Moisture Content:	NZS4402:1986:Test 2.1
One Dimensional Consolidation:	NZS4402:1986:Test 7.1

Samples were extruded from the tube and then trimmed close to final ring diameter using a scalpel blade. The consolidation ring was then pushed over the trimmed soil until the sample protruded from both ends of the ring. A wire was then used to cut the sample from the remaining tube and a flat edge used to trim the soil in the ring.

These test results relate to the samples tested only. The values of Mv shown on the tables have been calculated for each pressure increment, using void ratio difference for that increment.

Sample Descriptions ;

BH1 T1 / 1.50 – 1.95m
CLAY, trace fine sand, trace silt, firm to stiff, highly plastic, light grey with orange & black mottles, very moist, rootlets.

BH1 T2 / 3.00 – 3.45m
CLAY, trace fine sand, trace silt, firm, highly plastic, light grey, very moist.

BH2 T2 / 5.00 – 5.45m
CLAY, minor fine sand, minor silt, very stiff, highly plastic, light grey, slightly moist.

Thank you for the opportunity to carry out this testing. If you have any queries regarding the content of this report please contact the undersigned at your convenience.

Yours faithfully,

Wayne Campton
Signatory (Laboratory Manager)
Babbage Geotechnical Laboratory

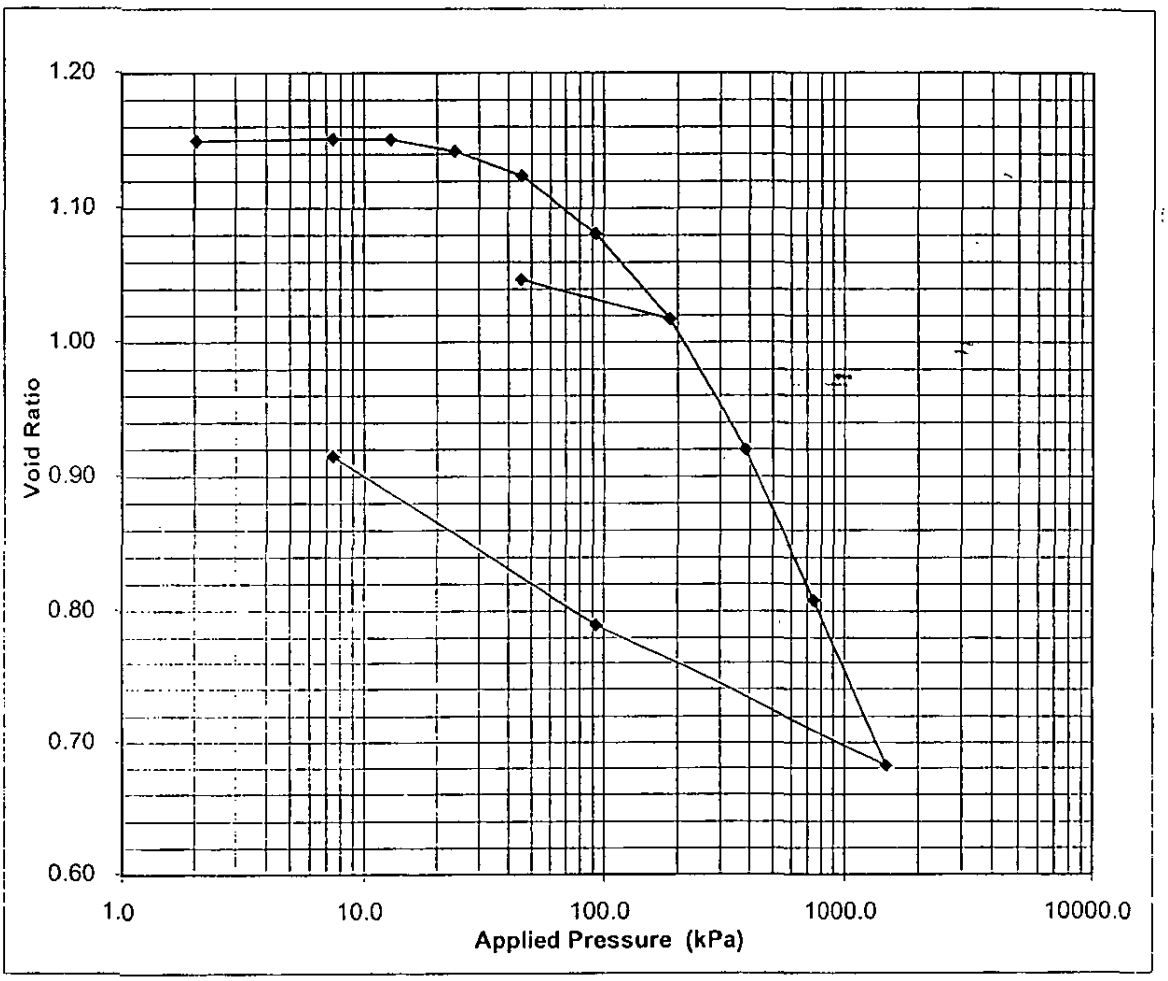
new zealand accredited laboratory

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation. This report may not be reproduced except in full.

BABBAGE GEOTECHNICAL LABORATORY

Job No:	Reg. No:	Sheet	of	Issue Date:	Aug-99
42608/GE/L	1503	2	10	Rev. No:	4
PROJECT				Auth. By:	WEC
WEST COAST ROAD					
				Initials	Date
ONE DIMENSIONAL CONSOLIDATION			Tested By:	JF	Jul-06
Test Method: NZS4402:1986:Test 7.1			Compiled By:	JF	Jul-06
			Checked By:	WEC	23/08/06

Bore No: BH1 **Sample Number:** T1 **Depth:** 1.5 - 2.0m



Applied Pressure p kPa	Void Ratio e	Mv m²/MN	Consolidation Coefficient Cv (log t) m²/year	Cv (sqrt t) m²/year
2.0	1.149			
7.5	1.151	-0.127		
12.9	1.151	0.024		
23.7	1.142	0.369	1.9	9.9
45.4	1.124	0.391	1.3	2.7
93.1	1.081	0.421	1.4	3.6
186.3	1.017	0.329	1.1	2.1
45.4	1.047	0.104		
186.3	1.018	0.102		
383.6	0.920	0.245	1.0	1.3
747.7	0.808	0.160	0.9	1.0
1493.5	0.682	0.093	0.8	1.1
93.1	0.790	0.046		
7.5	0.915	0.818		

BGL Babbage Geotechnical Laboratory	Job No: 42608/GE/L	Reg. No: 1503	Sheet of 3 10	Issue Date:	Aug-99
	PROJECT WEST COAST ROAD			Rev. No:	4
				Auth. By:	WEC
				Initials	Date
ONE DIMENSIONAL CONSOLIDATION Test Method: NZS4402:1986:Test 7.1			Tested By:	JF	Jul-06
			Compiled By:	JF	Jul-06
			Checked By:	WEC	23/08/06

RESULT SUMMARY:

Bore Number: BH1 **Sample Number:** T1 **Depth:** 1.5 - 2.0m

Sample History: Undisturbed ~~/ remoulded / compacted / other~~
Specimen from 75mm diameter tube
~~Compacted with ..... compactive effort / other~~

Sample preparation: Extruded from 75mm diameter tube in increments and trimmed around ring. 60mm diameter ring then pushed over sample.

Test details: Consolidation machine number : 2 Ring number : Brass
Area of ring : 2827mm^2
Solid density of soil particles, Ps = 2.65t/m^3 : ~~measured~~/assumed

			INITIAL		FINAL
Mass of dry specimen	Ms (g)		72.50		72.50
Thickness of specimen	H (mm)	Hi	20.800	Hf	16.278
Water content	w (%)	w_i	42.8	w_f	36.5
Dry density $P_d = \frac{M_S}{H \times A}$	t/m^3	Pd_i	1.23	Pd_f	1.58
Height of Soil Particles $H_S = \frac{M_S \times 1000}{P_S \times A}$	mm	Hs	9.677	Hs	9.677
Void Ratio $e = \frac{H - H_S}{H_S}$		e_i	1.149	e_f	0.682
Degree of Saturation $S = \frac{P_S \times w}{e}$	%	Si	98.6	Sf	142

BGL
BABBAGE GEOTECHNICAL LABORATORY

Job No:	Reg. No:	Sheet	of	Issue Date:	Aug-99
42608/GE/L	1503	4	10	Rev. No:	4
PROJECT				Auth. By:	WEC
WEST COAST ROAD					
				Initials	Date
ONE DIMENSIONAL CONSOLIDATION			Tested By:	JF	Jul-06
Test Method: NZS4402:1986:Test 7.1			Compiled By:	JF	Jul-06
			Checked By:	WEC	23/08/06

Bore No: BH1 **Sample Number:** T1 **Depth:** 1.5 - 2.0m

Applied Pressure kPa	Incremental Deflection mm	Thickness of Specimen mm	Comp. Ratio	Height of Voids mm	Void Ratio e	Coefficient of Consolidation (log t) m²/year	Coefficient of Consolidation (sqrt t) m²/year
2.0	0.000	20.800	1.000	11.123	1.149		
7.5	-0.014	20.814	1.001	11.138	1.151		
12.9	0.003	20.812	1.001	11.135	1.151		
23.7	0.083	20.728	0.997	11.052	1.142	1.94	9.93
45.4	0.176	20.553	0.988	10.876	1.124	1.35	2.70
93.1	0.412	20.140	0.968	10.464	1.081	1.37	3.62
186.3	0.618	19.523	0.939	9.846	1.017	1.05	2.13
45.4	-0.286	19.809	0.952	10.132	1.047		
186.3	0.286	19.523	0.939	9.846	1.018		
383.6	0.944	18.579	0.893	8.903	0.920	0.99	1.33
747.7	1.084	17.495	0.841	7.818	0.808	0.88	1.00
1493.5	1.217	16.278	0.783	6.602	0.682	0.78	1.08
93.1	-1.040	17.318	0.833	7.641	0.790		
7.5	-1.213	18.531	0.891	8.854	0.915		

Overburden Pressure P_o kpa

Pressure P_i $P_o + 100$ kPa

Thickness at P_o H_o mm

Thickness at P_i H_i mm

Voids Ratio at P_o e_o

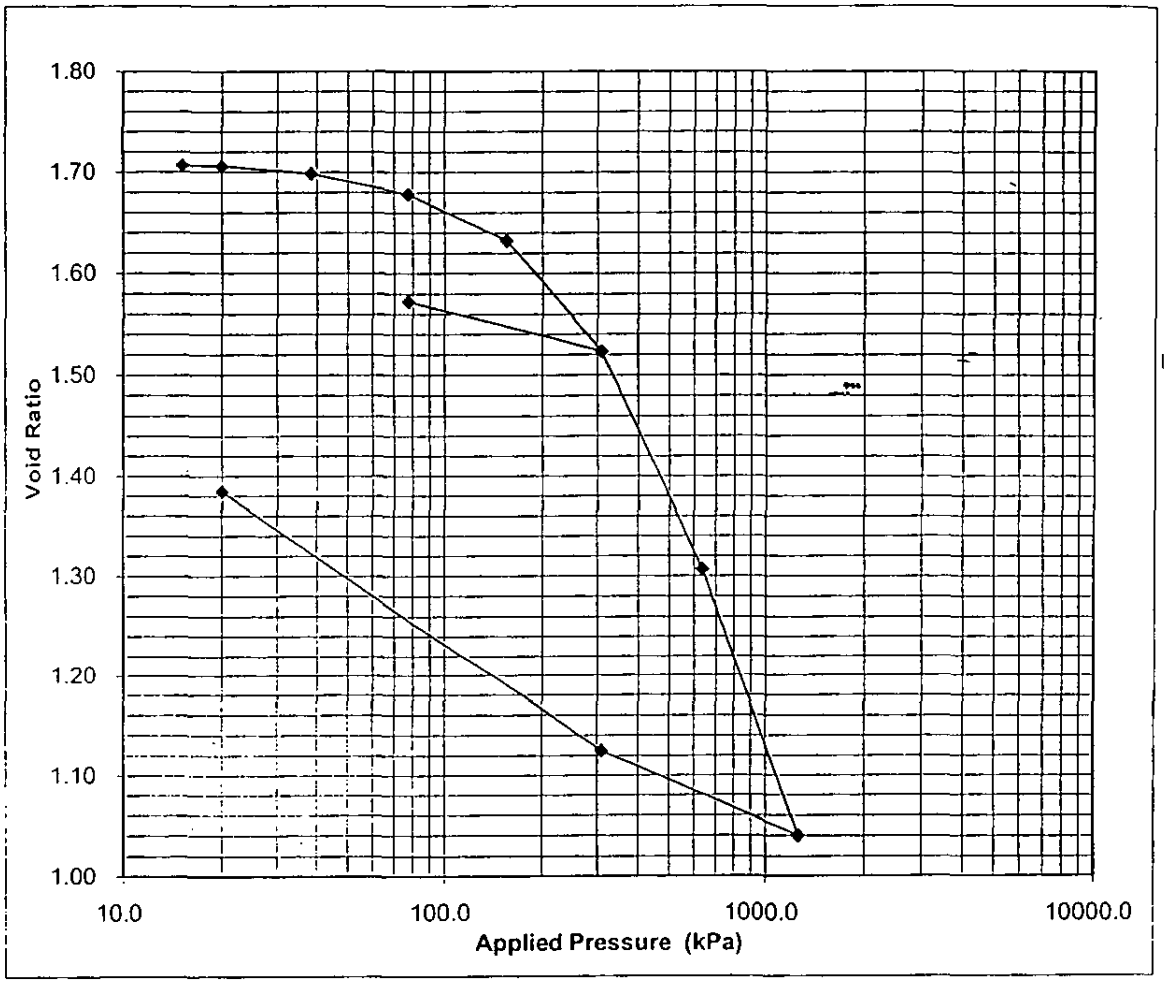
Voids Ratio at P_i e_i

Coefficient of Compressibility M_v m^2/MN

$$\frac{(e_o - e_i)}{(1+e_o)(P_i - P_o)} * 1000$$

	Job No:	Reg. No:	Sheet	of	Issue Date:	Aug-99
BGL BABBAGE GEOTECHNICAL LABORATORY	42608/GE/L	1503	5	10	Rev. No:	4
	PROJECT				Auth. By:	WEC
	WEST COAST ROAD					
					Initials	Date
ONE DIMENSIONAL CONSOLIDATION					Tested By:	JF Jul-06
Test Method: NZS4402:1986:Test 7.1					Compiled By:	JF Jul-06
					Checked By:	WEC 23/08/06

Bore No: BH1 **Sample Number:** T2 **Depth:** 3.0-3.5m



Applied Pressure kPa	Void Ratio e	My m²/MN	Consolidation Coefficient Cv (log t) m²/year	Cv (sqrt t) m²/year
15.1	1.707			
20.0	1.706	0.060		
38.4	1.698	0.156	3.6	6.4
77.3	1.678	0.190	2.7	4.4
154.9	1.632	0.221	2.9	3.5
310.2	1.523	0.267	1.3	1.6
77.3	1.573	0.084		
310.2	1.523	0.083		
636.4	1.307	0.263	1.2	1.2
1257.7	1.040	0.186	1.0	1.0
310.2	1.125	0.044		
20.0	1.385	0.422		

BGL Babbage Geotechnical Laboratory	Job No: 42608/GE/L	Reg. No: 1503	Sheet of 6 10	Issue Date:	Aug-99
				Rev. No:	4
	PROJECT WEST COAST ROAD			Auth. By:	WEC
				Initials	Date
ONE DIMENSIONAL CONSOLIDATION Test Method: NZS4402:1986:Test 7.1			Tested By:	JF	Jul-06
			Compiled By:	JF	Jul-06
			Checked By:	WEC	23/08/06

RESULT SUMMARY:

Bore Number: BH1 **Sample Number:** T2 **Depth:** 3.0-3.5m

Sample History: Undisturbed ~~/ remoulded / compacted / other~~
Specimen from 75mm diameter tube
~~Compacted with ..... compactive effort / other~~

Sample preparation: Extruded from 75mm diameter tube in increments and trimmed around ring. 63.4mm diameter ring then pushed over sample.

Test details: Consolidation machine number : 7 Ring number : Silver
Area of ring : 3157mm^2
Solid density of soil particles, Ps = 2.65 t/m^3 : ~~measured~~/assumed

		INITIAL		FINAL	
Mass of dry specimen	Ms (g)		70.46		70.46
Thickness of specimen	H (mm)	Hi	22.800	Hf	17.186
Water content	w (%)	w_i	68.3	w_f	53.6
Dry density $P_d = \frac{M_s}{H \times A}$	t/m^3	Pd_i	0.98	Pd_f	1.30
Height of Soil Particles $H_s = \frac{M_s \times 1000}{P_s \times A}$	mm	Hs	8.423	Hs	8.423
Void Ratio $e = \frac{H - H_s}{H_s}$		e_i	1.707	e_f	1.040
Degree of Saturation $S = \frac{P_s \times w}{e}$	%	Si	106.0	Sf	137

BGL BABBAGE GEOTECHNICAL LABORATORY	Job No:	Reg. No:	Sheet of	Issue Date:	Aug-99
	42608/GE/L	1503	7 10	Rev. No:	4
	PROJECT			Auth. By:	WEC
	WEST COAST ROAD				
				Initials	Date
ONE DIMENSIONAL CONSOLIDATION			Tested By:	JF	Jul-06
Test Method: NZS4402:1986:Test 7.1			Compiled By:	JF	Jul-06
			Checked By:	WEC	23/08/06

Bore No: BH1 **Sample Number:** T2 **Depth:** 3.0-3.5m

Applied Pressure (kPa)	Incremental Deflection mm	Thickness of Specimen mm	Comp. Ratio	Height of Voids mm	Void Ratio e	Coefficient of Consolidation (log t) m^2/year	Coefficient of Consolidation (sqrt t) m^2/year
15.1	0.000	22.800	1.000	14.377	1.707		
20.0	0.007	22.793	1.000	14.371	1.706		
38.4	0.066	22.728	0.997	14.305	1.698	3.55	6.41
77.3	0.167	22.560	0.989	14.138	1.678	2.69	4.42
154.9	0.388	22.172	0.972	13.750	1.632	2.94	3.53
310.2	0.920	21.252	0.932	12.830	1.523	1.28	1.62
77.3	-0.417	21.669	0.950	13.246	1.573		
310.2	0.417	21.252	0.932	12.830	1.523		
636.4	1.820	19.432	0.852	11.010	1.307	1.17	1.15
1257.7	2.246	17.186	0.754	8.763	1.040	0.98	0.96
310.2	-0.711	17.897	0.785	9.475	1.125		
20.0	-2.192	20.089	0.881	11.666	1.385		

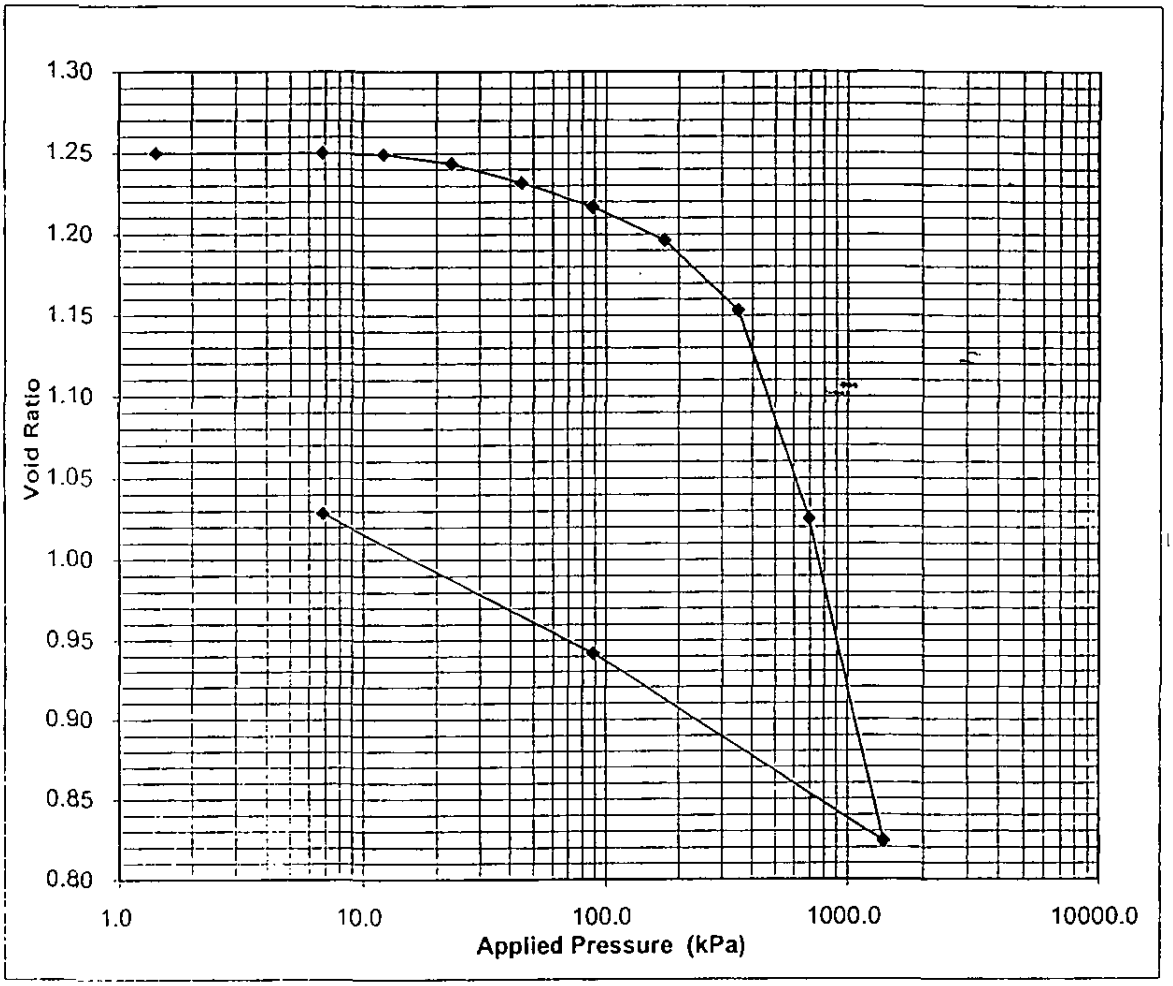
Overburden Pressure	P_o	kpa
Pressure P_i	$P_o + 100$	kPa
Thickness at P_o	H_o	mm
Thickness at P_i	H_i	mm
Voids Ratio at P_o	e_o	
Voids Ratio at P_i	e_i	

Coefficient of Compressibility M_v m^2/MN

$$\frac{(e_o - e_i)}{(1+e_o)(P_i - P_o)} * 1000$$

Job No:	Reg. No:	Sheet	of	Issue Date:	Aug-99
42608/GE/L	1503	8	10	Rev. No:	4
PROJECT				Auth. By:	WEC
WEST COAST ROAD					
				Initials	Date
ONE DIMENSIONAL CONSOLIDATION			Tested By:	JF	Aug-06
Test Method: NZS4402:1986:Test 7.1			Compiled By:	JF	Aug-06
			Checked By:	WEC	23/08/06

Bore No: BH2 Sample Number: T2 Depth: 5.0 - 5.5m



Applied Pressure kPa	Void Ratio e	MV m^2/MN	Consolidation Coefficient CV (logt) m^2/year	CV (sqrt t) m^2/year
1.4	1.250			
6.8	1.250	0.000		
12.3	1.249	0.094	18.1	48.2
23.1	1.244	0.222	18.0	30.8
44.8	1.232	0.246	18.0	30.7
88.1	1.217	0.156	16.0	26.7
174.8	1.196	0.105	17.5	34.4
348.3	1.153	0.114	11.9	20.4
695.1	1.025	0.171	2.5	6.6
1388.8	0.824	0.143	1.1	2.2
88.1	0.942	0.050		
6.8	1.029	0.550		

	Job No:	Reg. No:	Sheet of	Issue Date:	Aug-99
BGL BABBAGE GEOTECHNICAL LABORATORY	42608/GE/L	1503	9 10	Rev. No:	4
	PROJECT			Auth. By:	WEC
	WEST COAST ROAD				
				Initials	Date
ONE DIMENSIONAL CONSOLIDATION			Tested By:	JF	Aug-06
Test Method: NZS4402:1986:Test 7.1			Compiled By:	JF	Aug-06
			Checked By:	WEC	23/08/06

RESULT SUMMARY:

Bore Number: BH2 **Sample Number:** T2 **Depth:** 5.0 - 5.5m

Sample History: Undisturbed ~~/ remoulded / compacted~~ / ~~other~~
Specimen from 60mm diameter tube
~~Compacted with ..... compactive effort / other~~

Sample preparation: Extruded from 60mm diameter tube directly into ring, ends of sample then trimmed flat with edge of ring using a straight edge.

Test details: Consolidation machine number : 1 Ring number : Silver
Area of ring : 2827mm^2
Solid density of soil particles, Ps = 2.65t/m^3 : ~~measured~~/assumed

			INITIAL		FINAL
Mass of dry specimen	Ms (g)		83.26		83.26
Thickness of specimen	H (mm)	Hi	25.000	Hf	20.269
Water content	w (%)	w_i	48.1	w_f	41.9
Dry density $P_d = \frac{M_S}{H \times A}$	t/m^3	Pd_i	1.18	Pd_f	1.45
Height of Soil Particles $H_S = \frac{M_S \times 1000}{P_S \times A}$	mm	Hs	11.112	Hs	11.112
Void Ratio $e = \frac{H - H_S}{H_S}$		e_i	1.250	e_f	0.824
Degree of Saturation $S = \frac{P_S \times w}{e}$	%	S_i	102.0	S_f	135

BGL
BARBAGE GEOTECHNICAL LABORATORY

Job No:	Reg. No:	Sheet	of	Issue Date:	Aug-99
42608/GE/L	1503	10	10	Rev. No:	4
PROJECT				Auth. By:	WEC
WEST COAST ROAD					
				Initials	Date
ONE DIMENSIONAL CONSOLIDATION				Tested By:	JF Aug-06
Test Method: NZS4402:1986:Test 7.1				Compiled By:	JF Aug-06
				Checked By:	WEC 23/08/06

Bore No: BH2 **Sample Number:** T2 **Depth:** 5.0 - 5.5m

Applied Pressure kPa	Incremental Deflection mm	Thickness of Specimen mm	Comp Ratio	Height of Voids mm	Void Ratio e	Coefficient of Consolidation (log t) m²/year	Coefficient of Consolidation (sqrt t) m²/year
1.4	0.000	25.000	1.000	13.888	1.250		
6.8	-0.005	25.005	1.000	13.893	1.250		
12.3	0.013	24.993	1.000	13.881	1.249	18.06	48.20
23.1	0.060	24.932	0.997	13.820	1.244	18.04	30.82
44.8	0.133	24.799	0.992	13.687	1.232	17.96	30.67
88.1	0.167	24.632	0.985	13.520	1.217	15.99	26.67
174.8	0.225	24.407	0.976	13.295	1.196	17.53	34.36
348.3	0.484	23.923	0.957	12.811	1.153	11.91	20.41
695.1	1.419	22.504	0.900	11.392	1.025	2.48	6.61
1388.8	2.235	20.269	0.811	9.157	0.824	1.10	2.25
88.1	-1.310	21.579	0.863	10.467	0.942		
6.8	-0.965	22.544	0.902	11.432	1.029		

Overburden Pressure	P_o		kpa
Pressure P_i	$P_o + 100$		kPa
Thickness at P_o	H_o		mm
Thickness at P_i	H_i		mm
Voids Ratio at P_o	e_o		
Voids Ratio at P_i	e_i		

Coefficient of Compressibility M_v m^2/MN

$$\frac{(e_o - e_i)}{(1+e_o)(P_i - P_o)} \quad *1000$$

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wec@babbage.co.nz

Please reply to: W.E. Campton

Babbage Consultants Limited
P O Box 2027
Auckland 1140, New Zealand

Attention: Russell Allison

Job Number: 42608/GE

Checked by:
WEC
2nd November 2006

Dear Sir,

Re: ***West Coast Road***
Triaxial Testing - Quick Undrained
Report Number 42608/QUT Aug 06 Rev A

The following 2 pages presents the results of Compressive Strength in Undrained Triaxial Compression without Measurement of Pore Water Pressure testing on two tube samples collected by this laboratory on the 18th July 2006. The 60 mmØ tube samples were tested in accordance with the following standard:

BS1377 :1990 :Part 7 Section 8

Each sample was set up in a triaxial cell with a covering membrane (0.4mm thick), and the cell filled with water. Cell pressure was then raised to 100kPa, and tested without confirming saturation or allowing for consolidation.

The loading machine was adjusted and rate of compression set to induce failure at 5 min to 10 min (from triaxial test results). Load versus strain was measured until failure, or until 20% strain.

The table below summarises the test results.

Sample Number	Depth	Dimensions	Bulk Density	Moisture Content	Dry Density	Deviator Stress	Strain %
BH1, T1	1.5m	60mmDx 125mmL	1.72t/m^3	44.9%	1.18t/m^3	54kPa	8.1%
BH2, T1	3.0m	60mmDx111mmL	1.52t/m^3	70.4%	0.90t/m^3	123kPa	3.2%

Yours faithfully,

Wayne Campton
Signatory (Laboratory Manager)
Babbage Geotechnical Laboratory

new zealand accredited laboratory

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation. This report may not be reproduced except in full.

BGL	Job No: 42608	Reg. No: 1503	Report No: 42608/QUT Rev A	Page 2 of 3
BABBAGE GEOTECHNICAL LABORATORY				Issue Date: Aug-06

PROJECT: West Coast Road

		Initials	Date
Undrained Shear Strength in Triaxial Compression Without PWP Measurement	**Tested By:**	wec	Jul-06
	Compiled By:	comp	Aug-06
Test Method: BS1377:1990:Part 7 Section 8	**Checked By:**	wec	2/11/06

Bore Number: BH1 **Sample Number:** T1 **Depth:** 1.5

Test Performed on: Whole soil ~~/ Fraction passing 19mm test sieve~~
Sample History: Undisturbed ~~/ remoulded / recompacted / unknown~~
Sample Method & Type: From core sample ~~/ larger tube / block sample / pressed into tube / compacted with standard/heavy compactive effort~~

Cell Confining Pressure Set at: 100 kPa

Sample Description:

Membrane Thickness	0.4mm
Membrane Correction	1

Determination of Bulk Density:		
Diameter of Specimen:	(mm)	60.00
Initial Area of Specimen:	(mm^2)	2827.43
Initial Length:	(mm)	125.00
Initial Mass:	(g)	609.61
Volume	(mls)	353.43
Bulk Density:	(t/m^3)	1.725
Proving Ring No:		10-13232
Calibration Constant	(N/mm)	1491.75
Rate of Strain:	(%/min)	1.25

Determination of Water Content:		
Container Number:		96
Mass container + wet soil:		187.851
Mass container + dry soil:		146.091
Check container + dry soil		146.091
Mass of container:		53.014
Water Content:	(%)	44.9
Dry Density:	(t/m^3)	1.191

Time	Compression Gauge (mm)	Specimen Compression (mm)	Strain	Load Gauge (mm)	Axial Force (N)	Corrected Area (mm^2)	Measured Deviator Stress
14:01:26	0.334	0.000	0.000	-2.949	0.0	2827.4	0
14:01:57	1.063	0.729	0.006	-2.925	36.7	2844.0	13
14:02:27	1.843	1.509	0.012	-2.897	78.7	2862.0	27
14:02:58	2.624	2.290	0.018	-2.882	100.0	2880.2	35
14:03:28	3.409	3.075	0.025	-2.871	116.6	2898.7	40
14:03:58	4.197	3.863	0.031	-2.869	120.1	2917.6	41
14:04:29	4.979	4.644	0.037	-2.860	133.2	2936.5	45
14:04:59	5.760	5.426	0.043	-2.856	139.3	2955.7	47
14:05:30	6.545	6.210	0.050	-2.851	146.0	2975.3	49
14:06:00	7.334	7.000	0.056	-2.847	153.0	2995.2	51
14:07:31	9.697	9.363	0.075	-2.839	163.8	3056.4	54
14:08:02	10.485	10.150	0.081	-2.835	169.9	3077.3	55
14:08:32	11.263	10.928	0.087	-2.846	153.4	3098.3	50
14:09:02	12.048	11.714	0.094	-2.844	156.8	3119.8	50
14:09:33	12.821	12.487	0.100	-2.859	135.0	3141.2	43

Failure Conditions: **Maximum Deviator Stress** **54** kPa
Cu **27** kPa

Strain at failure: 8.1 % 10.15 mm

Mode of Failure: plastic

BGL BABBAGE GEOTECHNICAL LABORATORY	Job No: 42608	Reg. No: 1503	Report No: 42608/QUT Rev A	Page 3 of 3
				Issue Date: Aug-06

PROJECT: [redacted] West Coast Road

		Initials	Date
Undrained Shear Strength in Triaxial Compression Without PWP Measurement	**Tested By:**	wec	Jul-06
	Compiled By:	comp	Aug-06
Test Method: BS1377:1990:Part 7 Section 8	**Checked By:**	wec	2/11/06

Bore Number: BH2 **Sample Number:** T1 **Depth:** 3

Test Performed on: Whole soil ~~/ Fraction passing 19mm test sieve~~
Sample History: Undisturbed ~~/ remoulded / recompacted / unknown~~
Sample Method & Type: From core sample ~~/ larger tube / block sample / pressed into tube / compacted with standard/heavy compactive effort~~

Cell Confining Pressure Set at: 100 kPa
Sample Description:

Membrane Thickness	0.4mm
Membrane Correction	0.3

Determination of Bulk Density:		
Diameter of Specimen:	(mm)	60.00
Initial Area of Specimen:	(mm^2)	2827.43
Initial Length:	(mm)	111.50
Initial Mass:	(g)	477.93
Volume	(mls)	315.26
Bulk Density:	(t/m^3)	1.516
Proving Ring No:		10-13232
Calibration Constant	(N/mm)	1491.75
Rate of Strain:	(mm/min)	0.81

Determination of Water Content:		
Container Number:		97
Mass container + wet soil:		152.883
Mass container + dry soil:		111.684
Check container + dry soil		111.684
Mass of container:		53.151
Water Content:	(%)	70.4
Dry Density:	(t/m^3)	0.890

Time	Compression Gauge (mm)	Specimen Compression (mm)	Strain	Load Gauge (mm)	Axial Force (N)	Corrected Area (mm^2)	Measured Deviator Stress
15:32:38	-2.121	0.000	0.000	-2.927	0.0	2827.4	0
15:33:08	-1.674	0.446	0.004	-2.917	14.9	2838.8	5
15:33:38	-1.177	0.944	0.008	-2.907	30.2	2851.6	11
15:34:09	-0.710	1.410	0.013	-2.890	56.0	2863.7	20
15:34:39	-0.339	1.781	0.016	-2.794	198.6	2873.3	69
15:35:10	0.079	2.200	0.020	-2.738	283.2	2884.3	98
15:35:40	0.525	2.646	0.024	-2.706	330.6	2896.2	114
15:36:10	1.004	3.125	0.028	-2.692	351.7	2909.0	121
15:36:41	1.486	3.607	0.032	-2.685	361.5	2921.9	124
15:37:11	1.975	4.096	0.037	-2.687	359.3	2935.3	122
15:37:42	2.472	4.593	0.041	-2.694	347.5	2948.9	118
15:38:12	2.971	5.091	0.046	-2.703	334.1	2962.7	113
15:38:43	3.330	5.451	0.049	-2.761	248.9	2972.8	84

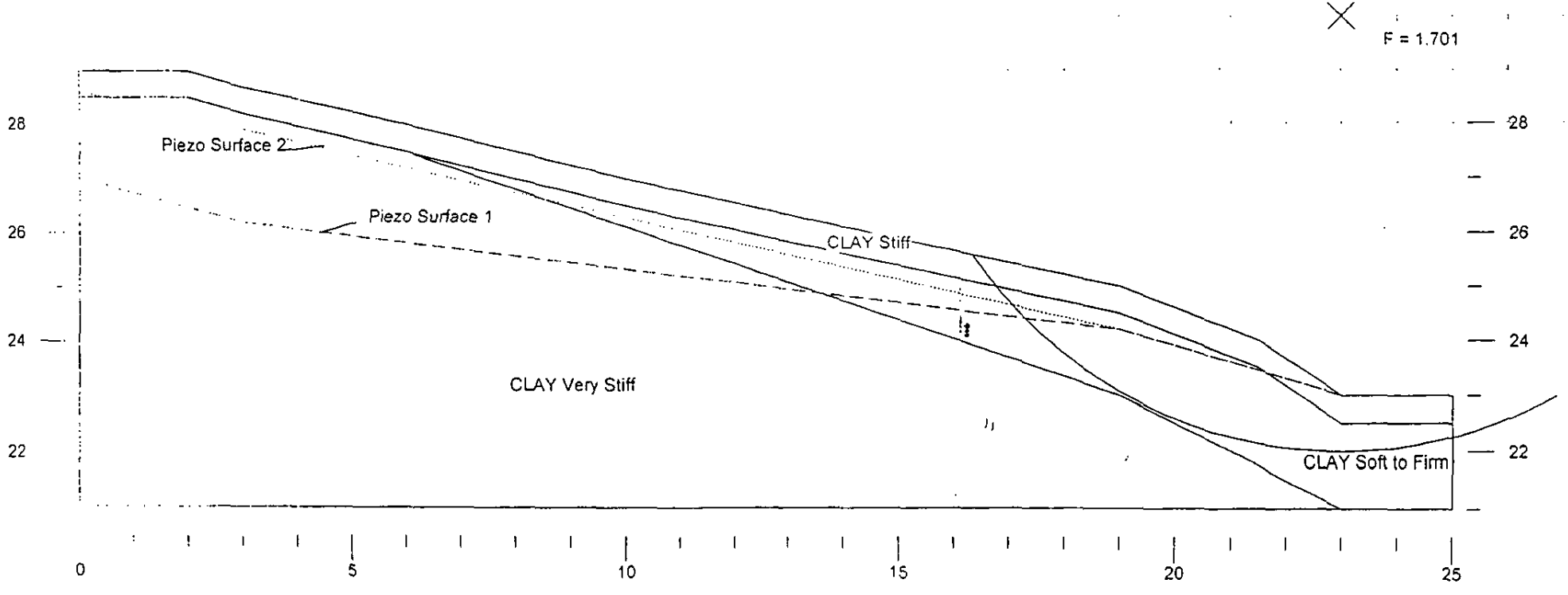
Failure Conditions: **Maximum Deviator Stress** **123** kPa
Cu **62** kPa
Strain at failure: 3.2 % Mode of Failure: planar
3.61 mm

Appendix D

Slope Stability Analysis

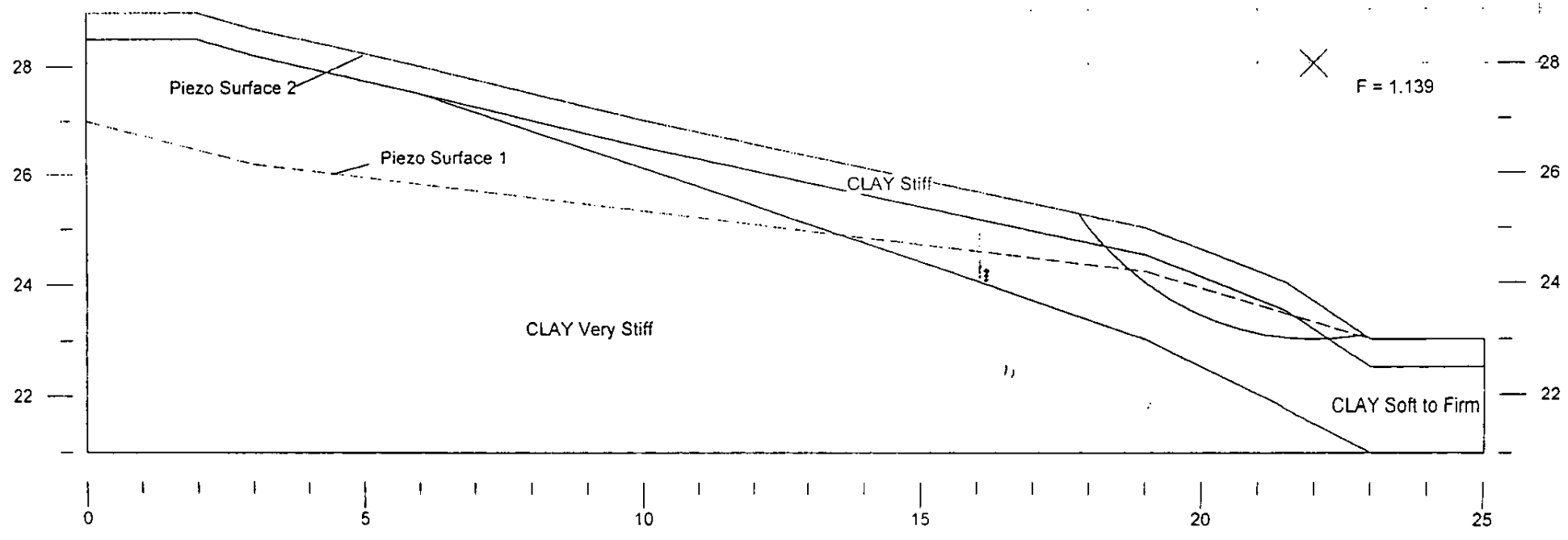
	Gamma kN/m3	C kPa	Phi deg	Piezo Surf.	Ru
CLAY Stiff	19	5	30	1	0
CLAY Soft/Firm	18	2	27	1	0
CLAY Very Stiff	20	7	32	1	0

Babbage Consultants Limited - Auckland, NZ
42608/GE
West Coast Road
7th November 2006
AA



	Gamma kN/m3	C kPa	Phi deg	Piezo Surf.	Ru
CLAY Stiff	18	5	30	2	0
CLAY Soft/Firm	18	2	27	2	0
CLAY Very Stiff	20	7	32	2	0

Babbage Consultants Limited - Auckland, NZ
42608/GE
West Coast Road
7th November 2006
AA



	Gamma kN/m3	*C* kPa	*Phi* deg	*Piezo* Surf.	*Ru*
Fill	17	5	30	0	0
CLAY Stiff	18	5	30	0	0
CLAY Firm	18	2	27	0	0
CLAY Stiff	18	5	30	0	0

Babbage Consultants Limited - Auckland, NZ
42608
West Coast Road
7 November 2006
Section BB

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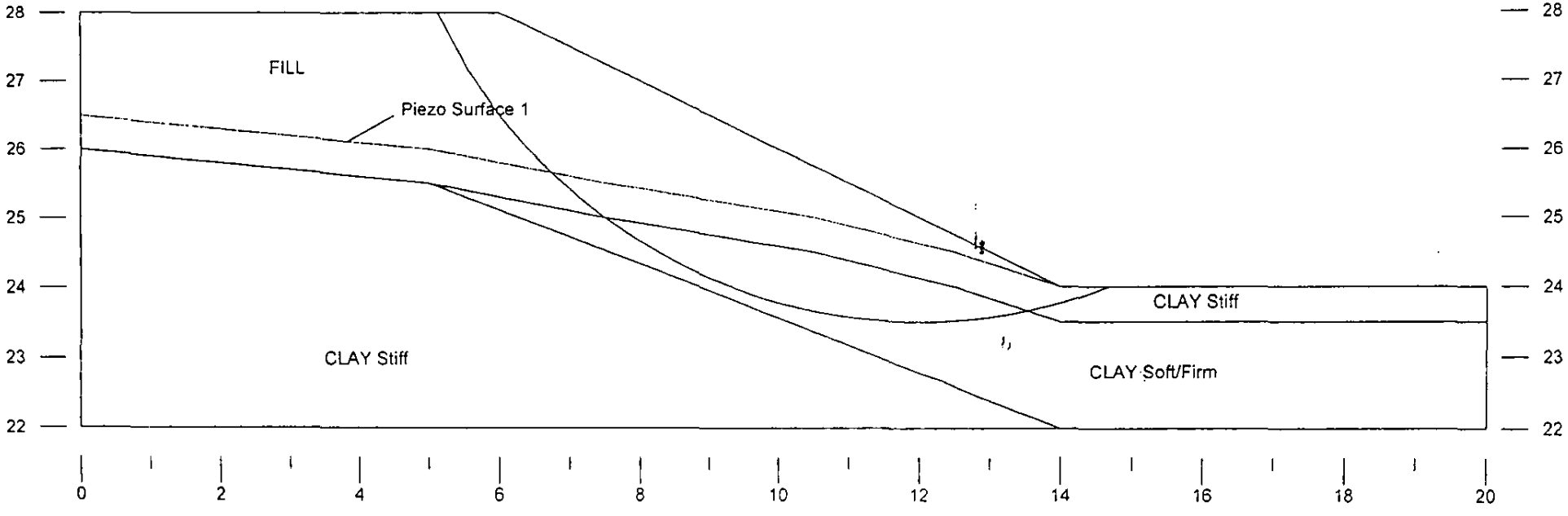

	Gamma kN/m3	C kPa	Phi deg	Piezo Surf.	Ru
Fill	17	5	30	1	0
CLAY Stiff	18	5	30	1	0
CLAY Firm	18	2	27	1	0
CLAY Stiff	18	5	30	1	0

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42608
West Coast Road
7 November 2006
Section BB

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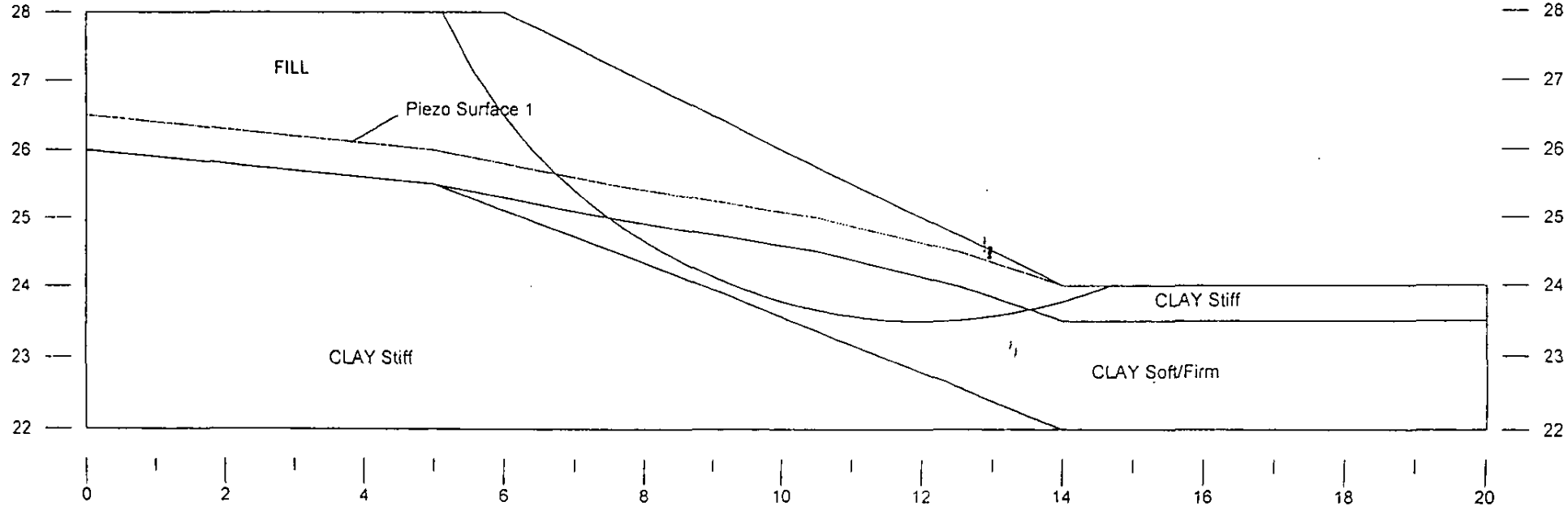

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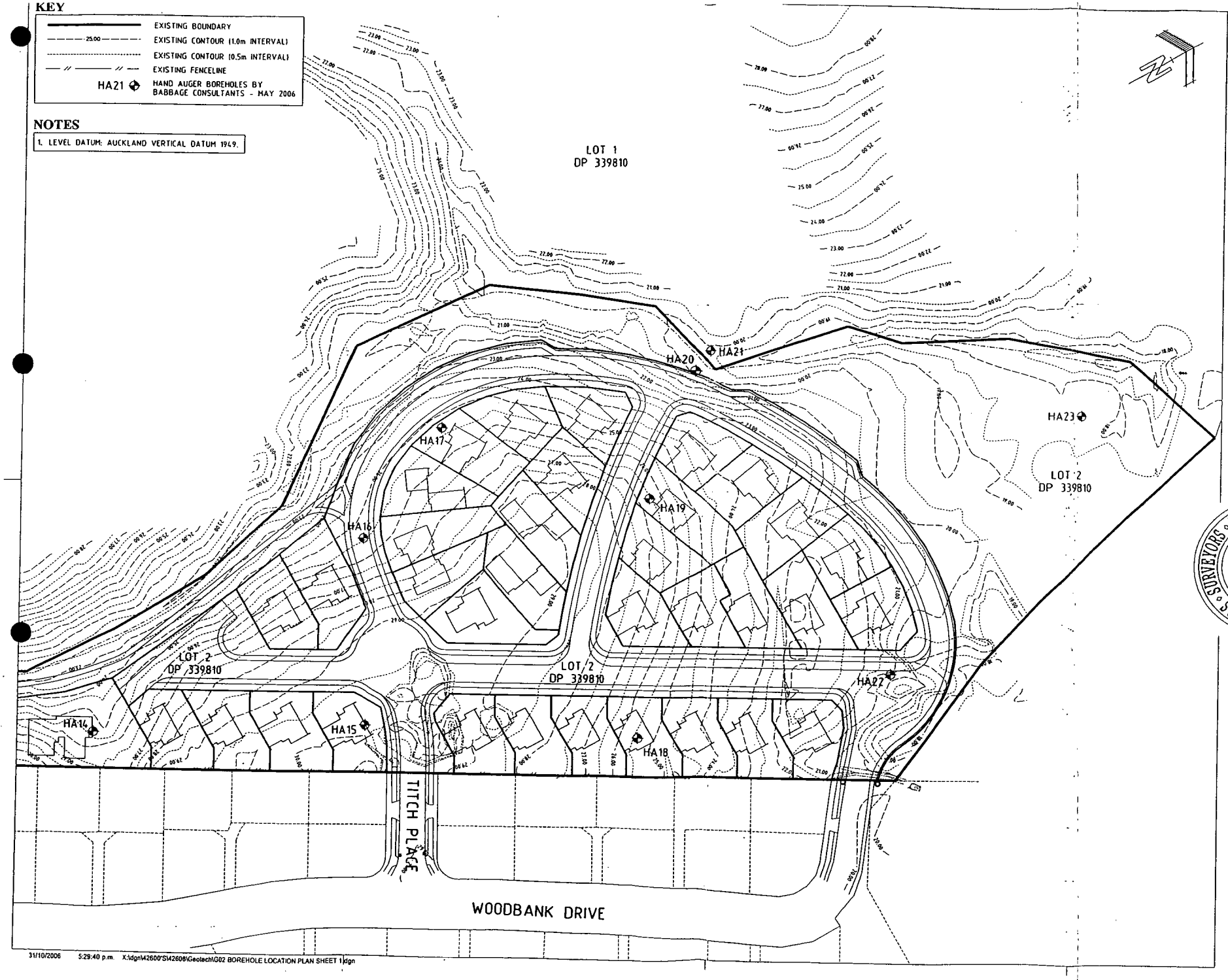
KEY

- EXISTING BOUNDARY
- 25.00 EXISTING CONTOUR (1.0m INTERVAL)
- EXISTING CONTOUR (0.5m INTERVAL)
- EXISTING FENCELINE
- HA21 HAND AUGER BOREHOLES BY BABBAGE CONSULTANTS - MAY 2006

NOTES

1. LEVEL DATUM: AUCKLAND VERTICAL DATUM 1949.



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DRAWING NOTES

REV	DATE	DESCRIPTION	DRAWN	CHECK
A	30.10.06	HAND AUGER DESCRIPTIONS AMENDED	MJD	RA

DRAWING REVISIONS

Babbage CONSULTANTS
ENGINEERS • SURVEYORS • ARCHITECTS
109 FANSHAWE STREET
PO BOX 202
AUCKLAND 1 - NEW ZEALAND
PHONE 09 - 379 9980 FAX 09 - 377 1170
admin@babbage.co.nz

CLIENT / PROJECT

WEST COAST ROAD HOUSING DEVELOPMENT

FOR

NZ HOUSING FOUNDATION

DRAWING TITLE

BOREHOLE LOCATION PLAN (SHEET 1)

	DATE	INITIAL
DESIGNED		
DRAWN	JUNE 2006	GNB
CHECKED		
APPROVED		

SCALE (A1)

1:500

JOB NUMBER	DRAWING NUMBER	REVISION
42608	G02	A

31/10/2006 5:29:40 p.m. X:\dgn\42600'S\42608\Geotech\G02 BOREHOLE LOCATION PLAN SHEET 1.dgn

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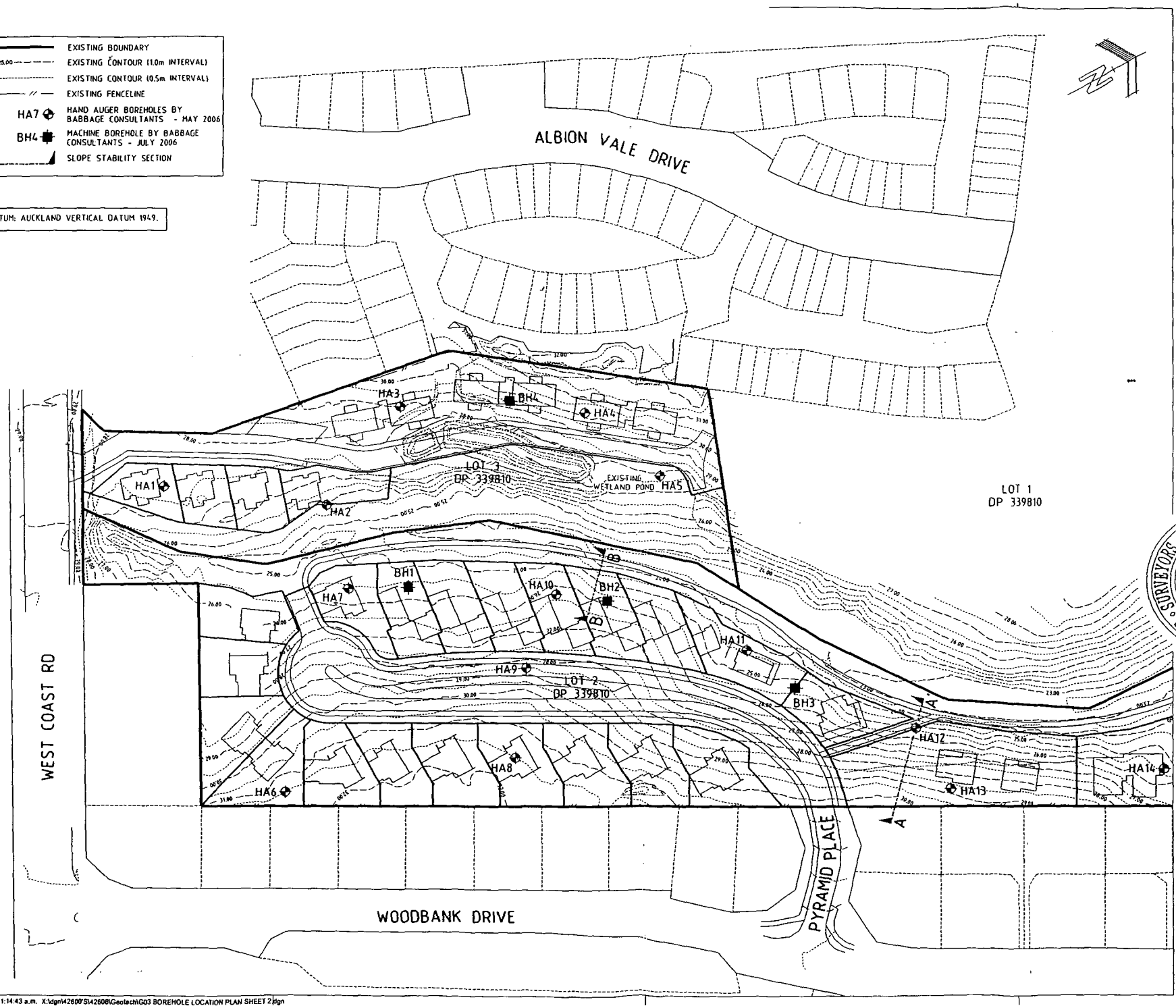
KEY

- EXISTING BOUNDARY
- EXISTING CONTOUR (1.0m INTERVAL)
- EXISTING CONTOUR (0.5m INTERVAL)
- EXISTING FENCELINE
- HA7 — HAND AUGER BOREHOLES BY BABBAGE CONSULTANTS - MAY 2006
- BH4 — MACHINE BOREHOLE BY BABBAGE CONSULTANTS - JULY 2006
- SLOPE STABILITY SECTION

NOTES

1. LEVEL DATUM: AUCKLAND VERTICAL DATUM 1949.



REV	DATE	DESCRIPTION	DRAWN	CHECK
A	30.10.06	MACHINE BOREHOLES AND SLOPE SECTIONS ADDED	MJO	RA

DRAWING REVISIONS

Babbage CONSULTANTS
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AUCKLAND 1 - NEW ZEALAN
PHONE 09 - 379 9980 - FAX 09 - 377 11
admin@babbage.co.n

CLIENT / PROJECT

WEST COAST ROAD HOUSING DEVELOPMENT

FOR

NZ HOUSING FOUNDATION

DRAWING TITLE

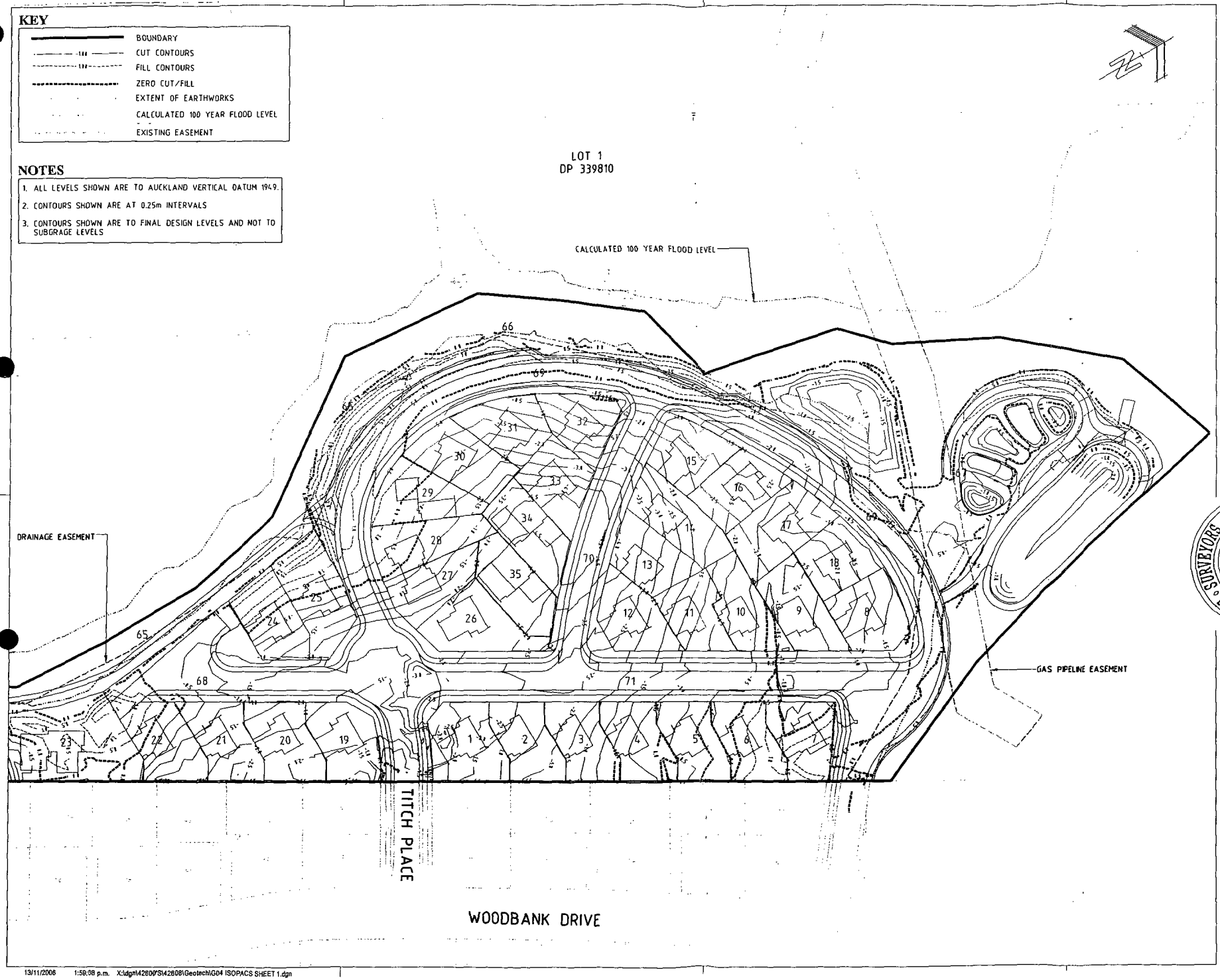
BOREHOLE LOCATION PLAN (SHEET 2)

	DATE	INITIAL
DESIGNED		
DRAWN	JUNE 2006	GNB
CHECKED		
APPROVED		

SCALE (A1)

1:500

JOB NUMBER	DRAWING NUMBER	REVISION
42608	G03	A



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DRAWING NOTES

REV	DATE	DESCRIPTION	DRAWN	CHECK
A	07.09.06	LEVELS AMENDED	FK	DMR

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SURVEYORS · ARCHITECTS · ENGINEERS
Babbage CONSULTANTS
109 FANSHAWE STREET
PO BOX 2027
AUCKLAND 1 · NEW ZEALAND
PHONE 09 - 379 9880 · FAX 09 - 377 1170
admin@babbage.co.nz

CLIENT / PROJECT

WEST COAST ROAD
HOUSING DEVELOPMENT
FOR
NZ HOUSING FOUNDATION

DRAWING TITLE

CUT AND FILL ISOPAC PLAN (SHEET 1)

	DATE	INITIAL
DESIGNED		
DRAWN	JUNE 2006	GW
CHECKED		
APPROVED		

SCALE (A1)
1:500

JOB NUMBER	DRAWING NUMBER	REVISION
42608	G04	A

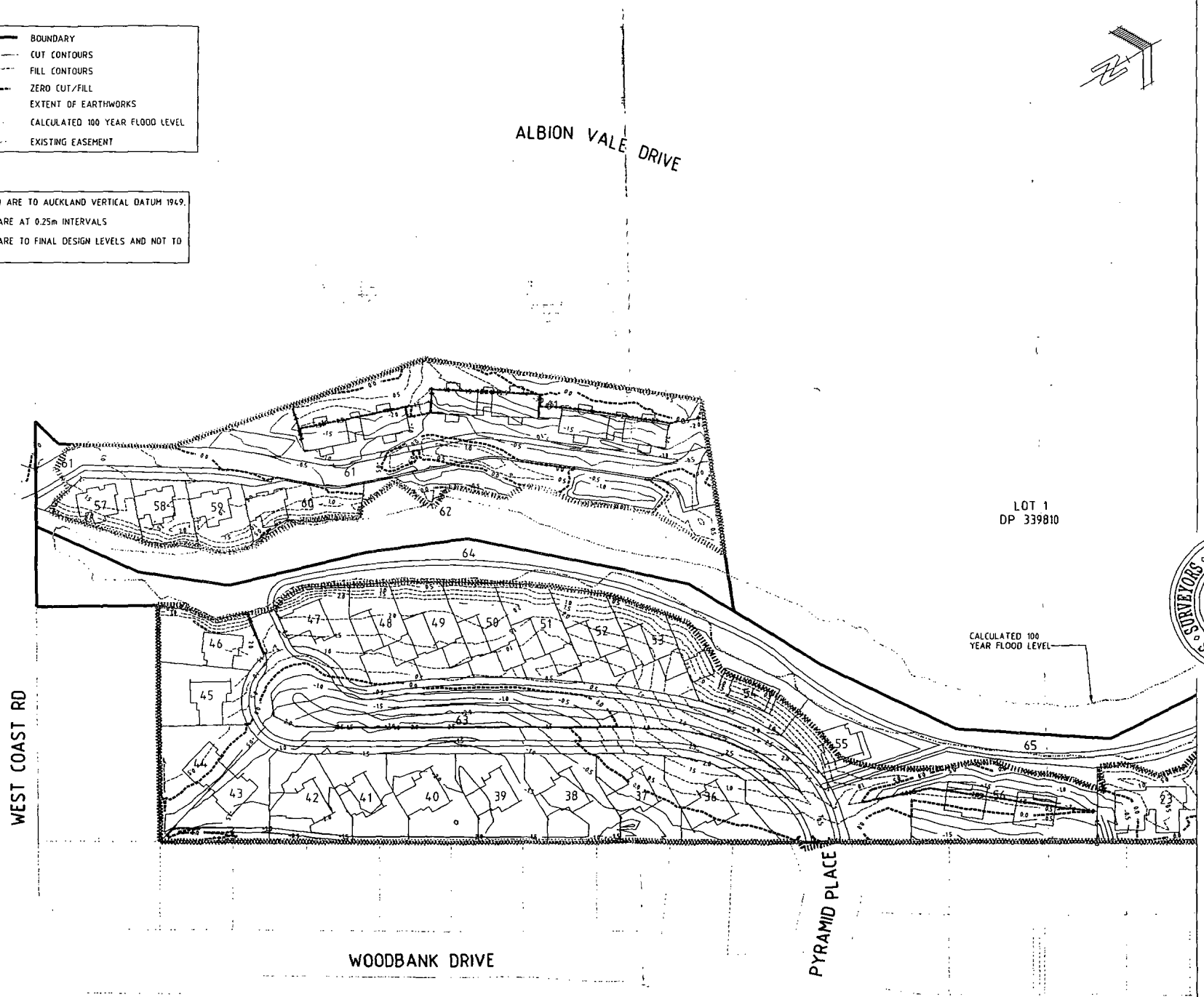
13/11/2006 1:59:08 p.m. X:\dgn\42600's\42608\Geotech\G04 ISOPACS SHEET 1.dgn

KEY

———	BOUNDARY
----100----	CUT CONTOURS
----100----	FILL CONTOURS
----------	ZERO CUT/FILL
. . . .	EXTENT OF EARTHWORKS
. . . .	CALCULATED 100 YEAR FLOOD LEVEL
. . . .	EXISTING EASEMENT

NOTES

1. ALL LEVELS SHOWN ARE TO AUCKLAND VERTICAL DATUM 1949.
2. CONTOURS SHOWN ARE AT 0.25m INTERVALS
3. CONTOURS SHOWN ARE TO FINAL DESIGN LEVELS AND NOT TO SUBGRADE LEVELS



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DRAWING NOTES

REV	DATE	DESCRIPTION	DRAWN	CHECK
A	07.09.06	LEVELS AMENDED	FK	DMR

DRAWING REVISIONS

Babbage CONSULTANTS
SURVEYORS · ENGINEERS · ARCHITECTS
109 FANSHAWE STREET
PO BOX 2027
AUCKLAND 1 · NEW ZEALAND
PHONE 09 - 379 9990 · FAX 09 - 377 1170
admin@babbage.co.nz

CLIENT / PROJECT

WEST COAST ROAD
HOUSING DEVELOPMENT
FOR
NZ HOUSING FOUNDATION

DRAWING TITLE

CUT AND FILL ISOPAC PLAN (SHEET 2)

	DATE	INITIAL
DESIGNED		
DRAWN	JUNE 2006	GW
CHECKED		
APPROVED		

SCALE (A1)

1:500

JOB NUMBER	DRAWING NUMBER	REVISION
42608	G05	A

13/11/2006 2:04:42 p.m. X:\dgn\42600'S\42608\Geotech\G05 ISOPACS SHEET 2.dgn

BCI-61

Application form for Building consent and/or Project Information Memorandum

CAT 2

Waitakere City Council
Te Tuhau o Waitakere

Section 33 or section 45 Building Act 2004

Consent number COM 20081464 **Date received** 29 SEP 2008 **Office use only**

1: THE OWNER

Name of owner: NEW ZEALAND HOUSING FOUNDATION
If owner is a company or trust provide name of contact person: (MR BRIAN DONELLY)
Mailing address: P.O. Box 36 027, NORTHCOTE.
Street address (For courier): 55 CARRINGTON RD, MT ALBERT.
Landline number: (09) 443 8415.
Mobile number: 021 949 120.
After hours: N/A.
Facsimile number: (09) 443 8415.
Email address: bd.nzhf@xtra.co.nz

2: AGENT (only required if application is being made on owners behalf)

Name of agent: Housing Foundation Ltd
If owner is a company or trust provide name of contact person: Louise Dunn / Frank Rienties
Mailing address: PO Box 36 027, Northcote
Street address (For courier): 55 Carrington Rd, mt Albert
Landline number: 8496395
Mobile number: 0275594524 / 0274365030
After hours:
Facsimile number:
Email address: louise@housingfoundation.co.nz

3: LICENSED BUILDING PRACTITIONERS (Complete this section ONLY if a Licensed Building Practitioner has been engaged)

Design License No. _____ Contact person _____ Ph number _____
Site License No. _____ Contact person _____ Ph number _____
Builder License No. _____ Contact person _____ Ph number _____
DIY _____ Contact person _____ Ph number _____

4: APPLICATION

I request that you issue a building consent ☑ project information memorandum ☑ for the building work described in this application. *(Please tick one or both as appropriate)*

Project Information Memorandum Number *(If applied for previously)* —

All consent related invoices/ refunds to be billed to *(include name and address for accounts)* Housing Foundation Ltd PO Box 36027, Northcote

Contact phone number/s 849 6395. 0275594524

GST Number 88-656-067

I will notify council if any of the information provided on this application form changes before building consent is granted.

Signature of owner/agent _____ Date 25/8/09

5: THE BUILDING

Address of building: 19 TITCH PLACE, GLEN EDEN.
Legal description: Lot Number LOT 32 which is a subdivision of LOT 2 DP Number 339810
Building name/Trading name: —
Location of building within site/block number: AS PER SITE & LOCALITY PLAN
Level/unit number: — Site Area (m2): 349 m2
Current, lawfully established, use: VACANT LAND - PROPOSED NEW DWELLING.
Include number of occupants per level and per use: — Year first constructed: —

6. THE PROJECT

Stage 1 of an intended 1 Stages

Description of the building work:

(Provide sufficient description of building work to enable scope of work to be fully understood continue on a separate page if necessary, or refer to an attached documents setting out the description)

Proposed New 4 Bedroom Dwelling with attached Garaging.

What is the existing use of the building? N/A.

Will the building work result in a change of use for the building? Yes ☐ No ☑ *(Please tick appropriate one)*

If yes, provide details of the new use /

Does the building work create a granny flat and/ or minor unit? Yes ☐ No ☑ *(Please tick appropriate one)*

Intended life of new building *(if less than 50 years)* 50+ Years.

Estimated value of intended work *(include GST)* $213,750

Existing gross floor area (m2) — Floor area of new work (m2) 160.5 m² Total floor area (m2) 160.5 m²

List consents (if any) previously issued for this project *(resource, building, subdivision)* Resource / Subdivision Consent etc as per attachments.

7. PROJECT INFORMATION MEMORANDUM *(Complete this section ONLY if you are applying for a Project Information Memorandum)*

The following matters are involved in this project: *(Tick relevant matters)*

☐ Subdivision ☐ Alterations to land contours ☐ New or altered connections to public utilities

☑ New or altered locations and/ or external dimensions of buildings ☑ New or altered access for vehicles

☐ Building work over or adjacent to any road or public place ☑ Disposal of stormwater

☐ Building work over any existing drains or sewers or in close proximity to wells or water mains

☐ Other matters known to the applicant that may require authorisations from the territorial authority: *(please specify)* _____

8. THE BUILDING CONSENT *(Complete this section ONLY if you are applying for a building consent)*

The following plans and specifications are attached to this application: *(Please tick appropriate box)*

☑ Specifications ☑ Calculations ☑ Producer Statement ☑ Plans* ☐ Other _____

**Provide two sets of plans and a third copy of floor plans with application as specified on Lodgement Checklist*

Do any of the drawings for building consent include any existing building work constructed without building consent/ permit? *(Please tick appropriate box)* ☐ Yes ☑ No

Does the property have an outstanding Notice to Fix? *(Please tick appropriate box)* ☐ Yes ☑ No

If yes, please include copy of Notice to Fix with application.

9. The building work will comply with the following code(s): *(Complete this section ONLY if you are applying for a building consent)*

Clause *(involved in the proposed work)*	Means of Compliance *(refer to compliance documents(s) or detail of alternative solution in the plans or specifications)*	Clause *(involved in the proposed work)*	Means of Compliance *(refer to compliance documents(s) or detail of alternative solution in the plans or specifications)*
B1 Structure	☑ B1/AS2 ☐ NZS 3604 ☐ NZS4229 ☐ NZS4203 ☐ Other	**G1 Personal hygiene**	☑ G1/AS1 ☐ Other
B2 Durability	☑ B2/AS1 ☐ NZS 3101 ☐ NZS3604 ☐ NZS3602 ☐ Other	**G2 Laundering**	☑ G2/AS1 ☐ Other
C1-4 Fire	☐ C/AS1 ☐ Other	**G3 Food preparation and prevention of contamination**	☑ G3/AS1 ☐ Other
D1 Access Routes	☑ D1/AS1 ☐ NZS 4121 ☐ Other	**G4 Ventilation**	☑ G4/AS1 ☐ AS1668.2 ☐ Other
D2 Mechanical installations for access	☐ D2/AS1 ☐ NZS 4332 ☐ EN81 ☐ EN115 ☐ Other	**G5 Interior environment**	☑ G5/AS1 ☐ Other
E1 Surface water	☑ E1/AS1 ☐ AS/NZS3500.3 ☐ Other	**G6 Airborne and impact sound**	☐ G6/AS1 ☐ Other
E2 External moisture	☑ E2/AS1 ☐ Specific design and testing ☐ Other	**G7 Natural light**	☑ G7/AS1 ☐ Other
E3 Internal moisture	☑ E3/AS1 ☐ Other	**G8 Artificial light**	☐ G8/AS1 ☐ NZS 6703 ☐ Other
F1 Hazardous agents on site	☐ F1/AS1 ☐ Other	**G9 Electricity**	☑ G9/AS1 ☐ Other
F2 Hazardous building materials	☑ F2/AS1 ☐ NZS4223	**G10 Piped services**	☐ G10/AS1 ☐ NZS 5261 ☐ Other
F3 Hazardous substances	☐ F3/AS1 ☐ Other	**G11 Gas as an energy source**	☐ G11/AS1 ☐ Other
F4 Safety from falling	☑ F4/AS1 ☐ FSP Act ☐ Other	**G12 Water supplies**	☑ G12/AS1 ☐ AS/NZS3500.2 ☐ AS/NZS3500.5 ☐ Other
F5 Construction and demolition hazards	☐ F5/AS1 ☐ Other	**G13 Foul water**	☑ G13/AS1 ☐ BS5572 ☐ AS/NZS3500.2 ☐ Other
F6 Lighting for emergency	☐ F6/AS1 ☐ Other	**G14 Industrial liquid waste**	☐ G14/AS1 ☐ Other
F7 Warning systems	☑ F7/AS1 ☐ NZS1668 ☐ NZS4512 ☐ NZS4515 ☐ Other	**G15 Solid waste**	☐ G15/AS1 ☐ Other
F8 Signs	☐ F8/AS1 ☐ Other	**H1 Energy efficiency**	☑ H1/AS1 ☐ NZS 4218 ☐ NZS4243 ☐ NZS4241 ☐ ALF Design Manual ☐ Other

IMPORTANT NOTICES

Commencement of work
A building consent cannot be issued for any work that has been commenced/ completed prior to the granting of the building consent. Undertaking building work before the consent is granted is an offence under the Building Act 2004 for which the owner and contractors can be prosecuted and fined. I confirm that this application does not relate to building work that has already been commenced.

Availability of Information
The information collected in this form is required under the provisions of the Building Act 2004. This information forms part of the Council's records relating to the property and will be held for at least the life of the building to which it relates. The information is available to any person who wishes to inspect Council's records except for those plans marked confidential under Section 217 of the Building Act 2004. Information relating to the applicant/ owner, the project and the property contained in this form will be used as part of the statistical information produced by the Council which is provided to Statistics New Zealand and Quotable Values and is also available, for a fee, to any person upon request from the Council.

Fees
A fee is required on lodgement of all applications. All base fees and lodgement fees are the minimum operational costs incurred by Council and are therefore non-refundable. All other fees shall be paid in full without set-off or deduction of any kind within 14 days of the date of the invoice or prior to the issue of the Building Consent, whichever is the sooner. The applicant shall further pay to Waitakere City Council, all costs and expenses (including costs on a solicitor/ client basis, and debt collector's costs) incurred in the enforcing or attempting to enforce these terms and conditions or in seeking payment of all fees. Where you fail to make payment of any amount on the due date, Waitakere City Council may in addition require you to compensate it by making payment of interest as liquidated damages on the amount due from the due date for payment until the date of actual payment at a rate equal to the current overdraft interest rate Waitakere City Council has with its principal registered bank. All development contributions will be billed to the owner(s). Refer to the current Regulatory Fees & Charges Schedule for upfront Building Consent fees.

10 BUILDING CONSENT APPLICATION CHECKLIST

Please check that all items on the checklist relevant to your building consent have been completed and included. The application will not be accepted by Council unless all the required and appropriate information is provided.

Attachments

- [x] Lodgement Checklist
- [ ] Application for Compliance Schedule
- [x] Water meter connection form
- [ ] Development Contribution Notice
- [ ] Project Information Memorandum(PIM)/ Certificate attached to PIM
- [ ] Application for Vehicle Crossing/ Street damage deposit
- [x] Certificate of Title* / letter of authorisation from the owner for agent to make application on the owner's behalf
- [x] Plans and specifications *(as listed by applicant under section 8 "The Building Consent" above)*

**Certificate of Title must not be older than 90 days*

DECLARATION

All the above information is, to the best of my knowledge, true and correct. I understand that all plans, documentation and reports submitted as part of an application are required to be kept available for public record. Therefore the public may view this application, once submitted.

I have authorisation from my co-owners to sign this application on their behalf. If this application is submitted by an agent a letter of authorisation from the owner to make the application in their behalf has been provided. The letter outlines alternative billing instructions if the primary contact for billing is not the owner.

Signature of Owner*/ Authorised agent _____ Date 25/9/08

*If application submitted on behalf of company/ trust include copy of authorising documents for the company/trust and sign below.

I, Louise Dunn have authority to bind the trust/ company to the agreement.

Signature _____ Date 25/9/08

SUBMITTING YOUR APPLICATION

To submit your application for Building Consent via a pre-lodgement meeting, please call Waitakere City Council Customer Services to arrange meeting time. Phone 839 0400

Location for pre-lodgement meeting: Waitakere Central, 6 Henderson Valley Road, Henderson

Alternatively mail your Application for Building Consent to: Waitakere City Council, Private Bag 93109, Henderson, WAITAKERE 0650

If you have any queries about any part of the Building Consent process, please contact our Customer Services line 839 0400 or email info@waitakere.govt.nz

BCI-08

Building consent application process sheet
Amended plans - Un-issued consents

Waitakere City Council
Te Taiao o Waitakere

Address	19 Titch Pl	Lot		Account Manager	Rada
ABA/COM	com-2008-1464	DP		Date received	02/02/09

REQUIRED INSPECTIONS:

Second-hand Building Materials Report Attached: YES / NO

- ☐ B1 Siting and Foundations
- ☐ B2 Reinforced Concrete and Blockwork
- ☐ B3 Tanking
- ☐ B4 Floor Slab
- ☐ B5 Specialty Slab
- ☐ B6 Timber Sub Floor
- ☐ B7 Framing
- ☐ B8 Building Wrap and Cavity
- ☐ B9 Cladding - Plaster
- ☐ B10 Cladding – Brick Veneer
- ☐ B11 Cladding - Other
- ☐ B12 Pre-Line Building
- ☐ B13 Waterproof Membranes
- ☐ B14 Gibnail
- ☐ B15 Final Building
- ☐ P1 Pre-Floor Plumbing
- ☐ P2 Pre-Line Plumbing
- ☐ P3 Drainage
- ☐ P4 Pre On-Site Waste Water Disposal
- ☐ P5 On- Site Waste Water Installation
- ☐ P6 Final Plumbing
- ☐ W1 Weather tightness
- ☐ 222 Resource Consent Monitoring
- ☐ MISC Miscellaneous
- ☐ DEM Demolition
- ☐ SFH Solid Fuel Heating
- ☐ F2 Pool Fencing

	TO	DATE IN	DATE OUT	SENT TO	PAUSED (P=Paused)	APPROVED BY (F=Final)	STAFF CODE	TIME
	112 Process Support	02/02/09	03/02/09	11M	F		RM	0.5
	113 Building Surveyor							
	114 Plumbing & Drainage Surveyor (Retic. Site)							
	11S Plumbing & Drainage Surveyor (Septic Tanks)							
	11S Structural Check	3/2/09	9/2/09	11M	F		SABJ	0.25
	11E EcoWater	03/02/09	3/2/09	115	F	Chitulu	GO	PW
	11F Fire & Egress							
224C ISSUED	11L Resource Planner							

Financial contributions	Yes / No	Is a section 37 required?	Yes / No If yes →	☐ No building work to commence ☐ Specific building work to commence
Uplifted		Date:		

	11M Account Manager	03/02/09	3/02/09	11E	F	—	BR	0.35
		9/2/09	10/02/09	11X	F	Brittany	BR	0.5
RMA	11X Final	10/02/09	12/2/09	Plup	F	RS	BRL	1.L
	Document Preparation							

BUILDING SURVEYORS PROCESSING SHEET

Structural check report – residential or minor building works

Calculations and Producer Statement check

Each of the items must be checked and the box ticked:

1. Site not stability sensitive ☐
2. Calculations provided ☐
3. Calculations cover all work on drawings requiring design ☐

I recommend that the application be approved subject to the conditions listed below:

Signed by: ..... Building Surveyor: ..... Date: .....

STRUCTURAL ENGINEER'S PROCESSING SHEET

Commercial/Industrial/Assembly buildings

Residential buildings requiring geotechnical reports

1. The following items are required to further process this application: (see letter attached).

   Signed: ..... Structural Engineer Date: .....

2. I recommend that the application be approved subject to the conditions listed below:

   Signed: ..... Structural Engineer Date: .....

   Processing time: .....

Staff Code	Conditions (incl. 1 to 3 standard conditions)

Staff Code	Notations

CODE	FEE DESCRIPTION	$	C
101	Plan Processing Fee		
102	Planning Check Fee		
103	PIM Fee		
104	Inspection Fee		
105	Code Compliance Certificate		
106	Water Connection		
108	Building Research Levy		
109	Building Industry Authority Levy		
110	Section 37 Certificate		
111	Design Check Fee		
112	Amended Plan Fee		
113	Photocopying		
114	Resource Consent (Minor Addtn)		
115	Sewer Connection		
116	Re-lay Sewer		
117	Engineering Fee-Subdivision		
118	Reserve Contribution (Massey)		
119	Reserve Contribution (Waitakere)		
120	Reserve Contribution (New Lynn)		
121	Reserve Contribution (Henderson)		
122	Performance Bond		
123	Stormwater Upgrading		
124	Road Construction Deposit		
125	Stormwater Connection		
126	Engineering Fees-Development		
127	Legal Processing		
128	Resource Bond		
129	Water Contribution		
130	Sewer Upgrading		
131	Planning Site Visit		
132	Consultancy Fees		
133	Fire Hydrants		
138	Oratia Stream		
139	Planning Resource Consent		
142	Compliance Schedule Base Fee		
143	Compliance Schedule Systems Fee		
144	Records Fee		
145	Drainage Engineer		
150	Extension of Building Consent		
151	Replacement Plans/Document		
152	Administration Fee		
153	Second-hand Building Insp		
154	Second-hand Materials Insp		
BDG	ABA Dangerous Goods		
BEH	ABA Environmental Health		
BFE	ABA Fire & Egress		
BPK	ABA Parks Processing		
T	Time		
	Subtotal		
	Outstanding Amount		
	TOTAL	**$**	

FINANCIAL CHECK	Initials ..... Date: .....

NOTES/REMARKS:

BCI-09

Building consent application process sheet
General

Waitakere City Council

Address	2008 - 1464	Lot	2	Account Manager	Rada.
ABA/COM	19 Tytch Pl	DP	339810	Date received	29/9/08

REQUIRED INSPECTIONS:

Second Hand building materials report attached Yes / No

- ☐ B1 Siting and Foundations
- ☐ B2 Reinforced Concrete and Blockwork
- ☐ B3 Tanking
- ☐ B4 Floor Slab
- ☐ B5 Specialty Slab
- ☐ B6 Timber Sub Floor
- ☐ B7 Framing
- ☐ B8 Building Wrap and Cavity
- ☐ B9 Cladding - Plaster
- ☐ B10 Cladding – Brick Veneer
- ☐ B11 Cladding - Other
- ☐ B12 Pre-Line Building
- ☐ B13 Waterproof Membranes
- ☐ B14 Gibnail
- ☐ B15 Final Building
- ☑ P1 Pre-Floor Plumbing
- ☑ P2 Pre-Line Plumbing
- ☑ P3 Drainage
- ☐ P4 Pre On-Site Waste Water Disposal
- ☐ P5 On- Site Waste Water Installation
- ☑ P6 Final Plumbing
- ☐ W1 Weather tightness
- ☐ 222 Resource Consent Monitoring
- ☐ MISC Miscellaneous
- ☐ DEM Demolition
- ☐ SFH Solid Fuel Heating
- ☐ F2 Pool Fencing

HAZARD

15

LW2.

	TO	DATE IN	DATE OUT	SENT TO	PAUSED (P=Paused)	APPROVED BY (F=Final)	STAFF CODE	TIME
	102 Process Support	1/10/08	2/10/08	10M	F		AK	.55
	103 Building Surveyor	14 OCT 2008	30/10/08	10M	P	letter	DK	4.0
		18/11/08	18/11/08		F		DK	0.3
	104 Plumbing & Drainage Surveyor (Retic. Site)	9/10/08	14 OCT 2008	103	F	✓	PG	.7
	10S Plumbing & Drainage Surveyor (Septic Tanks)							
	105 Structural Check							
	10E EcoWater	08/10/08	9/10/08	104	P	LCA	LW	jw
	10F Fire & Egress							
		07/01/09	RR1				RM	0.15
224C ISSUED	10L Resource Planner							

Financial contributions	Yes / No	Is a section 37 required?	Yes / No If yes →	☐ No building work to commence ☐ Specific building work to commence
Uplifted		Date:		

	10M Account Manager	2/10/08	8/10/08	10E	✓		PETER	BRK	0.35
		30/10/08	30/10/08		P		Rada	RM	0.3
RMA	10X Final Document Preparation	30/10/08	31.10.08	SUS	F			RM	0.20
		18/11/08							

BUILDING SURVEYORS PROCESSING SHEET

Structural check report – residential or minor building works

Calculations and Producer Statement check

Each of the items must be checked and the box ticked:

1. Site not stability sensitive ☐
2. Calculations provided ☐
3. Calculations cover all work on drawings requiring design ☐

I recommend that the application be approved subject to the conditions listed below:

Signed by: ..... Building Surveyor: ..... Date: .....

STRUCTURAL ENGINEER'S PROCESSING SHEET

Commercial/Industrial/Assembly buildings

Residential buildings requiring geotechnical reports

1. The following items are required to further process this application: (see letter attached).

   Signed: ..... Structural Engineer Date: .....

2. I recommend that the application be approved subject to the conditions listed below:

   Signed: ..... Structural Engineer Date: .....

   Processing time: .....

Staff Code	Conditions (incl. 1 to 3 standard conditions)
RE1	41-45A, 46, 57, 58

+4
+5
+9
+2
+3
+1

Staff Code	Notations

CODE	FEE DESCRIPTION	$	C	
101	Plan Processing Fee			
102	Planning Check Fee			
103	PIM Fee	—	(6)	Paid
104	Inspection Fee	(2595	00)	
105	Code Compliance Certificate	(296	00)	
106	Water Connection	(540	00)	
108	Building Research Levy	—		Paid
109	Building Industry Authority Levy	—		Paid
110	Section 37 Certificate			
111	Design Check Fee			
112	Amended Plan Fee			
113	Photocopying			
114	Resource Consent (Minor Addtn)			
115	Sewer Connection			
116	Re-lay Sewer			
117	Engineering Fee-Subdivision			
118	Reserve Contribution (Massey)			
119	Reserve Contribution (Waitakere)			
120	Reserve Contribution (New Lynn)			
121	Reserve Contribution (Henderson)			
122	Performance Bond			
123	Stormwater Upgrading			
124	Road Construction Deposit			
125	Stormwater Connection			
126	Engineering Fees-Development			
127	Legal Processing			
128	Resource Bond			
129	Water Contribution			
130	Sewer Upgrading			
131	Planning Site Visit			
132	Consultancy Fees			
133	Fire Hydrants			
138	Oratia Stream			
139	Planning Resource Consent			
142	Compliance Schedule Base Fee			
143	Compliance Schedule Systems Fee			
144	Records Fee			
145	Drainage Engineer			
146	Roading and Traffic			
150	Extension of Building Consent			
151	Replacement Plans/Document			
152	Administration Fee			
153	Second-hand Building Insp			
154	Second-hand Materials Insp			
BDG	ABA Dangerous Goods			
BEH	ABA Environmental Health	(2782	00)	VXG
BFE	ABA Fire & Egress			
BPK	ABA Parks Processing			
T	Time			
	Subtotal	518	25	
	Outstanding Amount	(6213	00)	
	TOTAL	$(6731	25	

FINANCIAL CHECK	Initials RB Date: 12/2/09

BCI-09

Building consent application process sheet
General

DUPLICATE

Address	19 Titch Pl	Lot	2	Account Manager	Rada.
ABA/COM	Com 2008-1464	DP	339810	Date received	29/9/08

REQUIRED INSPECTIONS:

- ☐ B1 Siting and Foundations
- ☐ B2 Reinforced Concrete and Blockwork
- ☐ B3 Tanking
- ☐ B4 Floor Slab
- ☐ B5 Specialty Slab
- ☐ B6 Timber Sub Floor
- ☐ B7 Framing
- ☐ B8 Building Wrap and Cavity
- ☐ B9 Cladding - Plaster

Second Hand building materials report attached — Yes / No

- ☐ B10 Cladding – Brick Veneer
- ☐ B11 Cladding - Other
- ☐ B12 Pre-Line Building
- ☐ B13 Waterproof Membranes
- ☐ B14 Gibnail
- ☐ B15 Final Building
- ☐ P1 Pre-Floor Plumbing
- ☐ P2 Pre-Line Plumbing
- ☐ P3 Drainage

HAZARD

- ☐ P4 Pre On-Site Waste Water Disposal
- ☐ P5 On- Site Waste Water Installation
- ☐ P6 Final Plumbing
- ☐ W1 Weather tightness
- ☐ 222 Resource Consent Monitoring
- ☐ MISC Miscellaneous
- ☐ DEM Demolition
- ☐ SFH Solid Fuel Heating
- ☐ F2 Pool Fencing

LWZ.

	TO	DATE IN	DATE OUT	SENT TO	PAUSED (P=Paused)	APPROVED BY (F=Final)	STAFF CODE	TIME
	102 Process Support							
	103 Building Surveyor							
	104 Plumbing & Drainage Surveyor (Retic. Site)							
	10S Plumbing & Drainage Surveyor (Septic Tanks)							
	105 Structural Check	8/10/08	9/10/08	10L	P		SMBY	1.0
	10E EcoWater							
	10F Fire & Egress QD	10/10/08		10F	—	F	DM instructed by Q.D.	
224C ISSUED	10L Resource Planner Migler Fire wall requires no LWC - Kelly DV.	9/10/08	10/10/08	10F	F	B	BEN	PW

Financial contributions	Yes / No	Is a section 37 required?	Yes / No If yes →	☐ No building work to commence ☐ Specific building work to commence
Uplifted		Date:		

	10M Account Manager								
RMA	10X Final Document Preparation								

BUILDING SURVEYORS PROCESSING SHEET

Structural check report – residential or minor building works

Calculations and Producer Statement check

Each of the items must be checked and the box ticked:

1. Site not stability sensitive ☐
2. Calculations provided ☐
3. Calculations cover all work on drawings requiring design ☐

I recommend that the application be approved subject to the conditions listed below:

Signed by: ..... Building Surveyor: ..... Date: .....

STRUCTURAL ENGINEER'S PROCESSING SHEET

Commercial/Industrial/Assembly buildings

Residential buildings requiring geotechnical reports

1. The following items are required to further process this application: (see letter attached).

   Signed: ..... Structural Engineer Date: .....

2. I recommend that the application be approved subject to the conditions listed below:

   Signed: ..... Structural Engineer Date: .....

   Processing time: .....

Staff Code	Conditions (incl. 1 to 3 standard conditions)

Staff Code	Notations

CODE	FEE DESCRIPTION	$	C
101	Plan Processing Fee		
102	Planning Check Fee		
103	PIM Fee		
104	Inspection Fee		
105	Code Compliance Certificate		
106	Water Connection		
108	Building Research Levy		
109	Building Industry Authority Levy		
110	Section 37 Certificate		
111	Design Check Fee		
112	Amended Plan Fee		
113	Photocopying		
114	Resource Consent (Minor Addtn)		
115	Sewer Connection		
116	Re-lay Sewer		
117	Engineering Fee-Subdivision		
118	Reserve Contribution (Massey)		
119	Reserve Contribution (Waitakere)		
120	Reserve Contribution (New Lynn)		
121	Reserve Contribution (Henderson)		
122	Performance Bond		
123	Stormwater Upgrading		
124	Road Construction Deposit		
125	Stormwater Connection		
126	Engineering Fees-Development		
127	Legal Processing		
128	Resource Bond		
129	Water Contribution		
130	Sewer Upgrading		
131	Planning Site Visit		
132	Consultancy Fees		
133	Fire Hydrants		
138	Oratia Stream		
139	Planning Resource Consent		
142	Compliance Schedule Base Fee		
143	Compliance Schedule Systems Fee		
144	Records Fee		
145	Drainage Engineer		
146	Roading and Traffic		
150	Extension of Building Consent		
151	Replacement Plans/Document		
152	Administration Fee		
153	Second-hand Building Insp		
154	Second-hand Materials Insp		
BDG	ABA Dangerous Goods		
BEH	ABA Environmental Health		
BFE	ABA Fire & Egress		
BPK	ABA Parks Processing		
T	Time		
	Subtotal		
	Outstanding Amount		
	TOTAL	**$**	

FINANCIAL CHECK	Initials ..... Date: .....

BCI-54 & 55

Checklist for building consent document preparation Residential, commercial & minor P & D

Waitakere City Council
Te Taiao o Waitakere

Consent Number: 2008-1464

The following should be checked on all consents:

1. ***Section 71 (building on land subject to natural hazards)*** *– will be noted on process sheets - should have been to Legal Services and fees charged;*
2. ***Section 75 (construction of building on 2 or more allotments)*** *– will be noted on process sheets - should have been to Legal Services and fees charged;*
3. ***Second hand materials used*** *– will be noted on checklist – if report not attached to file, check with Account Manager*
4. ***Consent for more than one unit*** *– add urgent memo for call centre.*
5. ***Swimming / Spa Pool*** *– check for pool fencing guidelines, F02 inspection, inspection fee & registration fee*
6. *Compliance schedule – Load CERT inspection, generate SPECSYS, fees on fees letter, memo.*
7. ***If all required fees have been paid the building consent can be issued*** *– attach post-it note for the counter.*

HARDCOPY FILES		
☑	1.	Check all **"Paused" have been "Finalled"** and **account manager has signed.**
☑	2.	Duplicate Only: **Remove process sheet and planning checklist**
☑	3.	Duplicate Only: **Replace superseded plans. Check all plans signed**
☑	4.	Original Only – **Place amendment on top of each letter request.**
PATHWAY		
☑	5.	**Location Maintenance –** Check against application form
☑		**Names Maintenance-** C/- address and owners name should be showing
☑		**Dates -** Application & Lodgement - Check against application form and any rejections
☑		**Fees –**Are there any outstanding upfront fees?
☑		**Building Categories** – Check for BT minor development categories & PIM questions
☑		**NZ Building Stats –** Check Project Value, Intended Life, work types, floor area etc
☑		**Is a VXG required? –** Lodge VXG application if value of work is over $5000.
☑		Check if Preliminary Street Damage inspection requested.
		Conditions Maintenance
☑	6.	**Conditions -** Check all conditions have been entered including 4 standard conditions.
☑		**Sort** by Condition Group & re-order if required.
☑		**Section 37** – Is stop scheduling Inspections box ticked? Have planning seen FIR?
☑		Add **urgent memo** to warn the call centre not to book inspections.
☑	7.	**Notations** – Check if notations have been entered?

☑	8.	**Inspections Maintenance** – Have all inspections been entered? Is **222** Resource Consent Monitoring inspection required? Are resource consents related?
		Workflow – Continue **Document Preparation** task
☑	9.	**Related Applications** – PIM, LUC, VXG & Water. Check fees have been entered.
☒	10.	**PIM** - Generate, Format and print
☐	11.	**Conditions** – Check formatting and print
☑	12.	**Inspection Sheets** – Check, sort into numerical order by column 2, print
☑	13.	**Application status** – Tick required option
☒	14.	**Notations** –Manually generate, check and print
☒	15.	**Section 37 Certificate** – Check and print
CALCULATE FEES		
☑	16.	Check the **Debtor and Receipt**
☑	17.	**Close time recording tasks** – check for hours, rate, activity code and billable tick. Doc Prep time entered for Process Support? Enter Records, Issue & Consultant Fees.
☒	18.	For a **Pre-Pathway application** – have the additional steps been followed?
☑	19.	Complete **Time Cost Sheet & Compare with base fee.**
☑	20.	Enter Granted Fees.
☐	21.	**Section 37?** – Charge fee
☐	22.	**Produce Invoice**
☐	23.	**Enter any fees to be paid at issue stage.** Do not transfer to Debtors
☑	24.	**Print GTD fees letter(s).** Include all fees entered but not yet transferred to Debtors, Inspections, CCC, VXG, Water, Development Contributions, Compliance Schedule
☑	25.	**Double check amount due on letter against time cost sheet.** Scan and attach Time cost sheet, time recording report and consultant invoices
☐	26.	**Copying, collating and filing** – no staples left in file. Stamp copy of GTD letter with 'Consent Issued'. Is a VXG Bond Receipt Holder form required? **E-mail** to contact.
☑	27.	Insert & start **Pickup task**
☑	28.	Update **Process sheet.**
☑	29.	**Complete Clipboard** showing consents waiting to be collected by Counter

Signed _____ Dated 13/2/09

BCI-89

Residential building processing checklist

Waitakere City Council
Te Taiao o Waitakere

COM 2008-14Cat4

Instructions

1. Provide written comments in each section where applicable.
2. Y = complies N = does not comply N/A = not applicable
3. If application includes an Alternative Solution, attach completed checklist AS-01 in accordance with PR-25
4. Record and attach all communications regarding the assessment.

Address	19, Tatch Rd												
Date		**Consent number**	COM 2008-1476	**Checked by:**	Rada								
Building Cat.	1	2	3	**Comp. level**	1	2	3	4	5				
Wind zone	(L)	M	H	VH	SD	**Corrosion**	Zone 1		Seaspray				

Item checked				**Comments**
Quality and N^{o} of plans	(Y)	N	N/A	(good) - not the best quality
Specifications	(Y)	N	N/A	Specifications must be relevant to project
Description of work	(Y)	N	N/A	
Scope within NZS3604	Y	N	N/A	
PIM issues				**Comments**
Heritage site/building	Y	(N)	N/A	
Power lines	Y	(N)	N/A	
Geotechnical	(Y)	N	N/A	- Babbage Consultants report.
Flooding	Y	(N)	N/A	
Min. floor level or HIRB	(Y)	N	N/A	Survey certificate required
Drains (Bridging and close proximity)	(Y)	N	N/A	
Section 37 / other	Y	(N)	N/A	Resource and Glib - consent
Site plan				**Comments**
Scale	(Y)	N	N/A	
Siting dimensions 3 minimum required	(Y)	N	N/A	
ROW >18m	Y	(N)	N/A	N.B Fire Service approval required
Buildings closer than 1.0m to boundary	(Y)	(N)	N/A	N.B Check fire ratings
Eaves closer than 670mm to boundary	(Y)	(N)	N/A	N.B Check fire ratings
Retaining walls (if on bdy assumed to incur a surcharge)	(Y)	N	N/A	
Earthworks (cut and fill)	(Y)	N	N/A	
Finished floor level	(Y)	N	N/A	
Datum / contours	Y	(N)	N/A	

Drains - public				Comments
Public drains shown (depth / close proximity)	(Y)	N	N/A	
Ground				**Comments**
Geotechnical issues (report provided / required)	(Y)	N	N/A	Report by Babbage Consultants
PS1 / PS2 (register checked)	(Y)	N	N/A	PS1 - Wilton Joubert Ltd.
NZS3604 >300 kPa	(Y)	N	N/A	
Clay S, M, H, E soil	(Y)	N	N/A	
Cut / fill / piling (certificates required)	(Y)	N	N/A	
Supervision required	Y	N	N/A	
Driven pile (certificate required)	Y	N	N/A	
Special conditions	Y	N	N/A	
Recommendations (correctly shown on plans)	Y	N	N/A	
Retaining walls (specific design /other)	Y	N	N/A	Engineers calculations may be required
Retaining walls (construction details)	Y	N	N/A	
Retaining walls surcharge (slope >20° / driveway)	Y	N	N/A	
Retaining walls (barrier if on access route)	Y	N	N/A	
Foundation – concrete				**Comments**
Specific design	(Y)	N	N/A	Ribraft Slab - PS1 - W. Joubert Ltd.
PS1 / PS2 (register checked)	(Y)	N	N/A	
Recommendations (correctly shown on plans)	(Y)	N	N/A	
Footings (depth / width)	(Y)	N	N/A	
Reinforcing (steel size, type, c/s)	(Y)	N	N/A	
Concrete strength (20 / 25 mPa)	(Y)	N	N/A	
Point loads (depth / size)	Y	N	N/A	
Columns and posts (depth / size)	(Y)	N	N/A	
Steps (sloping sites)	Y	N	N/A	
Foundation - timber				**Comments**
Specific design	Y	N	N/A	
PS1 / PS2 (register checked)	Y	N	N/A	
Recommendations (correctly shown on plans)	Y	N	N/A	
Pile layout / spacing (check for point loads)	Y	N	N/A	
Pile (Size / treatment / height)	Y	N	N/A	
Footing (depth / size / punch pad)	Y	N	N/A	
Connections - type (galvanised / stainless)	Y	N	N/A	

Continued.....

Foundation – timber, continued				Comments
Ordinary (size / connections)	Y	N	N/A	
Anchor (size / connections)	Y	N	N/A	
Braced (size / connections)	Y	N	N/A	
Driven piles (NZS3604 / specific design)	Y	N	N/A	
Driven pile (certificate required)	Y	N	N/A	
DPC to piles (< 300mm)	Y	N	N/A	
DPC to ground (limited clearance or cross-flow)	Y	N	N/A	
Chimney foundation	Y	N	N/A	
Columns and posts (depth / size)	Y	N	N/A	
Foundations - walls				**Comments**
Block (size / type)	Y	N	N/A	
Block (height and dimensions)	Y	N	N/A	
Reinforcing - vertical (size / type / centres)	Y	N	N/A	
Reinforcing - horizontal (size / type / centres)	Y	N	N/A	
Block (Grade A / B / C)	Y	N	N/A	
Supervision required	Y	N	N/A	
Retaining (maximum height)	Y	N	N/A	
Retaining / split-level (waterproofing / protection)	Y	N	N/A	
Subfloor ventilation	Y	N	N/A	
Subfloor access	Y	N	N/A	
Slabs - standard				**Comments**
Granular fill (certificate required if >600mm)	Y	N	N/A	
Sand binding (25mm minimum)	Y	N	N/A	
Membrane (0.25 micron minimum)	Y	N	N/A	
Finished floor level (shown on plans)	Y	N	N/A	
Plumbing fixtures (position shown on plans)	Y	N	N/A	
Pads / thickenings (shown on plans)	Y	N	N/A	
Drainage pipes (floor thickenings)	Y	N	N/A	
Slab thickness	Y	N	N/A	
Saw-cuts (3.0m or 4.0m)	Y	N	N/A	
Mesh – 668 (12m max.) Mesh – 665 (24m max.)	Y	N	N/A	
Free joints (>24m)	Y	N	N/A	
Supplementary steel (internal corners)	Y	N	N/A	

Slabs – specialty				Comments
Specific design	Y	N	N/A	
PS1 / PS2 (register checked)	Y	N	N/A	Rib-raft slab - PS1. W. Jaubert
Recommendations (correctly shown on plans)	Y	N	N/A	
Driven / bored pile (certificate required)	Y	N	N/A	
Membrane (0.25 micron minimum)	Y	N	N/A	
Finished floor level (shown on plans)	Y	N	N/A	
Plumbing fixtures (position shown on plans)	Y	N	N/A	
Pads / thickenings (shown on plans)	Y	N	N/A	
Drainage pipes (floor thickenings)	Y	N	N/A	
Subfloor				**Comments**
Timber treatment (schedule showing Grade and treatment)	Y	N	N/A	
Bearers (size / centres / span)	Y	N	N/A	
Bearers (cantilever / point loads)	Y	N	N/A	Engineer design required
Bearers (fixing to foundation walls)	Y	N	N/A	
Joist (size / centres / span / blocking)	Y	N	N/A	
Joist (blocking @ 1.8m over bearer)	Y	N	N/A	
Joist (cantilever / point loads)	Y	N	N/A	Engineer design required
Bracing layout (location and type)	Y	N	N/A	
Bracing (calculations)	Y	N	N/A	
Bracing (min. 4 / evenly spread)	Y	N	N/A	
Bracing (size / length / location)	Y	N	N/A	
Insulation (sisilation / polystyrene/ other)	Y	N	N/A	
Crawl space	Y	N	N/A	
Subfloor ventilation	Y	N	N/A	
Subfloor access	Y	N	N/A	
Split-floors (framing / insulation)	Y	N	N/A	
Flooring material (wet / dry areas)	Y	N	N/A	
Framing - wall				**Comments**
Timber treatment (schedule showing grade and treatment)	Y	N	N/A	
Wind and corrosion zones (to determine fixings)	Y	N	N/A	
Timber treatment (external / internal walls)	Y	N	N/A	

Continued....

Framing – wall, continued				Comments
Bottom plate (treatment, size, fixing details)	Y	(N)	N/A	
Stud / post (size, height, c/s)	(Y)	N	N/A	
Lintel (size / shown on plans)	Y	(N)	N/A	
Lintels (selection charts provided)	Y	(N)	N/A	- Lintels to provide on plans
Lintel (point load)	Y	(N)	N/A	Engineer design required
Engineered beams (size / fixing)	(Y)	N	N/A	Engineer design required - to provide on plans
Cantilevered lintels (construction details provided)	Y	(N)	N/A	Engineer design required
Engineer design (details shown on plans)	(Y)	N	N/A	Engineer design required
PS1 / PS2 (register checked)	(Y)	N	N/A	
Top plate (size)	Y	(N)	N/A	
Ceiling battens (type / size / centres)	(Y)	N	N/A	
Wall linings (wet / dry areas)	(Y)	N	N/A	
Building wrap (type / compatibility)	Y	(N)	N/A	to provide type of building wrap
Wind barrier (rigid / non-rigid)	(Y)	N	N/A	
Cavity battens (size / type / treatment / fixing)	(Y)	N	N/A	
Cavity (wrap, 20mm, vermin proof)	(Y)	N	N/A	
Chimney framing (framing / restraint)	Y	(N)	(N/A)	
Insulation (Type / R value)	(Y)	N	N/A	
Bracing calculations (provided for each floor level)	(Y)	N	N/A	
Bracing (type, height, length, location)	(Y)	N	N/A	
Bracing (evenly distributed)	(Y)	N	N/A	
Bracing (split levels / wet areas)	(Y)	N	N/A	
Diaphragms (ceiling / floor on plans)	(Y)	N	N/A	
Diaphragms (type, limitations, openings, size)	(Y)	N	N/A	
Mid-floor framing				**Comments**
Timber treatment and grade (external walls / wet areas)	(Y)	N	N/A	
Layout for each level (joist size, c/s, blocking)	(Y)	N	N/A	
Engineer designed beams (shown on plans)	Y	(N)	N/A	Engineer design required
Floor diaphragm (openings / size)	Y	(N)	N/A	Wet area
Floor lining (dry / wet areas)	(Y)	N	N/A	- Vinyl on Safe-flex.

Roof Framing				
Timber treatment (schedule detailing framing treatment)	Y	(N)	N/A	
Timber treatment (enclosed spaces)	Y	(N)	N/A	
Ceiling joists (size / centres / span)	(Y)	N	N/A	
Strongback / runners (size / centres / span)	Y	N	(N/A)	
Rafter (size / centres / span)	Y	N	(N/A)	
Ridge beam (size / span / fixing)	Y	N	(N/A)	Engineer design may be required
Skillion roof (sarking thickness / type)	Y	N	(N/A)	
Truss design Buildable Design	(Y)	N	(N/A)	
Bracing (type / fixings)	(Y)	N	N/A	
Building wrap (type / compatibility)	Y	(N)	N/A	→ Roof underlay thermacraft – to provide specifications
Insulation (Type / R value)	(Y)	N	N/A	
Under purlin (size / shown on plan)	(Y)	N	N/A	
Strutting beam (size / landing on L/B wall)	Y	N	N/A	
Purlin / tile batten (size / fixing / span / c/s)	Y	N	N/A	
Eaves (width specified)	Y	N	N/A	
Cladding - wall				**Comments**
Type (specify type)	(Y)	N	N/A	Check for product approvals
Acceptable Solution	(Y)	N	N/A	
Alternative Solution	Y	(N)	N/A	(separate checklist must be completed)
Specifications (maintenance / installation)	(Y)	N	N/A	
Bottom edge clearances (ground / decks / walls)	Y	N	N/A	– to provide ground clearance
Installer required (condition of consent)	(Y)	N	N/A	
M/F guarantee (condition of consent)	Y	N	N/A	
E2 risk matrix (provided / required)	(Y)	N	N/A	
Flashing / air-seals (windows / doors/corners)	(Y)	N	N/A	
Flashing details (other penetrations)	(Y)	N	N/A	– Windows / brick detail to reference on the plans
Apron flashing (detailed)	(Y)	N	N/A	– to cross reference details on the plans
Control joints (details / shown on plans)	(Y)	N	N/A	
Flashings (multiple claddings)	(Y)	N	N/A	
Solid plaster - on cavity (continuous foundation)	Y	(N)	N/A	
Stud spacing (400 non-rigid, 600 rigid)	Y	N	N/A	
Plaster system (type / coats)	Y	(N)	N/A	Check for product approvals

Continued.....

Cladding – wall, continued				Comments
Approved applicator required	Y	(N)	N/A	
PS3 required (condition of consent)	Y	(N)	N/A	
Brick veneer (height, type, cavity width, rebate)	(Y)	N	N/A	
Brick veneer (panel size, ties, angles, flashings)	(Y)	N	N/A	
2-storey (plans must be detailed and checked against M/F requirements)	Y	(N)	N/A	
Cladding - roof				**Comments**
Type (specify type/s)	(Y)	N	N/A	Check for Product approvals
Minimum roof pitch	(Y)	N	N/A	
Specifications (maintenance / installation)	(Y)	N	N/A	
Substrate (suitable for cladding)	(Y)	N	N/A	
Roof penetrations (flashings detailed)	(Y)	N	N/A	
Discharge (spreaders)	Y	(N)	N/A	
Internal gutter (size / capacity/ timber treatment)	Y	(N)	N/A	
Parapets (slope / capping / framing)	Y	(N)	N/A	
Installer guarantee - roof (condition of consent)	Y	(N)	N/A	
M/F guarantee (condition of consent)	Y	(N)	N/A	
Installer guarantee - other (condition of consent)	Y	(N)	N/A	
M/F guarantee (condition of consent)	Y	(N)	N/A	
Fire / Acoustic				**Comments**
Walls and ceilings (details shown on plans)	Y	(N)	N/A	–
Design checked (system specified - GBTL30a)	(Y)	N	N/A	Engineer design maybe required
Plans detailed (fixings, stopping, etc)	(Y)	N	N/A	For Roof eaves to front & Fire Resistance detail
Paths (open path 60m max, dead end 24m max)	Y	N	N/A	
External FRR wall (30/30/30 – 200mm min. return))	Y	(N)	N/A	
Penetrations FRR (pipes / electrical outlets)	Y	(N)	N/A	
No openings within 1.0m	Y	(N)	N/A	
Stability (gable ends)	Y	N	N/A	
Non-combustible claddings on external walls	(Y)	N	N/A	
Multi-units (continuous to underside of roofing)	Y	N	N/A	
200mm return each end of wall	(Y)	N	N/A	
Acoustics design checked (system specified)	(Y)	N	N/A	

Wet areas				**Comments**
Timber treatment (walls and floors)	Y	N	N/A	
Showers (framed and lined or / modular unit)	Y	N	N/A	
Waterproofing (type / substrate)	Y	N	N/A	Check for product approvals
Installer guarantee (condition of consent)	Y	N	N/A	
Floor lining (substrate / waterproofing)	Y	N	N/A	Check for product approvals — vinil on ship-lex
Wall lining (substrate / waterproofing)	Y	N	N/A	
Minimum 1 door between kitchen and WC	Y	N	N/A	
Basin in WC (except where adjacent to bathroom)	Y	N	N/A	
Mechanical light and ventilation	Y	N	N/A	
Laundry space (floor coverings if in garage)	Y	N	N/A	
Glazing (showers / joinery / skylights)	Y	N	N/A	
Kitchen				**Comments**
Oven / Fridge / Storage (floor coverings)	Y	N	N/A	
Stairs / entry				**Comments**
Internal / external	Y	N	N/A	
Tread / Rise / Pitch	Y	N	N/A	
Slip resistance	Y	N	N/A	
Landings	Y	N	N/A	
Clearance at doors	Y	N	N/A	
Max rise 4.0m	Y	N	N/A	
Handrails	Y	N	N/A	
Barriers (900mm internal / 1.0m external)	Y	N	N/A	
Heating				**Comments**
M/F details provided	Y	N	N/A	
Location (seismic restraint clearances)	Y	N	N/A	
ARC requirements met for wood burners	Y	N	N/A	
Installer guarantee (condition of consent)	Y	N	N/A	
Decks / balconies				**Comments**
Timber treatment (framing / substrate)	Y	N	N/A	
Finished floor level (clearances / air-gap)	Y	N	N/A	
Floor joists (size / c/s / cantilever)	Y	N	N/A	
Waste / overflow (if internal)	Y	N	N/A	
Saddle flashings (construction details)	Y	N	N/A	
Decking (material / membrane)	Y	N	N/A	

Continued.....

Decks / balconies, continued				Comments
Installer guarantee (condition of consent)	Y	N	N/A	
Slip resistance	Y	N	N/A	
Landings	Y	N	N/A	
Steps/ handrail / barrier Tread / Rise / Pitch	Y	N	N/A	
Bracing calculations >2.0m wide (125 pile min)	Y	N	N/A	
3-storey – balcony top floor - specific design	Y	N	N/A	
Other				**Comments**
Smoke alarms (in or within 3.0m bedrooms / all exits)	Y	N	N/A	
Glazing (Safety glass / skylights)	Y	N	N/A	
Restrictors (<760mm to floor)	Y	N	N/A	
Light and visual awareness	Y	N	N/A	
Ventilation	Y	N	N/A	
Producer statements	Y	N	N/A	
Alternative solutions	Y	N	N/A	
Blanket approval	Y	N	N/A	
Specialist components (all inputs identified)	Y	N	N/A	
Plans – sets collated and stamped	Y	N	N/A	
Conditions entered into computer	Y	N	N/A	
Inspection requirements identified	Y	N	N/A	
Checklist completed in full standards referenced, etc	Y	N	N/A	
Rational for all decision making steps recorded	Y	N	N/A	

Approval and review			
Approval Granted / Refused	State outcome and reasons		
Checked by:	Rada	Date	30/10/08
Reviewed by:		Date	

Log all communications and advise applicant if further information is required. Medium: L = letter E = email T = telephone F = facsimile I = in person			
Date / Time	**Medium**	**Officer's initials**	**Summary of dialogue, requests for information, etc**

Continued.....

BCI-15

Checklist for assessing alternative solutions

Waitakere City Council
Te Tohao o Waitakere

Instructions

1. Provide written comments in each section where applicable.
2. Y = complies N = does not comply.
3. Refer to PR-25 Alternative Solutions for policy.
4. Record and attach all communications regarding the assessment.

1	**Property address**	19, TITCH PLACE
	Consent number	COM 2008-1464
2	**Describe the building method or product proposed.**	
		- ARDEX- BUTYNOL MEMBRANES
3	**Record the manufacturer's name, address and contact details:**	
	Name	BUTYNOL MEMBRANES
	Address	- ARDEX NZ - PO BOX 10549
	Contact person	WWW. butynol. co. nz
	Phone / Mobile / Fax / Email	
4	**Which Building Code clauses are involved?**	

B1	B2	C1	C2	C3	C4	D1
D2	E1	E2	E3	F1	F2	F3
F4	F5	F6	F7	F8	G1	G2
G3	G4	G5	G6	G7	G8	G9
G10	G11	G12	G13	G14	H1	

5 What type of documentation has the applicant provided for assessment?

Comparison to an acceptable solution	(Y)	N
In-service history	(Y)	N
Expert opinion / producer statement / peer review	(Y)	N
Test / laboratory results	Y	(N)
Determination	Y	(N)
Appraisal	Y	(N)
Technical data including maintenance and installation details	Y	N

Brant appraisal No: 436(2005)

6 Assess the level of performance noting information relevant to the Building Code clauses covered by the building method or product proposed.

Wind region	L	(M)	H	VH	SP
Corrosion zone	Zone 1			Seaspray	
Complexity of design	Simple			Complex	
Is level and quality of detailing appropriate to level of risk?			Y		N

Comments:

7	**Assess the expert's opinion.**		
	Who is the expert? Name: _____		
	Has expert signed opinion?	Y	(N)
	Has expert dated opinion? (Opinion should be no older than 90 days to demonstrate currency)	Y	(N)
	Does opinion post date the referenced documents?	(Y)	N
	Comments		

8	**Assess the expert's competence, (evidence must be provided and attached to application).**		
	Is expert known by Council? (must be reputable)	(Y)	N
	Has expert provided CV and referees who can attest to his competence? (N/A if CPENG)	(Y)	N
	CPENG registration checked?	Y	(N)
	Registration number _____		
	Is expert an independent third party? (no conflict of interest)	(Y)	N
	Is the expert's opinion acceptable?	(Y)	N
	Comments		

9	**Assess data supplied in support of application. Data should include laboratory and field tests, investigatory studies, case studies, calculations, comparison to standards, historical use, etc.**		
	Has independence of testing laboratories been demonstrated? (TELARC, IANZ, etc)	Y	(N)
	Are standards applicable to NZ conditions / environment	(Y)	N
	Is data relevant to the NZ Building Code clause proposed	(Y)	N
	Are assumptions made and methods	Y	(N)
	Comments		

10	**Assess technical detail.**		
	Are construction details sufficient and appropriate?	(Y)	N
	Do the manufacturer's details clearly identify installation details?	(Y)	N
	Are maintenance requirements specified?	(Y)	N
	Are there any site specific features that need to be considered? (wind, corrosion, etc)	Y	(N)
	Comments		

11	**Consider guidance information (list documents referenced)**		
	Determinations	Y	(N)
	Case law	Y	(N)
	Warnings / bans	Y	(N)
	Guidelines or other publications	(Y)	N
	Historical use	(Y)	N
	Comments		

12	**Comparison to existing design (existing buildings) benchmarking**		
	If full compliance can not be achieved, assess reasonable practicality	(Y)	N
	Does proposal show the same level of performance?	(Y)	N
	Comments		

13	**What are the limitations on its use? (list limitations, if any)**

14	Quality assurance		
	Are approved installer's required / nominated?	(Y)	N
	Are completion certificates or producer statements required?	(Y)	N
	Is construction supervision required?	(Y)	N
	Will inspection records be provided on completion of work?	(Y)	N
	Have special site instructions been identified?	Y	(N)
	Are additional inspections required by the building consent authority? If yes, list below	Y	(N)
	Comments		

15	Conditions of consent (list requirements)

16	Acceptability of Alternative Solution		
	Is the building method or product acceptable?	(Y)	N
	On the balance of evidence is supporting documentation persuasive?	(Y)	N
	Does evidence result in the same level of compliance as provided by the acceptable solutions?	(Y)	N
	Comments		

17	Stamp each page of the plans "Alternative Solution" and identify what the Alternative Solution is:

Approving Officer: Paula Reid Date: 30/10/07

Reviewing Officer: _____ Date: _____

Alternative Solutions - communications record

Log all communications and advise applicant if further information is required.
Medium: L=letter E = email T = telephone call F = facsimile O = other

Date / Time	Medium	Officer's initials	Summary of dialogue, requests for information, etc

BCI-15

Checklist for assessing alternative solutions

Waitakere City Council
Te Tiriao o Waitakere

Instructions

1. Provide written comments in each section where applicable.
2. Y = complies N = does not comply.
3. Refer to PR-25 Alternative Solutions for policy.
4. Record and attach all communications regarding the assessment.

1	**Property address**	19, TITCH PLACE
	Consent number	COM 2008-1464

2. **Describe the building method or product proposed.**

THERMACRAFT -215- Roof underlay

3. **Record the manufacturer's name, address and contact details:**

Name	Thermacraft Industries (NZ) Ltd			
Address	PO BOX 58112, Greenmount, Auckland			
Contact person				
Phone 09 2733727	Mobile	Fax 09 2733726	Email	

4. **Which Building Code clauses are involved?**

(B1)	(B2)	C1	C2	C3	C4	D1
D2	E1	(E2)	E3	F1	F2	F3
F4	F5	F6	F7	F8	G1	G2
G3	G4	G5	G6	G7	G8	G9
G10	G11	G12	G13	G14	H1	

5. **What type of documentation has the applicant provided for assessment?**

Comparison to an acceptable solution	(Y)	N
In-service history	(Y)	N
Expert opinion / producer statement / peer review	Y	(N)
Test / laboratory results	Y	(N)
Determination	Y	(N)
Appraisal	(Y)	N
Technical data including maintenance and installation details	(Y)	N

BRANZ APPRAISAL

6. **Assess the level of performance noting information relevant to the Building Code clauses covered by the building method or product proposed.**

Wind region	L	(M)	H	VH	SP
Corrosion zone	(Zone 1)		Seaspray		
Complexity of design	Simple		(Complex)		
Is level and quality of detailing appropriate to level of risk?	Y	(N)			

Comments:

7	**Assess the expert's opinion.**		
	Who is the expert? Name: BRANZ		
	Has expert signed opinion?	(Y)	N
	Has expert dated opinion? (Opinion should be no older than 90 days to demonstrate currency)	(Y)	N
	Does opinion post date the referenced documents?	Y	(N)
	Comments		

8	**Assess the expert's competence, (evidence must be provided and attached to application).**		
	Is expert known by Council? (must be reputable)	(Y)	N
	Has expert provided CV and referees who can attest to his competence? (N/A if CPENG)	Y	(N)
	CPENG registration checked?	Y	(N)
	Registration number _____		
	Is expert an independent third party? (no conflict of interest)	(Y)	N
	Is the expert's opinion acceptable?	(Y)	N
	Comments		

9	**Assess data supplied in support of application. Data should include laboratory and field tests, investigatory studies, case studies, calculations, comparison to standards, historical use, etc.**		
	Has independence of testing laboratories been demonstrated? (TELARC, IANZ, etc)	(Y)	N
	Are standards applicable to NZ conditions / environment	(Y)	N
	Is data relevant to the NZ Building Code clause proposed	(Y)	N
	Are assumptions made and methods	(Y)	N
	Comments		

10	**Assess technical detail.**		
	Are construction details sufficient and appropriate?	(Y)	N
	Do the manufacturer's details clearly identify installation details?	(Y)	N
	Are maintenance requirements specified?	(Y)	N
	Are there any site specific features that need to be considered? (wind, corrosion, etc)	Y	(N)
	Comments		

11	**Consider guidance information (list documents referenced)**		
	Determinations	Y	(N)
	Case law	Y	(N)
	Warnings / bans	Y	(N)
	Guidelines or other publications	(Y)	N
	Historical use	(Y)	N
	Comments		

12	**Comparison to existing design (existing buildings) benchmarking**		
	If full compliance can not be achieved, assess reasonable practicality	(Y)	N
	Does proposal show the same level of performance?	(Y)	N
	Comments		

13	**What are the limitations on its use? (list limitations, if any)**
	/

14	Quality assurance		
	Are approved installer's required / nominated?	(Y)	N
	Are completion certificates or producer statements required?	(Y)	N
	Is construction supervision required?	Y	(N)
	Will inspection records be provided on completion of work?	Y	(N)
	Have special site instructions been identified?	Y	(N)
	Are additional inspections required by the building consent authority? If yes, list below	Y	(N)
	Comments		

15	Conditions of consent (list requirements)

16	Acceptability of Alternative Solution		
	Is the building method or product acceptable?	(Y)	N
	On the balance of evidence is supporting documentation persuasive?	(Y)	N
	Does evidence result in the same level of compliance as provided by the acceptable solutions?	(Y)	N
	Comments		

17	Stamp each page of the plans "Alternative Solution" and identify what the Alternative Solution is.

Approving Officer: Rada Rišić Date: 30/10/08

Reviewing Officer: _____ Date: _____

Alternative Solutions - communications record

Log all communications and advise applicant if further information is required.
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Date / Time	Medium	Officer's initials	Summary of dialogue, requests for information, etc

BCI-15

Checklist for assessing alternative solutions

Waitakere City Council
Te Tatau o Waitakere

Instructions

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4. Record and attach all communications regarding the assessment.

1	**Property address**	19 TITCH PLACE
	Consent number	COM 2008-1464
2	**Describe the building method or product proposed.**	-Superflex - waterproofing membrane
3	**Record the manufacturer's name, address and contact details:**	
	Name	Superflex - Wetarea membranes
	Address	
	Contact person	
	Phone 09 921 1994 / Mobile / Fax / Email	

4 Which Building Code clauses are involved?

(B1)	(B2)	C1	C2	C3	C4	D1
D2	E1	(E2)	E3	F1	F2	F3
F4	F5	F6	F7	F8	G1	G2
G3	G4	G5	G6	G7	G8	G9
G10	G11	G12	G13	G14	H1	

5 What type of documentation has the applicant provided for assessment?

Comparison to an acceptable solution	(Y)	N
In-service history	(Y)	N
Expert opinion / producer statement / peer review	(Y)	N
Test / laboratory results	Y	(N)
Determination	Y	(N)
Appraisal	Y	N
Technical data including maintenance and installation details	Y	N

BRANZ appraisal

6 Assess the level of performance noting information relevant to the Building Code clauses covered by the building method or product proposed.

Wind region	L	(M)	H	VH	SP
Corrosion zone	Zone 1		Seaspray		
Complexity of design	Simple		Complex		
Is level and quality of detailing appropriate to level of risk?			Y		N

Comments:

7	**Assess the expert's opinion.**		
	Who is the expert? Name: _____		
	Has expert signed opinion?	Y	(N)
	Has expert dated opinion? (Opinion should be no older than 90 days to demonstrate currency)	Y	(N)
	Does opinion post date the referenced documents?	(Y)	N
	Comments		
8	**Assess the expert's competence, (evidence must be provided and attached to application).**		
	Is expert known by Council? (must be reputable)	(Y)	N
	Has expert provided CV and referees who can attest to his competence? (N/A if CPENG)	(Y)	(N)
	CPENG registration checked?	Y	(N)
	Registration number _____		
	Is expert an independent third party? (no conflict of interest)	(Y)	N
	Is the expert's opinion acceptable?	(Y)	N
	Comments		
	Assess data supplied in support of application. Data should include laboratory and field tests, investigatory studies, case studies, calculations, comparison to standards, historical use, etc.		
	Has independence of testing laboratories been demonstrated? (TELARC, IANZ, etc)	Y	(N)
	Are standards applicable to NZ conditions / environment	(Y)	N
	Is data relevant to the NZ Building Code clause proposed	(Y)	N
	Are assumptions made and methods	(Y)	(N)
	Comments		

10	**Assess technical detail.**		
	Are construction details sufficient and appropriate?	(Y)	N
	Do the manufacturer's details clearly identify installation details?	(Y)	N
	Are maintenance requirements specified?	(Y)	N
	Are there any site specific features that need to be considered? (wind, corrosion, etc)	Y	(N)
	Comments		
11	**Consider guidance information (list documents referenced)**		
	Determinations	Y	(N)
	Case law	Y	(N)
	Warnings / bans	Y	(N)
	Guidelines or other publications	(Y)	N
	Historical use	(Y)	N
	Comments		
12	**Comparison to existing design (existing buildings) benchmarking**		
	If full compliance can not be achieved, assess reasonable practicality	(Y)	N
	Does proposal show the same level of performance?	(Y)	N
	Comments		
13	**What are the limitations on its use? (list limitations, if any)**		

14	Quality assurance		
	Are approved installer's required / nominated?	(Y)	N
	Are completion certificates or producer statements required?	(Y)	N
	Is construction supervision required?	Y	(N)
	Will inspection records be provided on completion of work?	Y	(N)
	Have special site instructions been identified?	Y	(N)
	Are additional inspections required by the building consent authority? If yes, list below	Y	(N)
	Comments		

15	Conditions of consent (list requirements)

16	Acceptability of Alternative Solution		
	Is the building method or product acceptable?	(Y)	N
	On the balance of evidence is supporting documentation persuasive?	(Y)	N
	Does evidence result in the same level of compliance as provided by the acceptable solutions?	(Y)	N
	Comments		

17	Stamp each page of the plans "Alternative Solution" and identify what the Alternative Solution is.

Approving Officer: Rada Rishe Date: 30/10/08

Reviewing Officer: _____ Date: _____

Alternative Solutions - communications record

Log all communications and advise applicant if further information is required.
Medium: L=letter E = email T = telephone call F = facsimile O = other

Date / Time	Medium	Officer's Initials	Summary of dialogue, requests for information, etc

BCI-15

Checklist for assessing alternative solutions

Waitakere City Council

Instructions

1. Provide written comments in each section where applicable.
2. Y = complies N = does not comply.
3. Refer to PR-25 Alternative Solutions for policy.
4. Record and attach all communications regarding the assessment.

1	**Property address**	19, TTC4 PLACE
	Consent number	COM 2008-391
2	**Describe the building method or product proposed.**	
		Gib Bracing System
3	**Record the manufacturer's name, address and contact details:**	
	Name	gib Ltd.
	Address	
	Contact person	
	Phone / Mobile / Fax / Email	

4 Which Building Code clauses are involved?

(B1)	(B2)	C1	C2	C3	C4	D1
D2	E1	E2	E3	F1	F2	F3
F4	F5	F6	F7	F8	G1	G2
G3	G4	G5	G6	G7	G8	G9
G10	G11	G12	G13	G14	H1	

5 What type of documentation has the applicant provided for assessment?

Comparison to an acceptable solution	(Y)	(N)
In-service history	(Y)	N
Expert opinion / producer statement / peer review	Y	(N)
Test / laboratory results	Y	(N)
Determination	Y	(N)
Appraisal	(Y)	N
Technical data including maintenance and installation details	(Y)	N

gib bracing system 2006. Brand Appraisal No. 299

6 Assess the level of performance noting information relevant to the Building Code clauses covered by the building method or product proposed.

Wind region	L	(M)	H	VH	SP
Corrosion zone	Zone 1		Seaspray		
Complexity of design	~~Simple~~		(Complex)		
Is level and quality of detailing appropriate to level of risk?			Y		(N)

Comments:

7	**Assess the expert's opinion.**		
	Who is the expert? Name: BRANZ		
	Has expert signed opinion?	(Y)	N
	Has expert dated opinion? (Opinion should be no older than 90 days to demonstrate currency)	(Y)	N
	Does opinion post date the referenced documents?	Y	(N)
	Comments		

8	**Assess the expert's competence, (evidence must be provided and attached to application).**		
	Is expert known by Council? (must be reputable)	(Y)	N
	Has expert provided CV and referees who can attest to his competence? (N/A if CPENG)	Y	(N)
	CPENG registration checked?	Y	(N)
	Registration number _____		
	Is expert an independent third party? (no conflict of interest)	(Y)	N
	Is the expert's opinion acceptable?	(Y)	N
	Comments		

9	**Assess data supplied in support of application. Data should include laboratory and field tests, investigatory studies, case studies, calculations, comparison to standards, historical use, etc.**		
	Has independence of testing laboratories been demonstrated? (TELARC, IANZ, etc)	(Y)	N
	Are standards applicable to NZ conditions / environment	(Y)	N
	Is data relevant to the NZ Building Code clause proposed	(Y)	N
	Are assumptions made and methods	Y	(N)
	Comments		

10	**Assess technical detail.**		
	Are construction details sufficient and appropriate?	(Y)	N
	Do the manufacturer's details clearly identify installation details?	(Y)	N
	Are maintenance requirements specified?	Y	(N)
	Are there any site specific features that need to be considered? (wind, corrosion, etc)	(Y)	(N)
	Comments		

11	**Consider guidance information (list documents referenced)**		
	Determinations	Y	(N)
	Case law	Y	(N)
	Warnings / bans	Y	(N)
	Guidelines or other publications	(Y)	N
	Historical use	(Y)	N
	Comments		

12	**Comparison to existing design (existing buildings) benchmarking**		
	If full compliance can not be achieved, assess reasonable practicality	(Y)	N
	Does proposal show the same level of performance?	(Y)	N
	Comments		

13	**What are the limitations on its use? (list limitations, if any)**
	Note: In wet areas, as showers and baths, gib bracing systems, should not be placed behind.

14	Quality assurance		
	Are approved installer's required / nominated?	Y	(N)
	Are completion certificates or producer statements required?	Y	(N)
	Is construction supervision required?	Y	(N)
	Will inspection records be provided on completion of work?	Y	(N)
	Have special site instructions been identified?	Y	(N)
	Are additional inspections required by the building consent authority? If yes, list below	Y	(N)
	Comments		

15	Conditions of consent (list requirements)

16	Acceptability of Alternative Solution		
	Is the building method or product acceptable?	(Y)	N
	On the balance of evidence is supporting documentation persuasive?	(Y)	N
	Does evidence result in the same level of compliance as provided by the acceptable solutions?	(Y)	N
	Comments		

17	Stamp each page of the plans "Alternative Solution" and identify what the Alternative Solution is.

Approving Officer: Sarah Ristow Date: 30/10/08

Reviewing Officer: _____ Date: _____

Alternative Solutions - communications record

Log all communications and advise applicant if further information is required.
Medium: L=letter E = email T = telephone call F = facsimile O = other

Date / Time	Medium	Officer's initials	Summary of dialogue, requests for information, etc

LOT. 32 - 19 TITCH PL

BCI-01

LODGEMENT CHECKLIST – BUILDING CONSENT APPLICATIONS

Please provide this checklist with your application

Waitakere City Council
Te Taiaro o Waitakere

1. Your application will only be accepted if the information outlined in this checklist is provided.
2. Please work through this checklist and circle the information that you have provided.
3. Two (2) sets of plans and other documents are required; include a third copy of floor plans.
4. Drawings must be produced on a minimum A3 sheet size.
5. Only original copies will be accepted.
6. All drawings must meet the minimum requirements of the Technical Drawings standard AS/NZS1100 with equivalent Microsoft Word text size 11 **(free-handed drawings will not be accepted)**
7. If a Project Information Memorandum (PIM) has already been issued for this project, please provide a copy with this application.
8. 2nd hand building report is required if using second-hand materials or buildings.
9. If building is positioned over two or more allotments, a third set of plans is required.

Declaration

This section must be completed by applicant (*Please cross-out that is not applicable from the following statements*):

1. This work ~~is~~ / **is not** covered by a WHRS claim.
2. This work ~~does~~ / **does not** involve re-cladding as a result of leaking.
3. This work ~~includes~~ / **excludes** monolithic cladding.
4. This application ~~includes~~ / **excludes** a swimming pool or spa pool.
5. This property ~~is~~ / **is not** known to be in a flood affected area. 29 SEP 2008
6. The building ~~does~~ / **does not** involve building over an existing boundary or two lots.
7. This building work ~~is~~ / **is not** as a result of a notice to fix.

Applicant's Signature: _____ Date: 29/9/08

For Council Use only:

Consent Number:

PIM Number:

Other Relevant Consent Number/s:

Wind Zone: ~~High~~ Low

District Plan: Human Environment Living

District Plan: Natural Area General.

Natural Hazards

Hazardous Facilities / Contaminated Sites

Stability Sensitive (Waitemata District Scheme)

Heritage Status

Impact on Waahi tapu? Yes / No

Archaeological Site? Yes / No

Customer Use: Circle as appropriate			Doc reference/ Page #		Council Use Only			Comments
(Y)	N	NA		Application form completed in full and signed	(Y)	N	NA	
(Y)	N	NA		Water meter connection and location plan – on site plan.	(Y)	N	NA	
(Y)	N	NA		Vehicle crossing form (if applicable)	(Y)	N	NA	
Y	N	NA		Street damage exists – notification received	Y	N	(NA)	
Y	N	(NA)		Application for septic tank (if applicable)	Y	N	(NA)	
Y	N	(NA)		Second hand building materials	Y	N	(NA)	
Y	N	(NA)		Road Opening Notices (RON)	Y	N	(NA)	
Y	N	(NA)		Compliance Schedule	Y	N	(NA)	

Customer Use					Council Use Only			
Circle as appropriate			Doc reference/ Page #					Comments
Y	N	NA		Swimming Pool Registration	Y	N	NA	
Y	N	NA		Approval from Parks Department to build on Council Reserve	Y	N	NA	
Y	N	NA		Application to erect a structure on a road reserve	Y	N	NA	
Proof of Ownership								
Y	N	NA		Certificate of title and flats plan (no older than 90 days)	Y	N	NA	
Y	N	NA		Sale and purchase agreement (full copy)	Y	N	NA	
Y	N	NA		Letter from owner if applicant / agent is not owner (state details of the Authorisation from the owner to make the application on the owner's behalf)	Y	N	NA	
Y	N	NA		The letter of authorisation from the owner should specify alternative billing instructions if the primary contact for billing is not the owner.	Y	N	NA	
Y	N	NA		If application is submitted on behalf of company/trust include copy of authorising documents for the company/trust.	Y	N	NA	
Resource Consents (1 copy only)								
Y	N	NA		Copy of approved resource consent or reference number if application has been lodged (record consent number in comments)	Y	N	NA	
District Plan / Site Plan Requirements (2 x copies of each of the following plans)								
Y	N	NA		**Cross-lease property** (minimum scale 1:100)	Y	N	NA	
Y	N	NA		Show entire property including boundaries for each unit and any common areas	Y	N	NA	
Y	N	NA		**Rural property** Full site plan (note: smaller scale may be used for large sites)	Y	N	NA	
Y	N	NA		o Source of potable water supply	Y	N	NA	
Y	N	NA		o Test Report required if bore water being used	Y	N	NA	
Y	N	NA		**All other property** (minimum scale 1:100)	Y	N	NA	
Y	N	NA		Show all existing and proposed building and eaves line	Y	N	NA	
Y	N	NA		Legal description and street address	Y	N	NA	
Y	N	NA		Vehicle access and manoeuvring, finished levels of driveway. Each car park space must have dimensions of at least 2.5 x 5.0m and slope not exceeding 1 in 16 (6.25%)	Y	N	NA	
Y	N	NA		Designated space (i.e. outdoor space – in living and rural villages only)	Y	N	NA	
Y	N	NA		Site area and boundary dimensions	Y	N	NA	
Y	N	NA		Building set-out (yard dimensions)	Y	N	NA	
Y	N	NA		Calculations for building coverage	Y	N	NA	
Y	N	NA		Calculations for existing and proposed impermeable surfaces (totals for each)	Y	N	NA	
Y	N	NA		North point, boundary bearings	Y	N	NA	

Customer Use			Council Use Only	
Circle as appropriate	Doc reference/ Page #			Comments

(Y)	N	NA		Datum and contours (or spot levels) Provide spot levels at corners of new building work and on the site boundaries immediately adjacent and at any point from which a height to boundary recession plane is measured.	(Y)	N	NA	
Y	N	(NA)		Volume of earthworks including cut and fill, including provision for silt control	Y	N	(NA)	} Sites already benched
Y	N	(NA)		Differentiate between the earthworks within the building eaves line and outside the eaves line	Y	N	(NA)	
Y	N	(NA)		Retaining walls – proposed heights	Y	N	(NA)	Existing
Y	N	(NA)		Site management plan showing: Provisions for the protection of public, suppression of dust, disposal of debris, disconnection from public utilities and suppression of noise, traffic management	Y	N	(NA)	
Y	N	(NA)		Identify any tress protected by the District Plan, location, species, height, girth, extent of drip-line of all trees (incl. overhanging from neighbouring property and clearance required)	Y	N	(NA)	
Y	N	(NA)		Watecare Services Ltd. Approval if building within 10m of WSL line	Y	N	(NA)	
Y	N	NA		Show vehicle crossing – show 50 meters of roadway in each direction	(Y)	N	NA	
(Y)	N	NA		Finished floor level (relative to ground levels)	(Y)	N	NA	
Drainage Plan								
(Y)	N	(NA)		Existing drainage	(Y)	N	NA	- Public drains shown.
(Y)	N	NA		New private and public drainage/water course if to be used including manholes / invert levels	(Y)	N	NA	
Y	N	(NA)		Septic tank and effluent	Y	N	(NA)	
Y	N	(NA)		Protection of public drains (if bridging or in close proximity a video maybe required) Buildings over or within 1.0m of a public sewer require a bridging design including actuak invert levels	Y	N	(NA)	
(Y)	N	NA		o Stormwater disposal	(Y)	N	NA	
Y	N	(NA)		o Detention / retention tanks	Y	N	(NA)	
Y	N	(NA)		o Location of HWC, if external	Y	N	(NA)	Internal
Y	N	(NA)		Retaining Walls	Y	N	(NA)	Exist.
(Y)	N	NA		o Show provisions for drainage	(Y)	N	NA	
Floor Plan (minimum scale 1:50 / Please provide extra copy)								
(Y)	N	NA		Proposed use of all spaces e.g. kitchen, bathrooms, toilets, etc.	(Y)	N	NA	
(Y)	N	NA		All rooms fully dimensioned	(Y)	N	NA	
(Y)	N	NA		Drawings must show key for elevations and include floor areas	(Y)	N	NA	
(Y)	N	NA		Smoke alarms and locations	(Y)	N	NA	
(Y)	N	NA		Window location / size	(Y)	N	NA	
(Y)	N	NA		Lintel / specific designed beams sizes	(Y)	N	NA	- See Seperate Sheet.
(Y)	N	NA		Bracing type, location and length	(Y)	N	NA	- See Seperate Sheet. P10
(Y)	N	NA		Location and type of hot water cylinder	(Y)	N	NA	

Customer Use					Council Use Only			
Circle as appropriate			Doc reference/ Page #					Comments
Y	N	NA		Location and type of heating – solid fuel / gas	Y	N	NA	
Y	N	NA		**Alterations**	Y	N	NA	
Y	N	NA		Existing floor plan and use of space	Y	N	NA	
Y	N	NA		Proposed floor plan and use of space	Y	N	NA	
Y	N	NA		New work must be clearly defined	Y	N	NA	
Foundation – fully dimensioned (scale 1:100 or 1:50)								
Y	N	NA		**Timber** – pile type, size, location, fixing details	Y	N	NA	
Y	N	NA		Sub-floor bracing, location, type, fixing details	Y	N	NA	
Y	N	NA		Bracing calculations and layout	Y	N	NA	
Y	N	NA		Bearer size and connection details	Y	N	NA	
Y	N	NA		Floor joist layout and size	Y	N	NA	
Y	N	NA		**Concrete** – width and depth of footing	Y	N	NA	
Y	N	NA		Masonry and reinforcing details	Y	N	NA	
Y	N	NA		Slab dimensions, point loads, pads, eg. Plumbing fixtures	Y	N	NA	
Y	N	NA		Mesh size and type	Y	N	NA	
Y	N	NA		Damp proof membranes	Y	N	NA	
Y	N	NA		Raft floor – engineers design and calculations	Y	N	NA	- Rib Raft by Wilton Jacobs
Elevations (scale 1:100 or 1:50)								
Y	N	NA		Each external face of the building	Y	N	NA	
Y	N	NA		Existing and finished ground levels	Y	N	NA	
Y	N	NA		Ground clearances and cladding clearance	Y	N	NA	
Y	N	NA		Joinery openings	Y	N	NA	
Y	N	NA		Roof cladding and pitch	Y	N	NA	
Y	N	NA		Eaves overhang	Y	N	NA	
Y	N	NA		Gutter	Y	N	NA	
Y	N	NA		Cladding type	Y	N	NA	
Y	N	NA		Control joint location (if applicable)	Y	N	NA	
Y	N	NA		Subfloor access and ventilation	Y	N	NA	
Y	N	NA		Deck, balconies, chimney, and pergolas	Y	N	NA	
Y	N	NA		Height in relation to boundary – building in relation to site boundaries. Spot levels on elevation drawings	Y	N	NA	- See Resource Consent approvals.
Y	N	NA		Maximum height. Demonstrate compliance by rolling height or mean ground level method. Calculations may be required. (8 metre maximum height in Living Environment Zone)	Y	N	NA	See Resource Consent approvals.
Cross-sections (minimum scale 1:50) referencing all details and sheet numbers to full demonstrate scope of work								
Y	N	NA		Cross-sections and long-sections	Y	N	NA	
Y	N	NA		Foundation / slab details showing	Y	N	NA	
Y	N	NA		o piles, footing depth and width	Y	N	NA	
Y	N	NA		o damp proof membrane	Y	N	NA	
Y	N	NA		Timber floor construction details	Y	N	NA	
Y	N	NA		o treatment level and type and fixing details	Y	N	NA	
Y	N	NA		o insulation (type and R value)	Y	N	NA	

Customer Use				Council Use Only			
Circle as appropriate			Doc reference/ Page #				Comments
Y	N	NA	o ground clearance in sub-floor space	Y	N	NA	
Y	N	NA	Wall framing construction details	Y	N	NA	
Y	N	NA	o treatment level and type (grade)	Y	N	NA	
Y	N	NA	o wall lining / insulation / building paper	Y	N	NA	
Y	N	NA	o wall cladding ~~/ cavity~~	Y	N	NA	
Y	N	NA	o finished floor levels	Y	N	NA	
Y	N	NA	Roof framing construction details	Y	N	NA	
Y	N	NA	o roof pitch	Y	N	NA	
Y	N	NA	o ceiling lining / insulation / building paper	Y	N	NA	
Y	N	NA	o roof cladding	Y	N	NA	
Y	N	NA	Retaining walls and drainage design	Y	N	NA	
Y	N	NA	Structural components and fixings	Y	N	NA	
Y	N	NA	Stairs ~~and decks~~	Y	N	NA	
Y	N	NA	o barrier construction details	Y	N	NA	
Y	N	NA	o pitch, tread, riser heights	Y	N	NA	
Roof framing (scale 1:100 or 1:50)							
Y	N	NA	Truss or rafter layout shown as a buildable design	Y	N	NA	
Y	N	NA	Spacing and dimensions of all roof framing	Y	N	NA	
Y	N	NA	Roof catchments area, fall direction and gutter size	Y	N	NA	
Y	N	NA	Downpipe sizes and location	Y	N	NA	
Y	N	NA	Roof bracing	Y	N	NA	
Y	N	NA	Area and type of all membrane roofs	Y	N	NA	
Y	N	NA	Outfall and overflow locations	Y	N	NA	
Y	N	NA	Lintels & specific design beams	Y	N	NA	
Floor framing (minimum scale 1:50) required for each level of the building							
Y	N	NA	**Subfloor and decks**	Y	N	NA	
Y	N	NA	Pile type, size and location	Y	N	NA	
Y	N	NA	Sub-floor braces (location and direction)	Y	N	NA	
Y	N	NA	Bearer size, span and spacing	Y	N	NA	
Y	N	NA	Floor joist size, span and spacing	Y	N	NA	
Y	N	NA	Bracing calculations	Y	N	NA	
Y	N	NA	o subfloor	Y	N	NA	
Y	N	NA	o deck if > 2.0m wide	Y	N	NA	
Y	N	NA	Exposed deck fixings to be stainless steel or hot dipped galvanised with eproxy coating	Y	N	NA	
Y	N	NA	**Timber mid-floor** - joist layout, spacing, size, stairwell openings, treatment type and level	Y	N	NA	
Y	N	NA	**Concrete mid floor** - reinforcing, mesh, shrinkage control joints, damp proof membrane and thickness, point loads pads and thickenings	Y	N	NA	
Y	N	NA	**Floor framing plans must also show** - plumbing and drainage fixtures, pipe sizes and location	Y	N	NA	

Customer Use			Council Use Only	
Circle as appropriate	Doc reference/ Page #			Comments

Cladding details (scale 1:10 or 1:5) Drawings should be of sufficient scale and detail to enable construction								
Y	N	NA		Flashing details for window, doors and other openings including	Y	N	NA	
Y	N	NA		o head, jamb and sill	Y	N	NA	
Y	N	NA		o parapets	Y	N	NA	
Y	N	NA		o balconies / decks	Y	N	NA	
Y	N	NA		o balustrades	Y	N	NA	
Y	N	NA		o apron flashings	Y	N	NA	
Y	N	NA		o junctions and interfaces	Y	N	NA	
Y	N	NA		o roof penetrations	Y	N	NA	
Y	N	NA		o meter box, pipes, penetrations, flashings	Y	N	NA	
Y	N	NA		Control joint design and location (monolithic only)	Y	N	NA	
Y	N	NA		Manufacturer's technical installation details / data	Y	N	NA	
Y	N	NA		Product accreditation or appraisal certificates for claddings	Y	N	NA	
Y	N	NA		E2 risk matrix for each wall face	Y	N	NA	
Plumbing and schematic								
Y	N	NA		Type of system - AS3500 or NZ Standards	Y	N	NA	
Y	N	NA		Plumbing schematic (if 2 or more storeys)	Y	N	NA	
Y	N	NA		Fixtures identified	Y	N	NA	
Y	N	NA		Vent, waste sizes and materials	Y	N	NA	
Y	N	NA		Floor finishes (wet and dry areas)	Y	N	NA	
Internal elevations NOTE: to be provided where the cross-sections or floor plans do not show the finishes and materials for walls and floors								
Y	N	NA		Wall finishes (wet and dry areas)	Y	N	NA	
Y	N	NA		Benches – surface finish	Y	N	NA	
Y	N	NA		Shower / bath – construction and waterproofing details	Y	N	NA	
Specifications (2 copies minimum) **Generic specifications will not be accepted**								
Y	N	NA		Specification relevant to project	Y	N	NA	
Y	N	NA		Appropriate standards referenced	Y	N	NA	
Y	N	NA		All technical sections or trades covered	Y	N	NA	
Y	N	NA		Types of materials, finishes and fixings to be used	Y	N	NA	
Y	N	NA		Heating (manufacturer's details)	Y	N	NA	
Y	N	NA		Hot water (manufacturer's details and seismic restraint)	Y	N	NA	
Product Literature (2 copies minimum)								
Y	N	NA		Technical data sheets for products to be used	Y	N	NA	
Y	N	NA		Installations instructions	Y	N	NA	
Y	N	NA		Product certification / appraisal certificates	Y	N	NA	
Y	N	NA		Maintenance schedule	Y	N	NA	
Bracing Calculations (2 copies minimum)								
Y	N	NA		Wind zone defined	Y	N	NA	
Y	N	NA		Wall bracing layout showing length and type of brace - must be shown on plans)	Y	N	NA	

Customer Use					Council Use Only			
Circle as appropriate			Doc reference/ Page #					Comments
(Y)	N	NA		Wall bracing calculation sheets (required for each floor level)	(Y)	N	NA	
Y	N	(NA)		Sub-floor bracing calculations	Y	N	(NA)	
Y	N	(NA)		Deck sub-floor bracing calculations if > 2.0m wide	Y	N	(NA)	
Design Reports and calculations (2 copies minimum) **Note: All Engineers issuing a producer statement must be registered with the Waitakere City Council.**								
(Y)	N	NA		Engineering design calculations	(Y)	N	NA	
(Y)	N	NA		Engineering must be detailed on plans and show fixing details	(Y)	N	NA	
(Y)	N	NA		o beams and lintels	(Y)	N	NA	
Y	N	(NA)		o retaining walls	Y	N	(NA)	
Y	N	(NA)		o other	Y	N	(NA)	
(Y)	N	NA		Geotechnical report - a geotechnical report must be provided for sites steeper than 1:4 or where there are fill or stability issues	(Y)	N	NA	~ Site Geotechnical report provided.
Y	N	(NA)		Swimming pool design and fencing	Y	N	(NA)	
Y	N	(NA)		Fire report	Y	N	(NA)	
Y	N	(NA)		Septic tank and effluent design	Y	N	(NA)	
Y	N	(NA)		Soakage reports and construction details	Y	N	(NA)	
Y	N	(NA)		Material compatibility schedule	Y	N	(NA)	
Y	N	(NA)		Where glazing exceeds 30% of wall area an alternative solution must be provided	Y	N	(NA)	
Y	N	(NA)		Acoustic reports (high noise route or Whenuapai Airbase contours, living accommodation in the working/community environment)	Y	N	(NA)	

Comments:

Lodgement Officer: Danny Khan Date: 30/8/08

Please Note:

This document has been produced to assist in the preparation of the documents required in the application of the Building Consent and is not in any way or form a Technical Processing Checklist.

Once processing commences, information may still be requested to ensure compliance with the Building Act 2004, the NZ Building Code, and the Waitakere City council District Plan.

We strongly recommend adhering to standard drafting practice (as outlined in NZ/AS 1100) and refer to the Department of Building and Housing (DBH) – "Guidelines to applying for a Building Consent". This can be found on the DBH website (www.dbh.govt.nz) or hard copies are available at our offices.

The Building Consent Authority (BCA) requires all construction information and details to be provided on the relevant drawings, using clear scales and presented in a manner that can be efficiently processed.

This Application Checklist may change due to our ongoing commitment to quality and education.

BCI-99

District Plan Checklist
Living Environment

Waitakere City Council
Te Tatao o Waitakere

COM No. 2008 1464 Date 10/10/08 Planner: Ben Geldenhuys

Location	
Street Address: 7 TUMPLACE NEWFOUNDWAY.	Site Area: refer LUC.
L E No: ✓ Nat Area: Yes	Map Reference N/A
Site File checked: (Yes) / No	Within M.D.H Node: Yes / No refer LUC

General provisions	
Hazardous Facility /Contaminated Site N/A	Landscape Elements: N/A
Natural Hazards: Yes	Heritage Item N/A.
Road Hierarchy Local	General Noise Rule: - Major Road N/A
Designations/Scheduled Site N/A	New vehicle crossing: (Yes) / No
Waitakere Ranges Heritage Bill area Yes / (No)	Related Sub / Land Use Consent ? 2006 1077 1078

Rule No.	Provision	OK/ Permitted	Not OK	PC26 OK	PC26 Not OK	Comments/Activity	N/A
2	Density/MDH						
3	Building Location/ Natural landscape elements						
4	Building height (8m)						
5	Height in relation to Boundaries					refer LUC	
	North (2.5m + 55°)						
	South (2.5m + 35°)						
	East (2.5m + 45°)						
	West (2.5m + 45°)						
	Transport (2.5m + 55°)						
6	Front Yards (3m)						
7	Building Coverage (35%)						
8	Building Location/Privacy & Amenity						
9	Outdoor Space						
	25m² per bedroom						
	6.0m line						
	Bearing						

	3.0m min dim						
	Slope						
	Accessible from Main Living Room						
Rule No.	**Provision**	**OK/ Permitted**	**Not OK**	**PC 26 OK**	**PC 26 Not OK**	**Comments/Activity**	**N/A**
10	Non Residential Activities (NRA)						
11	Traffic Generation, NRA						
12	Carparking & Driveways						
	Number of spaces						
	Dimensions						
	Driveway access						
	Gradient						
	On site turning						
	Service strip						
13	Noise (NRA)						
14	Air Discharges, Odour, Dust, Glare & Vibration						
15	Signs						
16	Relocated Buildings						
17	Infrastructure						

BCI-98

District Plan Checklist
General Natural Area

Waitakere City Council
Te Taiao o Waitakere

COM No: 2008 1464 Date: 16/10/08 Planner: Ben Geldenhuys

Location	
Street Address: 41 Tea Pl NEW FAULDING	Site Area: refer cert.
Human Environment: L	Map Reference N/A
Other Natural Areas: N/A	Site File checked: Yes / No

General provisions	
Hazardous Facility /Contaminated Site N/A	Landscape Elements: N/A
Natural Hazards: Yes	Heritage Item N/A
General Noise Rule: - Major Road N/A	Road Hierarchy Local
Designations/Scheduled Site N/A	

Rule No.	Provision	OK/ Permitted	Not OK	Comments/Activity	N/A
1	Located within other Natural Areas				
2	Vegetation clearance				
3	Earthworks *Check area, volume, cut, fill and sloe of earthworks in context with site and Natural Area*				

Rule No.	Provision	OK/ Permitted	Not OK	Comments/Activity	N/A
	Check retaining structure (height/surcharge loading etc) *Check erosion and sediment control measures*				
4	Impermeable surfaces				
5	Establishment of vegetation				

Waitakere City Council
Te Taiao o Waitakere

STRUCTURAL ENGINEER CHECKLIST

Address: 19 Titch Place, Lot 32			**Consent Number: COM 2008-1464**
CHECK ITEM	**Y / N**	**NA**	**COMMENTS**
DE Assessment Completed	Y		
Check for Comments & Letters by Other Staff Members	Y		
External Peer review Required/ Provided (Check WCC Register, Acceptable Provider, Check for Limitations)	N		
Producer Statement PS1 (Check WCC Register, Acceptable Provider, Check for Limitations)	N		**See RFI**
Geotechnical Issues (Slope Stability, Design Parameters)	Y		**Refer RFI**
Close Proximity to Public Drains (Check for Foundation Bridging Details, Refer Any Comments From Ecowater)	N		
Retaining Walls on Boundary (Design Surcharge)		N/A	
Retaining Walls (Design Parameters, Surcharge, Timber, Masonry, Concrete-Observation))		N/A	
Confirm Live Load, Seismic Coefficient (Check Loadings to Current Loadings Codes)	Y		
Roof Framing (Purlins, Rafters, Trusses & Their Fixings)	Y		
Roof Bracing (Ceiling Diaphragm, Cross-Bracing)	Y		
Wall Framing (Girts, posts, studs, lintels)	Y		
Wall Bracing (Sheeting, Cross Bracing, Portals)	Y		
Addition of Mezzanine Floor (Bracing & Footings)		N/A	
Addition of New Floor (Bracing , Footings & Check Existing Footings))		N/A	
Racking System (Blanket Approval, Structural Check-Observation)		N/A	
Racking System (Existing Slab for New Loads)		N/A	
Firewall Stability (Precast Panels-Observation)	Y		**Block Fire Wall**
Boundary Walls (Clearance for Deflection)		N/A	
Masonry Walls (Grade A/ B –Observation)	Y		
Timber Floor (Joists, Beams, Diaphragms Outside NZS3604 Only)		N/A	
General Observation of Items Covered by NZS3604	Y		

Waitakere City Council
Te Tatao o Waitakere

CHECK ITEM	Y / N	NA	COMMENTS
Concrete Floor (Slab, Beams, Connections & Observations)		N/A	
Ground Floor RC Slab-on-Grade (Thickness, Joints, Reinforcement, Reinf Cover)		N/A	
RC Footings, Beams, Columns, Tilt-up Panels-Observation)		N/A	
Compaction of Hard fill Over 600mm Deep-Observation		N/A	
Foundations (Shallow, Deep- Observations)		N/A	
Ribraft Slab (Firth, Others or Specific Design- Observations)	Y		
Internal Footings	Y		
Complies With Clause B1 of NZBC (Alternate Solutions identified & Calculations Stamped With Details)	Y		***Alternative Solution*** **AS2870:1996**
Observation Requirements Entered & Sign-0ff Pathways	Y		**150** **153** **168-Rib Raft Foundation Slab, Boundary Block Firewall**

Comments:-

1. **Discussed the issue of the geotechnical report with Mr Lance Goldsmith and Mr Keran Moss (Moss Engineering Limited, Ph 021387779). Mr Moss has acknowledged the issue and will provide the necessary supplementary foundation design recommendations. I've informed him that the application will be suspended until we receive his recommendations.**

2. **Suspended, see RFI.**

WCC Structural Engineer: Saby Virdi

Date **9/10/08**

Reviewed by:

Comments:

BCI-79

P&D Processing Plan Checklist

Waitakere City Council
Te Taiao o Waitakere

Instructions
1. Provide written comments in each section where applicable.
2. Y = complies N = does not comply N/A = not applicable
3. Complete all sections
4. If application includes an Alternative Solution, attach completed checklist AS-01 in accordance with PR-25
5. Record and attach all communications regarding the assessment.

Address	19 TITCH PL									
Date	14/10/08	**Consent number**		2008/1464	**Checked by:**					
Building Cat.	1	(2)	3	**Comp. level**	1	2	(3)	4	5	

Minor P&D only

Site issues				**Comments (describe how compliance achieved)**		
Sewer connections	(Y)	N	N/A			
Stormwater connections	(Y)	N	N/A			
Drains (bridging & close proximity)	Y	N	(N/A)			
Scale	(Y)	N	N/A			
Retaining walls /split levels – cess pits	(Y)	N	N/A			
Finished floor level	(Y)	N	N/A			
Existing Drainage	Y	N	(N/A)			
Drains – public				**Comments (describe how compliance achieved)**		
Public drains inverts shown	(Y)	N	N/A			
Location of drainage laterals	(Y)	N	N/A			
Drains – private				**Comments (describe how compliance achieved)**		
System	(Y)	N	N/A	(G13)	AS3500	Other
Total number of discharge units	(Y)	N	N/A			
TV <10m head of drain size	(Y)	N	N/A			
GT / ORG Below floor level and fixtures	(Y)	N	N/A			
Backflow Pools, spa baths, etc)	Y	N	(N/A)			
On-site disposal				**Comments (describe how compliance achieved)**		
Septic tank – Effluent design	Y	N	N/A			
Septic tank – Type	Y	N	N/A			
Septic tank – Size	Y	N	N/A			
Septic tank – Location plan	Y	N	N/A			
Stormwater soakage (Design / details provided)	Y	N	N/A			
Potable water				**Comments (describe how compliance achieved)**		
Town/~~tank/bore/other~~	(Y)	N	N/A			
New – application attached	(Y)	N	N/A	ECOWATER		
Water reuse	Y	N	(N/A)			
Water reticulation (Commercial / Industrial Only)				**Comments (describe how compliance achieved)**		
System	Y	N	N/A	G12	AS3500	Other
Diagrammatical layout	Y	N	N/A	(including location of plumbing fixtures shown on plans)		
Pipe – Size	Y	N	N/A			
Pipe – Material	Y	N	N/A			

HWC Noted in spec.	Size	Y	N	N/A	
	Restraint	Y	N	N/A	
	Valves	Y	N	N/A	
	Type	Y	N	N/A	
Water reticulation (Domestic)					**Comments (describe how compliance achieved)**
Wet back – fires (open vented)		Y	N	N/A	
Solar heating		Y	N	N/A	
Cladding – roof					**Comments (describe how compliance achieved)**
Type		Y	N	N/A	
Minimum roof pitch		Y	N	N/A	
Material compatibility		Y	N	N/A	
Roof penetrations (flashings detailed)		Y	N	N/A	
Discharge (spreaders)		Y	N	N/A	
Internal gutter / valley (size / capacity / timber treatment / overflow)		Y	N	N/A	
Overflows for internal spouting (Taylor fascia, etc)		Y	N	N/A	
Item checked					**Comments (describe how compliance achieved)**
D/P	Size	Y	N	N/A	80
	Number	Y	N	N/A	6
Plumbing sanitary					**Comments (describe how compliance achieved)**
Diagrammatical or schematic layout		Y	N	N/A	
System		Y	N	N/A	G13 / AS3500 / Other
Individual waste pipes	Discharge units	Y	N	N/A	
	Length	Y	N	N/A	
	Pipe size	Y	N	N/A	
	Venting	Y	N	N/A	
Soil waste & overflow stacks	Discharge units	Y	N	N/A	
	Pipe sizes	Y	N	N/A	
	Venting	Y	N	N/A	
Floor waste gully (recommended 2-storey)		Y	N	N/A	
Slabs					**Comments (describe how compliance achieved)**
Finished floor level (shown on plans)		Y	N	N/A	
Plumbing fixtures (shown on plans)		Y	N	N/A	
No pipes running through slab thickenings		Y	N	N/A	
Pipe Layout (shown on plans)		Y	N	N/A	
Wet Areas					**Comments (describe how compliance achieved)**
Basin in WC (except where adjacent to bathroom)		Y	N	N/A	
Enclosed Decks / balconies					**Comments (describe how compliance achieved)**
Waste / outlet overflow – size (same as outlet)		Y	N	N/A	
Other					**Comments (describe how compliance achieved)**
Domestic fire sprinkler system		Y	N	N/A	

Alternative solutions	Y	N	(N/A)	
ECO-Water approval required	(Y)	N	N/A	
Time recorded accurately for processing	(Y)	N	N/A	
Time entered	(Y)	N	N/A	
Conditions entered into computer	(Y)	N	N/A	
Inspection requirements identified	(Y)	N	N/A	
Checklist completed in full standards referenced, etc	(Y)	N	N/A	

Approval and review	
Approval Granted / Refused	State outcome and reasons

Checked by:		Date	
Reviewed by:		Date	

Log all communications and advise applicant if further information is required.
Medium: L = letter E = email T = telephone F = facsimile I = in person

Date / Time	Medium	Officer's initials	Summary of dialogue, requests for information, etc

Date / Time	Medium	Officer's initials	Summary of dialogue, requests for information, etc

EWI-01

EcoWater (Network Utility Operator) Checklist for Building & Resource Consents

Waitakere City Council
Te Taiao o Waitakere

Application Address: 19 [illegible]	LUC-
Applicant Name:	SUB- 2006-1078
Type of Development: New 4 Bn dwelling w attached garage	ABA-
	COM- 20081464

Checklist Completed By:	Date:
Assets & Network Approvals By:	Date:
Quality Check & Approvals By:	Date:

	CHECKLIST ITEM	DP, COP, POLICY (Specification)	ASSESSMENT (Fill In Data or Circle One Option)			
APPLICATION & SITE INFORMATION	Infringement Types (relating to EcoWater)	Consent Document / Planner				
	Notified Consent	Consent Document / Planner	yes	(no)	n/a	if yes, Team Leader sign-off
	Pre-Application - RMA Number	PRE-	yes	no	n/a	
	Pre-Application - OSS Advice	DS Database/Pathway Property Memo	yes	no	n/a	
	Requisitions (relating to EcoWater)	Pathway / InfoBase	yes	no	n/a	
	Hansen Jobs	Hansen	yes	no	n/a	
	EcoWater Property File	relevant documents or advice	yes	no	n/a	
	Human Environment	GIS - human environment layer	Living General			
	Natural Environment	GIS - natural environment layer				
	Special Subdivision Area (eg Structure Plan)	DP Maps & Variations	yes	no	specify:	
	Riparian Margin	GIS - natural environment layer	yes	(no)	n/a	
	Stability Sensitive	requires Geotech report	(yes)	no	n/a	
	Hazards & Special Features	Pathway Property Conditions	yes	no	n/a	GeoAcc
OTHER APPROVALS REQUIRED	**WATERCARE SERVICES LTD**					
	Works within 10m of WSL WW or WS lines.	WSL approval given in writing	yes	no	(n/a)	if no, applicant must provide
	Trade Waste Dischare Consent	WSL approval for industrial discharge	yes	no	(n/a)	if no, applicant must provide
	AUCKLAND REGIONAL COUNCIL					
	WCC comprehensive discharge consent	application complies with CMP	yes	no	n/a	if no, amend proposal or apply to ARC
	Urban - new impermeable >1000m^2	pipe discharges to coast / tidal area	yes	no	n/a	SWQT, energy dissipation
		pipe discharges to fresh water stream	yes	no	n/a	SWQT, energy dissipation, detention
	New pipe outlet to coastal or stream environ.		yes	no	n/a	
	Rural - more than 5 Lot subdivision		yes	no	n/a	
	Filling in 1%AEP floodplain		yes	no	n/a	
	Downstream flooding or erosion		yes	no	n/a	
	Works within 50m of a watercourse		yes	no	n/a	
	Culvert more than 20m long		yes	no	n/a	
	WCC ASSETS & NETWORK					
	Building over/near >150mm WW drain	approval given	yes	no	n/a	if no, amend proposal
	Building over/near >350mm SW drain	approval given	yes	no	n/a	if no, amend proposal
	Building platform clear of large drains	(build over, reroute, amend boundaries)	yes	no	n/a	if no, discuss with Team Leader
	Stream crossing	approval given (bridge or culvert)	yes	no	n/a	
	Esplanade reserve if stream >3m wide	check if required by Parks	yes	no	n/a	
	Drainage reserve	required by Assets	yes	no	n/a	
	Utility reserve	required by Assets	yes	no	n/a	
	Twin Streams property purchase	property identified for purchase	yes	no	n/a	if yes, discuss with Team Leader
	NEIGHBORING PROPERTIES					
	Services connection points located in neighbouring properties	Private agreement for access (no Council involvement)	yes	no	n/a	Add to SPECDE report & alert planner. Condition - cannot commence consent until connections in place.
EARTHWORKS & GEOTECH	Earthworks near stream / overland flowpath	inside 1%AEP flood area	yes	no	n/a	if yes, discuss with Team Leader
	Earthworks over drains	minimum coverage 1200mm roads	yes	no	n/a	
		minimum coverage 750mm other	yes	no	n/a	
		max. coverage 2000mm (class 2)	yes	no	n/a	
		raise manhole lid level & access	yes	no	n/a	
		lower manhole lid level & access	yes	no	n/a	
	retaining walls over/within 2m of drains	bridging piles - min. clearance 1m	yes	no	n/a	
	Geotech Report	instability, slips, stream erosion	yes	no	n/a	
		specific stormwater disposal	yes	no	n/a	
		specific wastewater disposal	yes	no	n/a	
		specific pipe/trench design	yes	no	n/a	
		specific bridge/foundation design	(yes)	no	n/a	

	CHECKLIST ITEM	DP, COP, POLICY (Specification)	ASSESSMENT (Fill in Data or Circle One Option)				
CATCHMENT INFORMATION	Supercatchment name	GIS - project table - StwSupCatShp	Henderson Creek South				
	Catchment Management Plan	proposal complies with CMP	yes	no	n/a		
	Integrated Catchment Management Plan	proposal complies with ICMP	yes	no	n/a		
	WCC - Comprehensive Discharge Consent	proposal complies with CDC	yes	no	n/a		
	Site affected by flooding or overland flow	close to stream or large dia SW pipes	yes	no	n/a		
	Flooding assessment provided (open stream)	check rainfall, catchment area etc	yes	no	n/a		
	Geotech assessment of stream bank erosion	check, setback required	yes	no	n/a		
	Riparian Margin	refer GIS natural areas map	yes	no	specify:		
	Overland flowpath assessment provided	check rainfall, catchment area etc	yes	no	n/a		
	Easements required for flood areas		yes	no	n/a		
	Crossing major stream - bridge required	check abutments, x-section, velocity	yes	no	n/a		
	Driveways <200mm flood during 1%AEP		yes	no	n/a		
	Private culverts - 5yr capacity & condition	as-built, cctv, calcs, erosion, upgrade	yes	no	n/a	adequate	upgrade
	Fish Passage on culverts / outlets	complies with TP131	yes	no	n/a		
	Piping of stream proposed	not allowed, not in accord with policy	yes	no	n/a	if yes, discuss with Team Leader	
	Buildings entirely outside 1%AEP floodplain	refer DP, Hazards	yes	no	n/a	if no, discuss with Team Leader	
	Minimum floor level required	Manukau Coastal - R.L. 2.74m + 1.0m	yes	no	n/a		
		Waitemata Coastal - R.L. 2.25m + 1.0m	yes	no	n/a		
		All Streams - 0.5m freeboard	yes	no	n/a		
		OLFP Catchment >2Ha - 0.5m freeboard	yes	no	n/a		
		OLFP Catchment <2Ha - 0.2m freeboard	yes	no	n/a		
		specified in Flood Report	yes	no	n/a		
INFRASTRUCTURE - WATER SUPPLY	WS - existing connection	GIS, Pathway Water Billing	yes	no	n/a	new connection	
	WS - separate meters for each Unit/Lot	check Pathway, manifold for units	yes	no	n/a	new connection	
	WS - backflow prevention required	check COP and ByLaw	yes	no	n/a		
	WS - building over waterpipes	not allowed - reroute waterpipes	yes	no	n/a		
	WS - pressure zones	change at approx R.L. 60.0m	yes	no	n/a		
	WS - pressure to long/steep driveways	check HGL minus R.L. is >35m	yes	no	n/a		
	WS - new public water main	not under driveway/carriageway	yes	no	n/a		
	WS - tank supply only	reduce mitigation requirements	yes	no	n/a		
	Fire hydrant within 270m / 135m / 90m / 65m	GIS - use ruler (along roads/driveways)	yes	no	n/a	existing	new
	Fire hydrant - flow available for NZFS Class		Res-25l/s	schl-50l/s	ind-100l/s	lge comm-200l/s	
	Domestic sprinkler system for fire coverage	check water supply system capacity	yes	no	n/a		
	Rural / Urban fire districts	GIS - project tbl - RuralFire... / UrbanFire..	Urban	Huia	Piha	Waiatarua	Rural
	Urban fire district without fire coverage	design provided to NZFS COP	yes	no	n/a		
INFRASTRUCTURE - WASTE WATER	WW - inner drainage area (reticulated)	GIS - project table - InnerDrnBdy	yes	no	n/a		
	WW - works over/within 2m of drains/MHs	1m clear, cctv, no build over connections	yes	no	n/a		
	WW - pipe material earthenware	automatic relay required (no CCTV)	yes	no	n/a	(for building consent)	
	WW - pipe material AC/PVC/PE	CCTV - relay if bad condition	yes	no	n/a	(for building consent)	
	WW - existing connection/disconnect	GIS - Infrastructure Layer	yes	no	n/a	dry chamber	new
	WW - all of site served by gravity	1m above invert of public drain or pump	yes	no	n/a	if no, discuss with Team Leader	
	WW - new public drainage	refer COP, no conflict with trees	yes	no	n/a	if yes, discuss with Team Leader	
	WW - new public drainage	serve upstream catchment	yes	no	if yes:	construct	easement
	WW - privately owned drains	check ownership in GIS	yes	no	if yes:	can't authorise - need owners approval	
	WW - on-site disposal (septic systems)	GIS - Infrastructure Layer	yes	no	n/a	existing	new
INFRASTRUCTURE - STORM WATER	SW - works over/within 2m of drains/MHs	1m clear, cctv, no build over connections	yes	no	n/a		
	SW - existing connection/disconnect	GIS - Infrastructure Layer	yes	no	n/a	wet chamber	new
	SW - all of site served by gravity	1m above soffit of public drain	yes	no	n/a	if no, discuss with Team Leader	
	SW - downstream capacity for MPD	check GIS modelling	under	over	unknown	if under, require SW mitigation	
	SW - new public drainage	within 100m of bdy, no conflict with trees	yes	no	n/a	if yes, discuss with Team Leader	
	SW - new public drainage	serve upstream catchment	yes	no	if yes:	construct	easement
	SW - privately owned drains	check ownership in GIS	yes	no	if yes:	can't authorise - need owners approval	
	SW - existing discharge point	check GIS, as-builts, consent plans etc	pipe	kerb	soakage	watercourse	coast
	SW - approved discharge point	stormwater pipe connection (reticulated)	yes	no	if yes:	may be subject to conditions	
	SW - approved discharge point	kerb & channel (non-reticulated)	yes	no	if yes:	mitigation required	
	SW - approved discharge point	soakage (non-reticulated)	yes	no	if yes:	mitigation required	
	SW - approved discharge point	watercourse (new outfall)	yes	no	if yes:	mitigation required	
	SW - approved discharge point	coastal outfall	yes	no	if yes:	stormwater quality treatment required	

	CHECKLIST ITEM	DP, COP, POLICY (Specification)	ASSESSMENT (Fill In Data or Circle One Option)				
STORMWATER MANAGEMENT / LOW IMPACT DESIGN / TUSC	Stormwater mitigation for storm events	refer CMP, pipe modelling, COP, ARC	2	10	100	34.5mm/24hrs	
	Impermeable Surfaces allowed	refer District Plan Rules	10%	15%	20%	60%	90%
	Impermeable Surfaces restricted	refer Consent Notice / previous SUB	specify:				
	Impermeable Surfaces exceed allowable %	refer site plan - actual 43.9✓ %	yes	no	n/a	if yes, require SW mitigation	
	ICMP Req Low Impact Design (LID)		yes	no	n/a		
	TUSC - Dev Con Remission	outline mitigation requirements below	yes	no	n/a	TUSC score:	
	Bush Planting	mitigate 1%AEP or pay Twin Streams	yes	no	area:	A = 364 m² ✓	
	Twin Streams Payment	mitigate 1%AEP or pay Twin Streams	yes	no	amount:		
	Rain Water Reuse Tank (full or partial)	mitigates 1/2 roof area, max 100m²	yes	no	size:	Bldg. - 94.5m² ✓	
	Detention Tank	mitigation level required	yes	no	size:	impervious - 58.8m² ✓	
	Low Flow Water Saving Devices		yes	no	size:		
	Rain Garden		yes	no	size:	153.2m² ✓	
	Permeable Paving		yes	no	size:		
	Downstream Stormwater Quality Device	check pipe system discharge point	yes	no	size:	OK ✓ = 43.9%	
	Stormwater Quality Treatment Required	roads, driveways, industrial roofs, coast	yes	no	size:		
	Dual Strip Driveway		yes	no	size:		
	Swale / Vegetated Filter Strip		yes	no	size:		
	Dispersion Trench		yes	no	size:		

CONTRIBUTIONS	Development Contribution - TUSC Remission		yes	no	n/a	remission:	$
	Financial (RMA) - Water Supply	GIS project tbl - Developer Contr.	yes	no	n/a		$
	Financial (RMA) - Wastewater	GIS project tbl - Developer Contr.	yes	no	n/a		$
	Financial (RMA) - Stormwater Quantity	GIS project tbl - Developer Contr.	yes	no	n/a		$
	Financial (RMA) - Stormwater Quality	GIS project tbl - Developer Contr.	yes	no	n/a		$
	Financial (RMA) - Twin Streams Oratia	zone/proposal (credit bush planting)	med.dens	resid.	foothills	commercial	$
	Financial (RMA) - Twin Streams Opanuku	zone/proposal (credit bush planting)	med.dens	resid.	foothills	commercial	$
	WCC contribution towards cost of asset	discuss with Assets and T.L.	yes	no	specify:	%	$ (max)

MEDIUM DENSITY & APARTMENT DEVELOPMENTS	Building over public drains	not allowed - reroute drains	yes	no	n/a	
	Public drains in front yards (not under drive)		yes	no	n/a	
	Avoid retaining walls over new public drains		yes	no	n/a	
	Private drainage or devices	body corporate rules - maintenance	yes	no	n/a	only private if no upstream catchment
	Cutoff drains & fall from basement parking		yes	no	n/a	
	Basement - cesspits pump to sewer/SWQT	no SWQT for basement parking	yes	no	n/a	
	Check public watermains capacity/pressure	may need to upgrade public mains	yes	no	n/a	
	Internal fire sprinkler system	check flow rates available	yes	no	n/a	
	Water supply pressure zones per floor		yes	no	n/a	
	Bulk Council water meter & private meter/unit	body corporate rules - water charging	yes	no	n/a	
	SW contribution charged by impermeable m²		yes	no	n/a	

SUBDIVISIONS	Unit title subdivision (will have body corp.)	private devices and drains OK	yes	no	n/a	
	Cross lease	separate private drainage	yes	no	n/a	
		consent notice re shared drainage	yes	no	n/a	
	Freehold subdivision	platform free of hazards/large drains	yes	no	n/a	if no, discuss with Team Leader
		all public devices and drains	yes	no	n/a	if no, discuss with Team Leader
		culvert under shared drive - private	yes	no	n/a	if no, discuss with Team Leader
		boundaries over manholes	yes	no	n/a	if no, amend plans
		ICT Infrastructure on new public road	yes	no	n/a	condition to require ICT
		sites large enough for on-site WW	yes	no	n/a	if no, amend plans
		on-site WW disposal all within bdy	yes	no	n/a	if yes, amend plans or move WW
	Urban Design (liase with Parks/Roads etc)	road next to stream or reserve	yes	no	n/a	
		integrated SW devices/amenity	yes	no	n/a	

COMPUTER FREEHOLD REGISTER
UNDER LAND TRANSFER ACT 1952

Search Copy

R.W. Muir
Registrar-General
of Land

Identifier **163628**
Land Registration District **North Auckland**
Date Issued 02 September 2004

Prior References
NA117B/312

Estate	Fee Simple
Area	4.9336 hectares more or less
Legal Description	Lot 2 Deposited Plan 339810

Proprietors
New Zealand Housing Foundation

Interests

Subject to a pipeline right over part marked B on DP 339810 created by Transfer B344219.1 - 30.10.1984 at 10.55 am

Subject to an oil and gas supply right (in gross) over part marked B on DP 339810 in favour of Natural Gas Corporation of New Zealand Limited created by Transfer B344219.1 - 30.10.1984 at 10.55 am

6135712.2 Consent Notice pursuant to Section 221 Resource Management Act 1991 - 2.9.2004 at 9:00 am

Subject to a drainage easement (in gross) over part marked K, B & G on DP 339810 in favour of the Waitakere City Council created by Easement Instrument 6135712.4 - 2.9.2004 at 9:00 am

The easements created by Easement Instrument 6135712.4 are subject to Section 243 (a) Resource Management Act 1991

6551320.5 Mortgage to Housing New Zealand Corporation - 29.8.2005 at 9:00 am

THIS AGREEMENT is dated the 2 day of July 2008

BETWEEN

1. **GOLDSMITH DEVELOPMENTS LIMITED ("Contractor")**

2. **NEW ZEALAND HOUSING FOUNDATION or its nominee ("Principal")**

3. **LANCE JOSEPH GOLDSMITH ("Guarantor")**

BACKGROUND

The Principal may by notice require the Contractor to undertake the Contract Works following which the Contractor shall undertake the Contract Works in accordance with this Agreement.

AGREEMENT

1. TRANSACTION SUMMARY DEFINITIONS AND INTERPRETATION

1.1 Transaction Summary

(a) Land: Land at West Coast Road, Henderson comprising an area of approximately 57,284m2 being that land comprised and described in computer freehold registers 163628 and 163629 which is shown for identification purposes only on the Scheme Plan.

(b) Contract Works: is the construction of the Residences described in any notice given pursuant to 2.1.

(c) Residences: those Residences which the Principal requires the Contractor to construct by giving to the Contractor notice to that effect pursuant to clause 2.1.

(d) Contract Price: For each type of Residence is, for the first of each House Type to be constructed pursuant to this Agreement, the following:

House Type	Guaranteed Maximum Price
3	$172,000 (inclusive of GST)
4A	$180,300 (inclusive of GST)
4B	$182,300 (inclusive of GST)
4C	$176,300 (inclusive of GST)
5A	$189,900 (inclusive of GST)

(e) Percentage of Contract Price to be retained as Retention, subject to clause 10: $10,000.00 to be retained from the last of the Residences to achieve Practical Completion pursuant to this Agreement.

Housing Foundation of New Zealand

Type 4A House

This is a Standard TYPE 4A HOUSE

ATTACHED DOCUMENTS ARE

1- ALL COUNCIL APPLICATION FORMS FOR THIS LOT .

2- A COPY OF THE MASTER CERT. OF TITLE.

3- 2 COPIES OF FULL SPECIFICATIONS AS PER STD PLANS.

4- 2 COPIES OF ENGINEERS CALCS AND FLOOR SLAB DESIGN (INCLUDING PS1 BY ENGINEER).

5- 2 FULL SETS OF WORKING DRAWINGS.

6- 1 ADDITIONAL COPY OF THE FLOOR PLANS.

7- 2 SETS OF – THE RESOURCE CONSENT.
- **THE EARTHWORKS COMPLETION REPORT.**
- **THE GEOTECH COMPLETION REPORT.**

8- A COPY OF THE RELEVANT STAMPED CONSENT PLANS FOR A STD TYPE 4A HOUSE .

THERE ARE MINOR CHANGES FROM THE STD PLAN

- **WINDOW AND DOOR CHANGES TO THE LOWER LEVEL.**
- **THE KITCHEN NOW PROJECTS OUT 400MM.**
- **LINTEL AND BRACING CHANGES TO SUIT THE ABOVE.**

Adrienne Ward

From: Louise Dunn [louise.d@housingfoundation.co.nz]
Sent: Wednesday, 4 March 2009 3:40 p.m.
To: Adrienne Ward
Subject: RE: Consents

Hi Adrienne

Yes, we do not wish to have preliminary inspections.

Thanks for this; just email me when they are ready to pick up - thanks ☺

Louise Dunn

Office Manager
New Zealand Housing Foundation

PO Box 36-027
Northcote 0748
Auckland

Phone: 09 849 4395
Mobile: 027 559 4524
Email: louise.d@housingfoundation.co.nz

Be nice to the world. Please don't print this e-mail unless you really need to

From: Adrienne Ward [mailto:Adrienne.Ward@waitakere.govt.nz]
Sent: Wednesday, 4 March 2009 2:37 p.m.
To: Louise Dunn
Cc: Rhonda Hobson; Adrienne Ward
Subject: Consents

Hi Louise

I am crediting back the vehicle crossing inspection fees and bonds that have been charged on COM's

20081474
20081460
20081475
20081464
20081369
20081367
20081472
200906

Can you please confirm Housing Foundation do not wish to have preliminary vehicle crossing inspections? If not requested the applicant shall be deemed to have accepted that the road, footpath & berm are in good condition at commencement of works.

Please let me know asap so I can continue with the consent issuing.

Many thanks

2009-123

Vehicle Crossing Application and Street Damage Deposit

Send to: The Chief Executive
Waitakere City Council
Private Bag 93109
Henderson
WAITAKERE 0650

For more information: **Waitakere Central**
Civic Centre, 6 Henderson Valley Road
Henderson
Telephone (09) 839 0400
Facsimile (09) 836 8001

Waitakere City Council
Te Tatao o Waitakere

Property owner's name: N.Z. Housing Foundation.
Address: P.O. Box 36027, Northcote.
Phone number: (09) 443 8415

Applicants name: Housing Foundation Ltd
Address: PO Box 36027, Northcote
Phone: 8494395 Mobile: 0275596526
Fax:

Project Location

Address:
Suburb: Glen Eden
Lot No: Lot 2 - subdivision of DP No: 339810

Project type. Circle on or more as required:
(Vehicle Crossing) (Building) Subdivision

Vehicle Crossing Information

Note: Every property is required to have a complying vehicle crossing. Please answer every question.

A vehicle crossing is / is not in place. Crossing is Council certified.
Yes / No / Unknown.

The road is: ☑ Kerbed & channelled ☐ Unkerbed

Property: ☑ Meets the road boundary ☐ is on a....unit access

I intend to build a vehicle crossing to the following grade:

Grade: ☑ Residential ☐ Light Commercial ☐ Commercial

Note: Residential crossings serving 5 or more units, require a light commercial grade.

A vehicle crossing complying with Council Standard will be in place at the completion of the work, as per conditions 2 & 3 below.

Resource consent/R & T application. (see condition 3 below)
☑ Has been made ☐ Has not been made

FEE & DEPOSIT DETAILS

See attached Bond and Fees Schedule

Street Damage Inspection (tick if required)

Preliminary street inspection required (optional) ☑

(If not requested the applicant shall be deemed to have accepted that the road, footpath & berm are in good condition at commencement of works.)

Vehicle Crossing Inspection (tick if required)

Boxing check / pre-seal inspection ☑

(After boxing is completed, scoria compacted, cut off drains and reinforcing are in place or metal shaped and compacted sealed crossings.)

Final Inspection (mandatory)

(A final inspection is required regardless of whether or not a deposit is lodged. Any additional re-inspections required at either the boxing or final inspection shall be at the applicants' cost.)

Final Inspection ☑

(After construction joints cut, topsoiling & street damage reinstated.)

Receipt No: _____

To Book All Inspections

Please phone 836 8000, extension 8308 or 8725 giving a minimum of one full working days notice. Bookings close at 3.00 pm.

Conditions Please read carefully.

Note: Every property is required to have a complying vehicle crossing.
Under the local Government Act and Council Bylaw No.22, "Use of Public Roads" Council may grant permission for works to make use of the road reserve for site access subject to:

1. Lodging of a Street Damage Deposit and payment of the relevant inspection fee.
2. The applicant obtaining a copy of Council's vehicle crossing standards appropriate to the road type and the extent of the work being done, and on completion of the work, each property involved being serviced by a vehicle crossing which extends from the road edge to the property boundary and has been either installed or upgraded to meet those standards, including requirements for visibility, drainage control, safety platform and surfacing. All crossings are to have the appropriate inpsections.
3. The obtaining of a Resource Consent or Roading and Traffic Approval as detailed in "Vehicle Crossing notes & specifications" for any crossing not complying with Council's "Code of Practice" and for those encroaching on a parking bay by more than 1 metre.
4. All proposed excavations over 250mm having the depth and location of services confirmed by hand digging prior to excavation. Any repairs to services will be at the applicants expense.
5. The applicant taking all steps necessary to avoid damage to the street, footpath or berm and any such damage being reinstated to the satisfaction of Council.
6. The frontage and footpath of each property being kept to a reasonable safety standard during the works. This may require the building of a temporary crossing.
7. Apart from 8 below, unless a "Bond transfer" form has been filled in, Council will only make refunds in the name of the payer recorded on the receipt. Transfer form attached.....(Unmarked="no")
8. In the event of the property changing ownership before the above works are completed, Council may refund all deposits to the current owner at the time of final clearance.
9. Any additional work undertaken by Council, eg extra inspections or safety work, may be added from the refundable Street Damage Deposit.

I have read the above conditions and those overleaf. I agree to abide by them and those contained in Council's "Code of Practice" and "Vehicle Crossing Notes and Specifications".

Property Owner's Signature: _____ Date: 25/9/08

Street Damage and Vehicle Crossing Information Sheet

Street Damage Deposits

If street damage becomes evident as a result of development works then Council shall give notice to the applicant to repair within specified time. Should the repairs not be completed by the specified date, then Council may utilise the deposit held to arrange completion of the works.

Street damage shall include uncompleted crossings and damage to surfaces, structures, underground services and trees within the road reserve boundaries. It also includes the depositing of any mud or debris on the road carriageway.

If pre-start inspection is not requested it is deemed that the road, berm and footpath are in good condition at the commencement of works. Alternatively the applicant may produce clear, photographic or video evidence of pre-start damage and present this with the application.

Vehicle Crossings

The "vehicle crossing" is that part of the driveway that is build on the road reserve i.e. between the edge of the carriageway and the property boundary. Under the Local Government Act, each property owner is required to supply a vehicle crossing as a part of developing the site and Council is required to set standards for these crossings. A copy of the appropriate specifications for use in constructing vehicle crossings is available with this application at no charge.

Sites Requiring Standard Crossings

Most vehicle crossings are fairly straight forward. Where a crossing is generally flat with good visibility, all that is required is the application overleaf and bookings for the boxing and final checks at the appropriate times.

Sites Requiring Non Standard Crossings

Safe and convenient access is a benefit to both the property occupant and the general public. For sites which rise or fall steeply from the road or have restricted visibility, the construction of a crossing can be a difficult and critical part of the site development. Where and of the following occur, a full Resource Consent application is indicated:

- Grade is steeper than 1 in 5
- Traffic visibility is limited (Design table is available on request)
- Maximum vehicle crossing profile (See attached to specifications) cannot be achieved
- A retaining wall is required as part of the vehicle crossing development
- Earthworks greater than 30 cubic meters are required (depending on natural area classification)
- Proposed layout includes crossing neighbours' frontage

If the proposed vehicle crossing has any of the above characteristics and a Resource Consent is not obtained, the matter may have to be remedied at a later date. This could involve considerable expense and may hinder later sale of the property. To keep delays to a minimum, it is advisable to make Resource Consent applications as early as possible. A copy of the Vehicle Crossing Application form should be lodged with any Building Consent Application.

Construction Standards

Standard details are available for various types of construction. These include:

- Residential up to 4 units (kerbed road)*
- Residential (unkerbed roads)
- Light commercial (over 4 residential units, schools, halls, churches, public buildings)*
- Heavy commercial

*** A supplementary design for high speed/volume roads is included with the specifications. Please ensure that you receive a copy of the specifications relevant to your site usage.**

Should you require further clarification, phone 839 0400

EXISTING EASEMENTS IN GROSS

PURPOSE	SERVIENT TENEMENT	CREATED BY	GRANTEE
OIL AND GAS SUPPLY	LOT 2 DP 339810	B344219.1	NATURAL GAS CORPORATION OF NEW ZEALAND LTD.
DRAINAGE	LOTS 2 AND 3 DP 339810	6135712.4	WAITAKERE CITY COUNCIL
STORMWATER DETENTION AND DRAINAGE	LOT 3 DP 339810	6070221.2	
RIGHT OF WAY	LOT 3 DP 339810	6070221.1	

PROPOSED EASEMENTS

PURPOSE	SHOWN	SERVIENT TENEMENT	DOMINANT TENEMENT
RIGHT OF WAY RIGHT TO SUPPLY TELECOM, WATER, ELECTRICITY AND GAS	(A)	LOT 61 HEREON	LOTS 57, 58, 59 AND 60 HEREON

PROPOSED EASEMENTS IN GROSS

PURPOSE	SHOWN	GRANTEE
RIGHT OF WAY	(A) (B)	WAITAKERE CITY COUNCIL

AREA SCHEDULE

LOTS 1 - 61 INCL.	RESIDENTIAL	2.8682ha
LOTS 62 AND 64 - 67 INCL.	LOCAL PURPOSE (DRAINAGE) RESERVE TO VEST	1.6040ha
LOTS 63 AND 68 - 71 INCL.	ROAD TO VEST	1.2449ha
	TOTAL =	5.7171ha

KEY

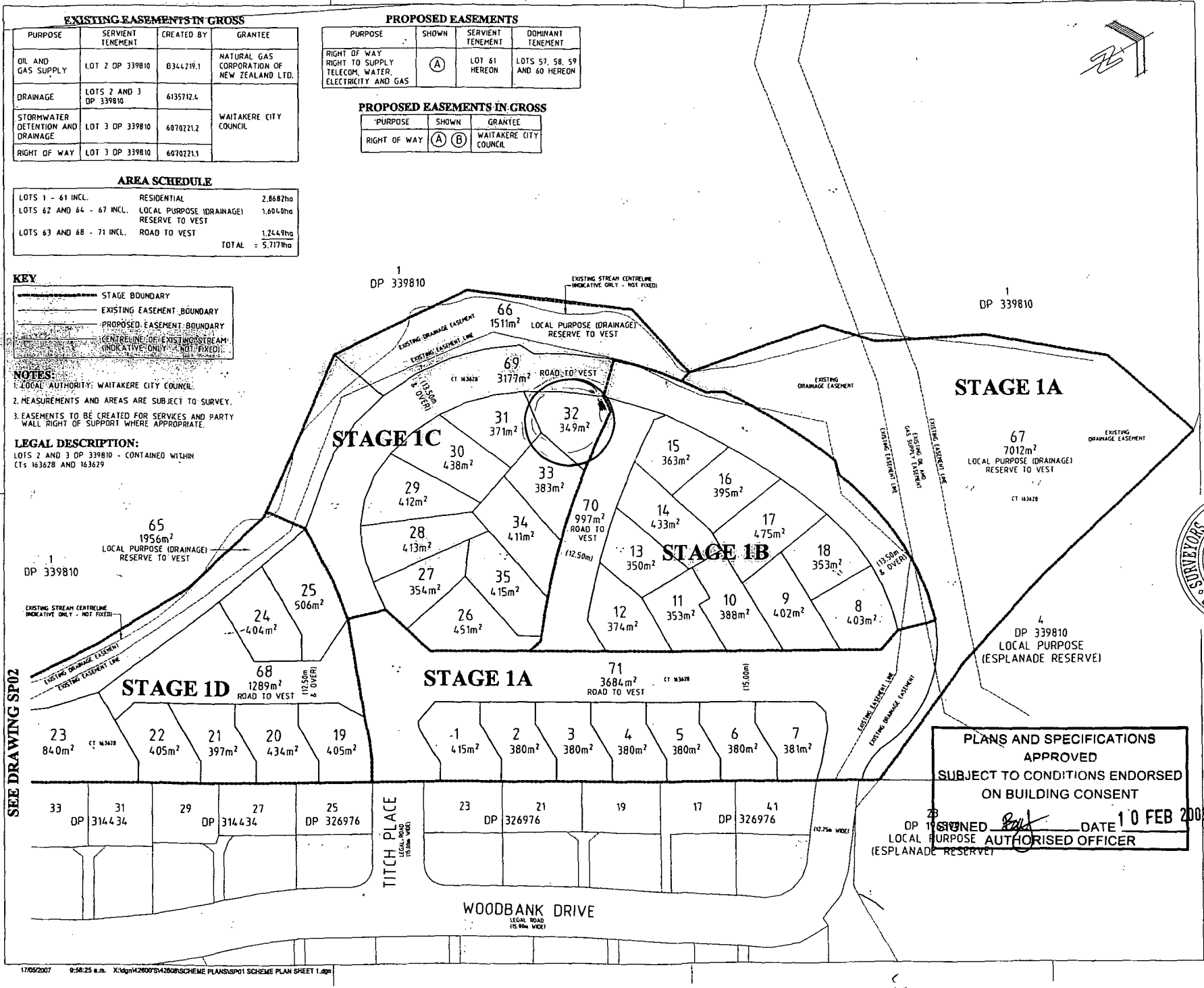
- STAGE BOUNDARY
- EXISTING EASEMENT BOUNDARY
- PROPOSED EASEMENT BOUNDARY
- CENTRELINE OF EXISTING STREAM (INDICATIVE ONLY - NOT FIXED)

NOTES:

1. LOCAL AUTHORITY: WAITAKERE CITY COUNCIL.
2. MEASUREMENTS AND AREAS ARE SUBJECT TO SURVEY.
3. EASEMENTS TO BE CREATED FOR SERVICES AND PARTY WALL RIGHT OF SUPPORT WHERE APPROPRIATE.

LEGAL DESCRIPTION:

LOTS 2 AND 3 DP 339810 - CONTAINED WITHIN CTs 163628 AND 163629



PLANS AND SPECIFICATIONS APPROVED
SUBJECT TO CONDITIONS ENDORSED ON BUILDING CONSENT
SIGNED _____ DATE 10 FEB 2009
AUTHORISED OFFICER

17/05/2007 9:58:25 a.m. X:\dgn\42600's\42608\SCHEME PLANS\SP01 SCHEME PLAN SHEET 1.dgn

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PLEASE REFER ALL QUERIES TO
BABBAGE CONSULTANTS LIMITED

DRAWING NOTES

REV	DATE	DESCRIPTION	DRAWN	CHECK

DRAWING REVISIONS

SURVEYORS • ARCHITECTS • ENGINEERS
Babbage CONSULTANTS
109 FANSHAWE STREET
PO BOX 2027
AUCKLAND 1 NEW ZEALAND
PHONE 09 - 379 9990 FAX 09 - 377 1170
admin@babbage.co.nz

CLIENT / PROJECT

WEST COAST ROAD HOUSING DEVELOPMENT
FOR
NZ HOUSING FOUNDATION

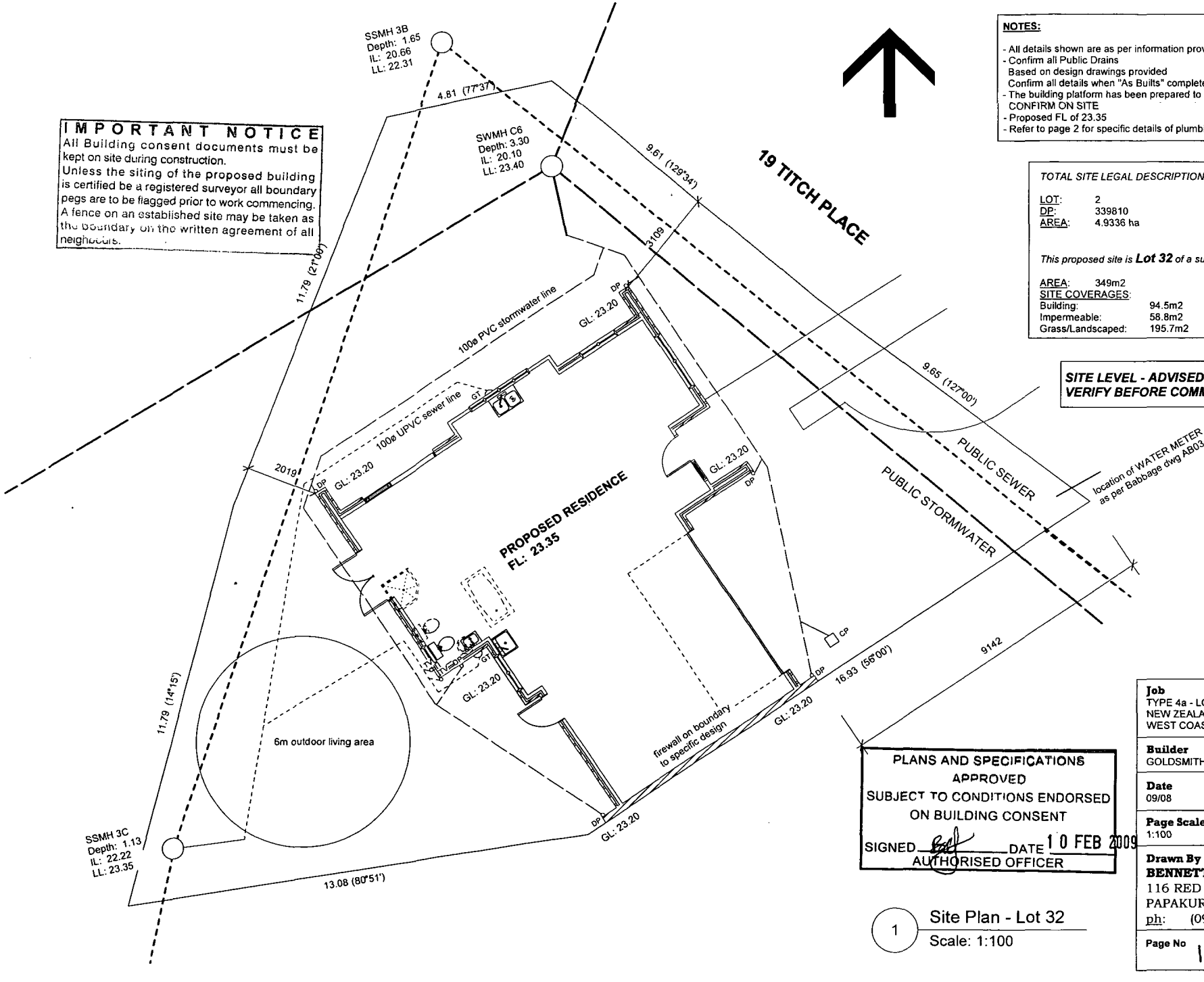
DRAWING TITLE

PROPOSED SUBDIVISION OF LOTS 2 AND 3 DP 339810 (SHEET 1 OF 2)

	DATE	INITIAL
DESIGNED	JUNE 2006	JA
DRAWN	JUNE 2006	MJD
CHECKED		
APPROVED		

SCALE (A1)
1:500

JOB NUMBER	DRAWING NUMBER	REVISION
42608	SP01	



IMPORTANT NOTICE

All Building consent documents must be kept on site during construction.
Unless the siting of the proposed building is certified be a registered surveyor all boundary pegs are to be flagged prior to work commencing.
A fence on an established site may be taken as the boundary on the written agreement of all neighbours.

NOTES:

- All details shown are as per information provided.
- Confirm all Public Drains
  Based on design drawings provided
  Confirm all details when "As Builts" complete.
- The building platform has been prepared to an advised level of RL: 23.20
  CONFIRM ON SITE
- Proposed FL of 23.35
- Refer to page 2 for specific details of plumbing and drainage.

TOTAL SITE LEGAL DESCRIPTION

LOT: 2
DP: 339810
AREA: 4.9336 ha

This proposed site is ***Lot 32*** *of a subdivision of the above.*

AREA: 349m2
SITE COVERAGES:

Building:	94.5m2	=	27%
Impermeable:	58.8m2	=	16.8%
Grass/Landscaped:	195.7m2	=	56.2%

SITE LEVEL - ADVISED AS 23.20
VERIFY BEFORE COMMENCING

PLANS AND SPECIFICATIONS
APPROVED
SUBJECT TO CONDITIONS ENDORSED
ON BUILDING CONSENT
SIGNED _____ DATE 10 FEB 2009
AUTHORISED OFFICER

1 Site Plan - Lot 32
Scale: 1:100

Job
TYPE 4a - LOT 32 - 19 TITCH PLACE
NEW ZEALAND HOUSING FOUNDATION
WEST COAST ROAD DEVELOPMENT

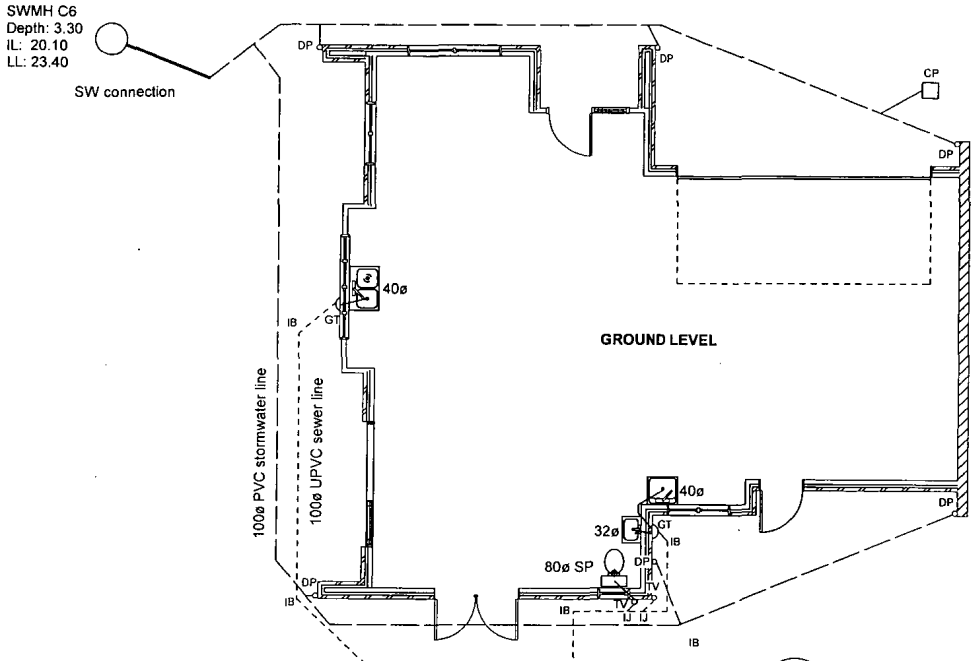
Builder
GOLDSMITH DEVELOPMENTS LTD

Date
09/08

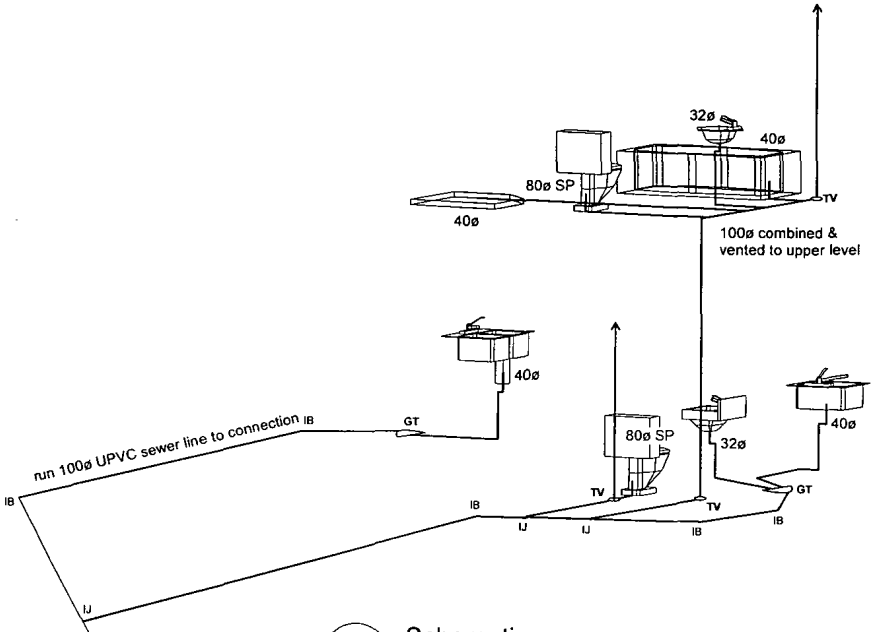
Page Scale
1:100

Drawn By
BENNETT DRAUGHTING
116 RED HILL ROAD
PAPAKURA
ph: (09) 296 6369

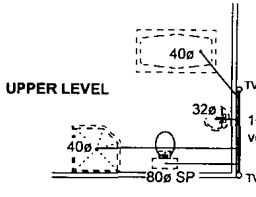
Page No	Total Pages
1	21



2 Drainage
Scale: 1:100



2a Schematic
Plumbing to NZBC G13



SS connection

SSMH 3C
Depth: 1.13
IL: 22.22
LL: 23.35

NOTES:

- All details shown are as per information provided.
- Confirm all Public Drains
  Based on design drawings provided
  Confirm all details when "As Builts" complete.
- The building platform has been prepared to an advised level of RL: 23.20
  CONFIRM ON SITE
- Proposed FL of 23.35

PLUMBING FIXTURES TO NZBC G13/AS1.
Waste Size & Minimum Falls Required.

	Size	Min Fall.
Bath	40ø	1:40
Shower	40ø	1:40
Tub	40ø	1:40
K Sink	65ø	1:40
Vanity	32ø	1:20
WC	80ø SP	1:60

ALL DP's TO BE 85ø

DRAINLAYER MUST PROVIDE AN "AS BUILT" OF ALL DRAINS ON COMPLETION.

PLANS AND SPECIFICATIONS
APPROVED
SUBJECT TO CONDITIONS ENDORSED
ON BUILDING CONSENT
SIGNED _____ DATE 10 FEB 2009
AUTHORISED OFFICER

Job
TYPE 4a - LOT 32 - 19 TITCH PLACE
NEW ZEALAND HOUSING FOUNDATION
WEST COAST ROAD DEVELOPMENT

Builder
GOLDSMITH DEVELOPMENTS LTD

Date
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Page Scale
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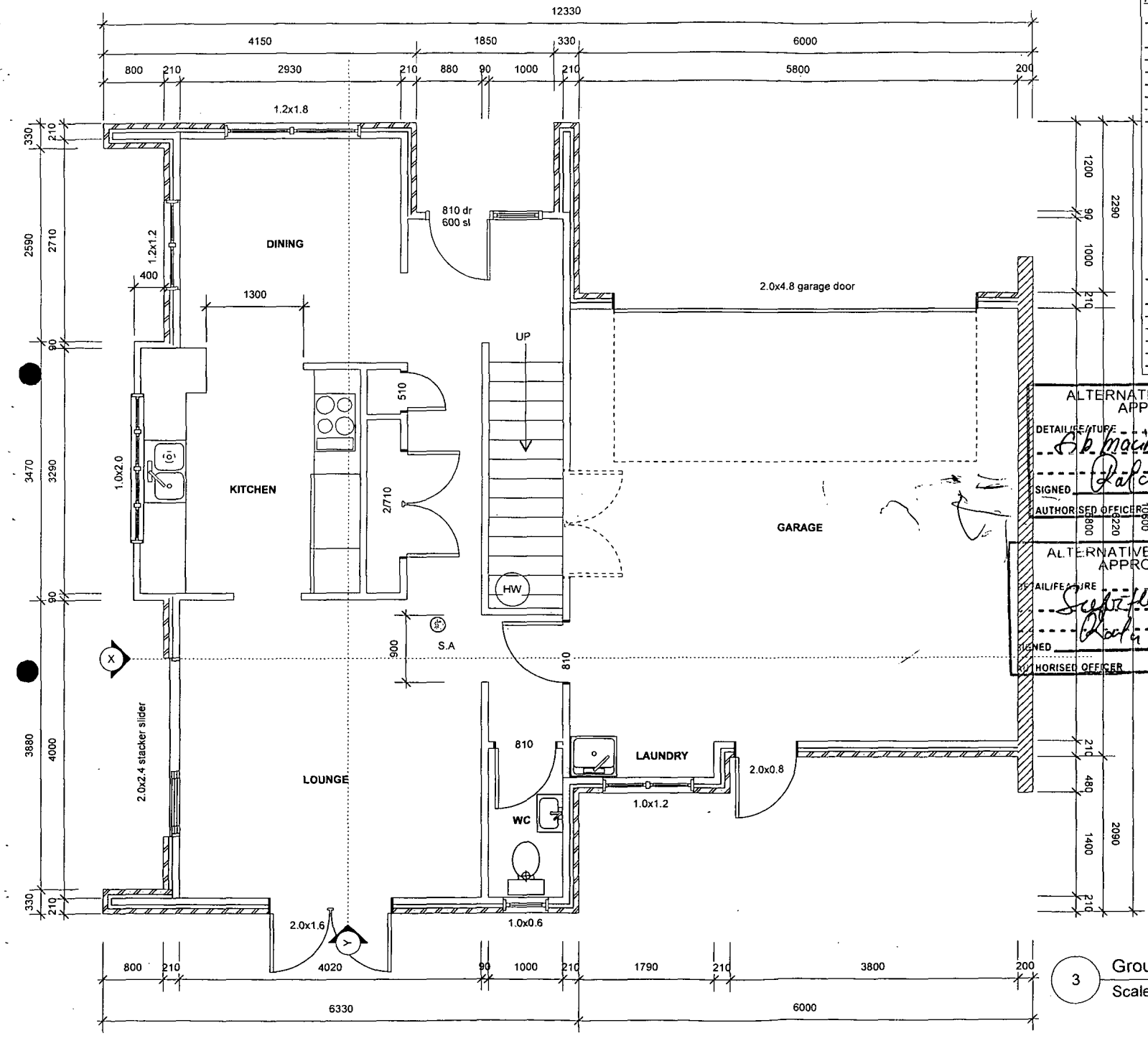


FLOOR NOTES:

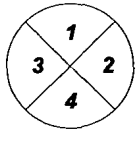
- All work must comply with the NZ Building Code & approved documents including NZS 3604.1999.
- Kitchen facilities to NZBC G3
- Laundry Facilities to NZBC G2
- Seismic Strapping & Tempering valve to NZBC G12
- Equipotential Bonding to NZBC G.12
- All "wet" areas must comply with NZBC E3
- Safety glass to Bathrooms & WC to NZBC F2
- Framing & Lintels to NZS 3604 - High Wind Zone. Lintels & beams outside NZS 3604 are sized ex the Gangnail Charts - see spec.
  ALL TIMBER MUST BE MSG8 MIN GRADE
  Exterior Loadbearing Studs in Lower Level must be at 480 cts
  Loadbearing Studs -
  90x45 @ 600 cts - nogs @ 800 cts
  90x45 top & bottom plates to NZS 3604
  140x35 over all top plates
  Non Loadbearing Studs -
  90x45 or 70x45 @ 600 cts - nogs @ 800 cts
  90x45 or 70x45 top & bottom plates to NZS 3604
  140x35 over all top plates
- All timber must comply with NZBC B2 - All framing to walls, ceiling & roof to be H-1.2 min with H-3.1 bottom plates. (note: use H-3.1 in all wet areas).
- **Ground Floor** cladding will be 70 Series Brick Veneer with 40mm cavity to E2/ASI.
- **Top Floor** cladding will be Palliside Weatherboards on a cavity system to E2/AS1.
- "Thermokraft Diflex 130" building paper, fixed with staples to manufacturers details.
- Provide domestic smoke alarms to comply with the NZBC.
- Refer to specific layout for bracing & lintel information.
- CHECK ALL DIMENSIONS, LEVELS & DETAILS ON SITE.

ALTERNATIVE SOLUTION APPROVED
DETAIL/FEATURE: Sub flooring
SIGNED: [signature] DATE: 30/10/07
AUTHORISED OFFICER

ALTERNATIVE SOLUTION APPROVED
DETAIL/FEATURE: Subfloor
SIGNED: [signature] DATE: 30/10/07
AUTHORISED OFFICER

PLANS AND SPECIFICATIONS APPROVED
SUBJECT TO CONDITIONS ENDORSED ON BUILDING CONSENT
SIGNED [signature] DATE 10 FEB 2009
AUTHORISED OFFICER

Ground Floor Area:	94.5m2
Top Floor Area:	67m2
Total Floor Area:	**160.5m2**



ELEVATIONS

3 Ground Floor
Scale: 1:50

Job
TYPE 4a HOUSE
NEW ZEALAND HOUSING FOUNDATION
WEST COAST ROAD DEVELOPMENT

Builder
GOLDSMITH DEVELOPMENTS LTD

Date
09/08

Page Scale
1:50

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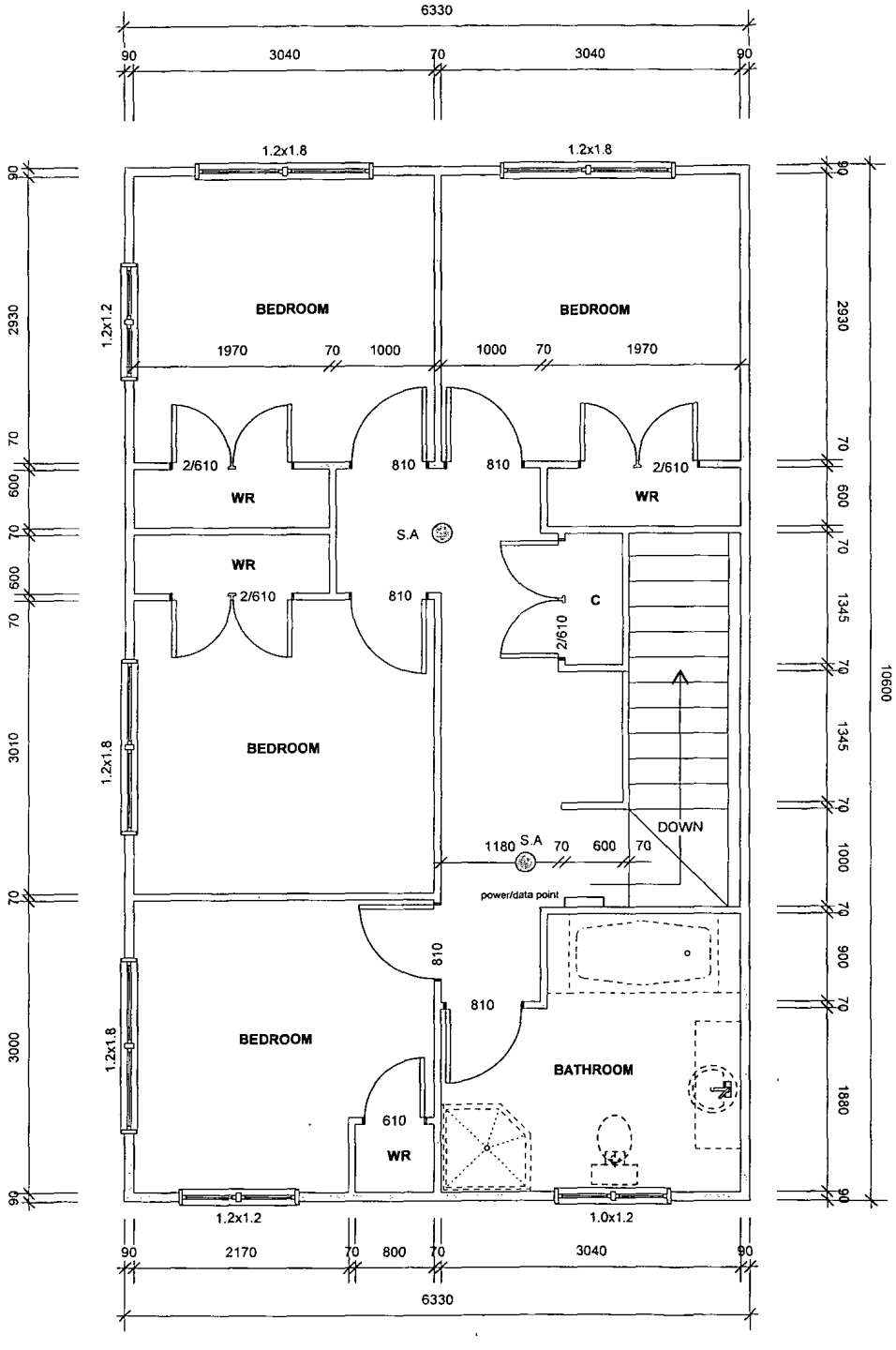

FLOOR NOTES:

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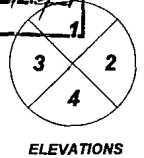
- Kitchen facilities to NZBC G3
- Laundry Facilities to NZBC G2
- Seismic Strapping & Tempering valve to NZBC G12
- Equipotential Bonding to NZBC G.12
- All "wet" areas must comply with NZBC E3
- Safety glass to Bathrooms & WC to NZBC F2
- Framing & Lintels to NZS 3604 - High Wind Zone.
  Lintels & beams outside NZS 3604 are sized ex the Gangnail Charts - see spec.
  ALL TIMBER MUST BE MSG8 MIN GRADE
  Exterior Loadbearing Studs in Lower Level must be at 480 cts
  Loadbearing Studs -
  90x45 @ 600 cts - nogs @ 800 cts
  90x45 top & bottom plates to NZS 3604
  140x35 over all top plates
  Non Loadbearing Studs -
  90x45 or 70x45 @ 600 cts - nogs @ 800 cts
  90x45 or 70x45 top & bottom plates to NZS 3604
  140x35 over all top plates
- All timber must comply with NZBC B2 - All framing to walls, ceiling & roof to be H-1.2 min with H-3.1 bottom plates. (note: use H-3.1 in all wet areas).
- **Ground Floor** cladding will be 70 Series Brick Veneer with 40mm cavity to E2/ASI.
- **Top Floor** cladding will be Palliside Weatherboards on a cavity system to E2/AS1.
- "Thermokraft Diflex 130" building paper, fixed with staples to manufacturers details.
- Provide domestic smoke alarms to comply with the NZBC.
- Refer to specific layout for bracing & lintel information.
- CHECK ALL DIMENSIONS, LEVELS & DETAILS ON SITE.

ALTERNATIVE SOLUTION APPROVED
DETAIL/FEATURE Sika Marine Systems
SIGNED Dala DATE 30/10/08
AUTHORISED OFFICER

PLANS AND SPECIFICATIONS APPROVED
SUBJECT TO CONDITIONS ENDORSED ON BUILDING CONSENT
SIGNED [illegible] DATE 10 FEB 2009
AUTHORISED OFFICER

ALTERNATIVE SOLUTION APPROVED
DETAIL/FEATURE Super-flex
SIGNED Dala DATE 30/10/08
AUTHORISED OFFICER

Ground Floor Area:	93.5m2
Top Floor Area:	67m2
Total Floor Area:	**160.5m2**



ELEVATIONS

Job
TYPE 4a HOUSE
NEW ZEALAND HOUSING FOUNDATION
WEST COAST ROAD DEVELOPMENT

Builder
GOLDSMITH DEVELOPMENTS LTD

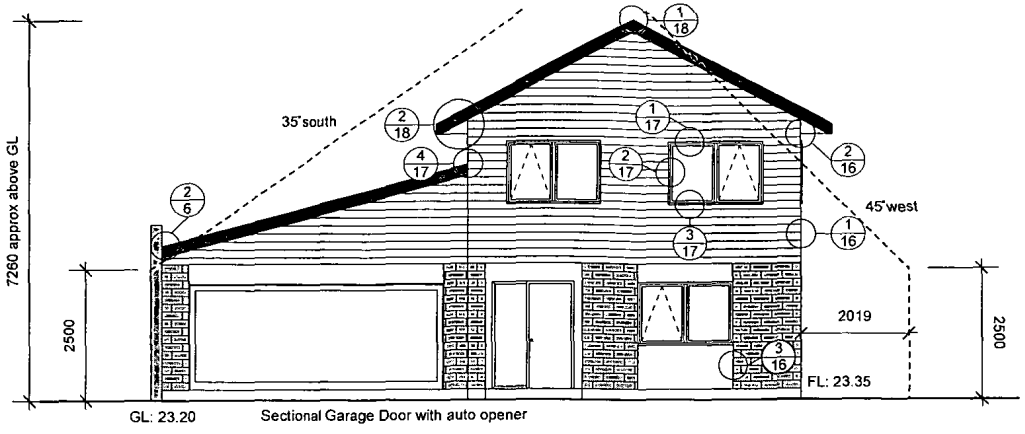
Date
09/08

Page Scale
1:50

Drawn By
BENNETT DRAUGHTING
116 RED HILL ROAD
PAPAKURA
ph: (09) 296 6369

Page No	Total Pages
4	21

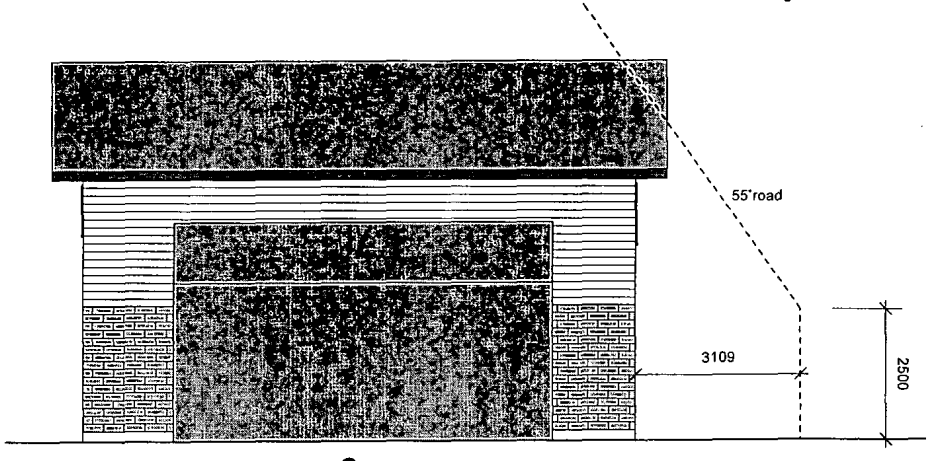
4 Top Floor
Scale: 1:50



1

- 28° upper roof pitch.
- 15° lower roof pitch.
- Colorsteel Longrun roofing.
- Lower cladding - 70 Series Brick Veneer.
- Upper cladding - Pallside Weatherboards on a Cavity System

ALL SITES HAVE BEEN BENCHED TO THE RL STATED (21.00). ALL HIRB REFERENCES ARE AS PER THE RESOURCE CONSENT, A COPY OF THIS IS ATTACHED WITH THE APPLICATION.



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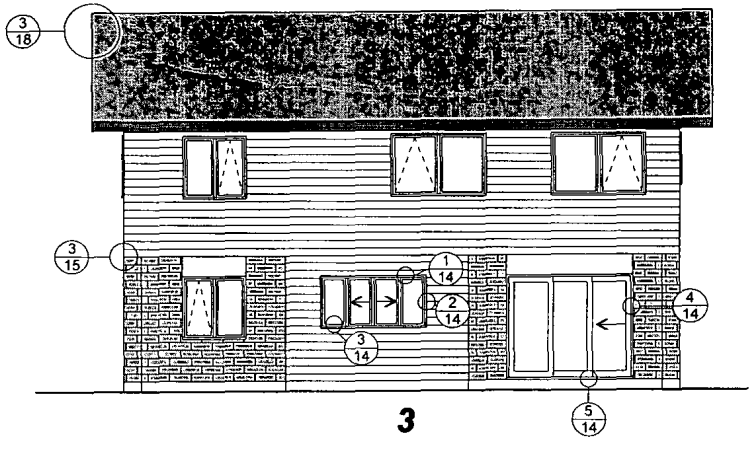

3

4

PLANS AND SPECIFICATIONS
APPROVED
SUBJECT TO CONDITIONS ENDORSED
ON BUILDING CONSENT
SIGNED _____ DATE 10 FEB 2009
AUTHORISED OFFICER

5 Elevations
Scale: 1:100

Job
TYPE 4a HOUSE
NEW ZEALAND HOUSING FOUNDATION
WEST COAST ROAD DEVELOPMENT

Builder
GOLDSMITH DEVELOPMENTS LTD

Date
09/08

Page Scale
1:100

Drawn By
BENNETT DRAUGHTING
116 RED HILL ROAD
PAPAKURA
ph: (09) 296 6369

Page No	Total Pages
5	21

FOUNDATION NOTES:

- All ground is assumed to be "good ground" to NZS 3604.1999.
  If any variations occur or unusual conditions are encountered consult a Geotech Engineer immediately.
- All concrete must be 20 MPA min.
- 0.25 MU polythene to underside of slab.
- Confirm all levels, setout dimensions etc on site before commencing.
- **Foundation to specific Rib Raft design & producer statement by contractor.**

ROOF NOTES:

- Lower Roof - 15°pitch. Coloursteel Corrogated Profile fixed strictly to manufacturers specs & E2/AS1
- Upper Roof - 28°pitch. Coloursteel Corrogated Profile fixed strictly to manufacturers specs & E2/ASI
- Gangnail/Mitek truss system - all trusses @ 900 max cts.
- All trusses must be manufactured by an approved fabricator who must confirm all designs.
- The fabricator must provide a Producer Statement covering all trusses & fixings.
- Any changes to this layout will require a reassessment of affected Beams & Lintels.
- Truss Fixings: - Subject to verification by fabricator.
  To Plate - 2 wire dogs each end min - fabricator to confirm.
  To Truss - L.L Joist bkt.
- Roof Bracing to NZS 3604 - "Light Gable".

PLANS AND SPECIFICATIONS
APPROVED
SUBJECT TO CONDITIONS ENDORSED
ON BUILDING CONSENT
SIGNED _____ DATE 10 FEB 2009
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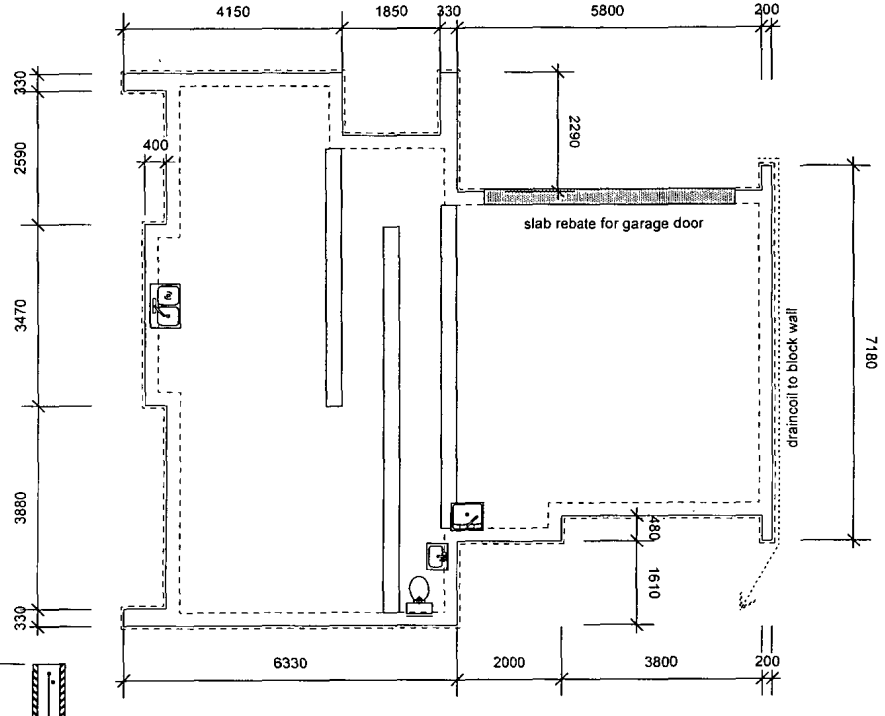
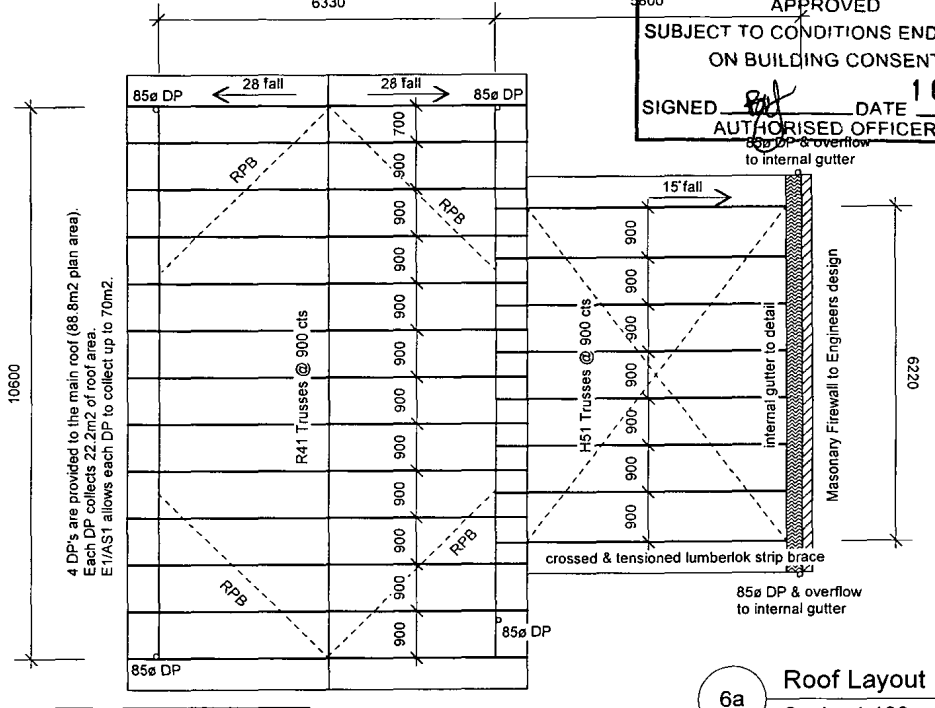
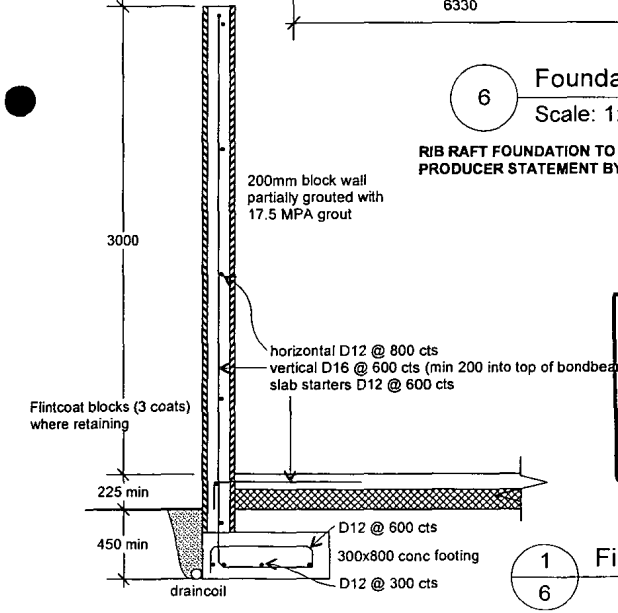


6 Foundation
Scale: 1:100

RIB RAFT FOUNDATION TO SPECIFIC DESIGN & PRODUCER STATEMENT BY WILTON JOUBERT LTD



6a Roof Layout
Scale: 1:100

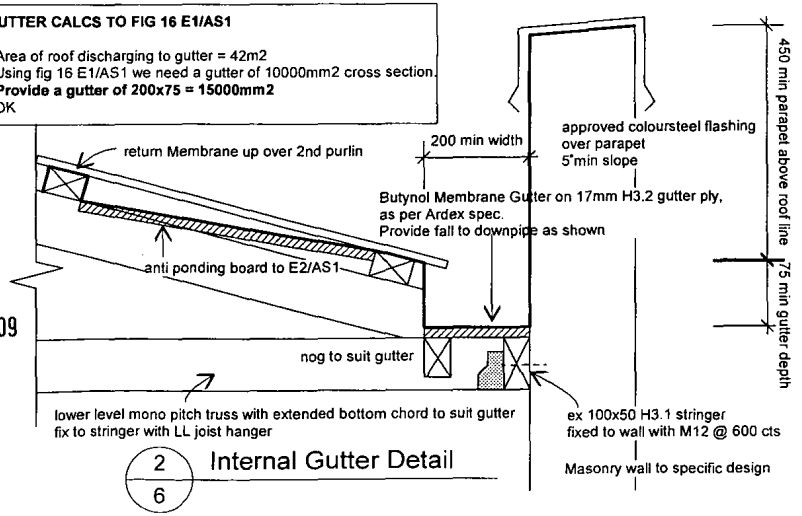


1/6 Firewall Detail

ALTERNATIVE SOLUTION
APPROVED
DETAIL/FEATURE Butynol Membrane
SIGNED _____ DATE 10 FEB 2009
AUTHORISED OFFICER

GUTTER CALCS TO FIG 16 E1/AS1

- Area of roof discharging to gutter = 42m2
  Using fig 16 E1/AS1 we need a gutter of 10000mm2 cross section.
- **Provide a gutter of 200x75 = 15000mm2**
  OK

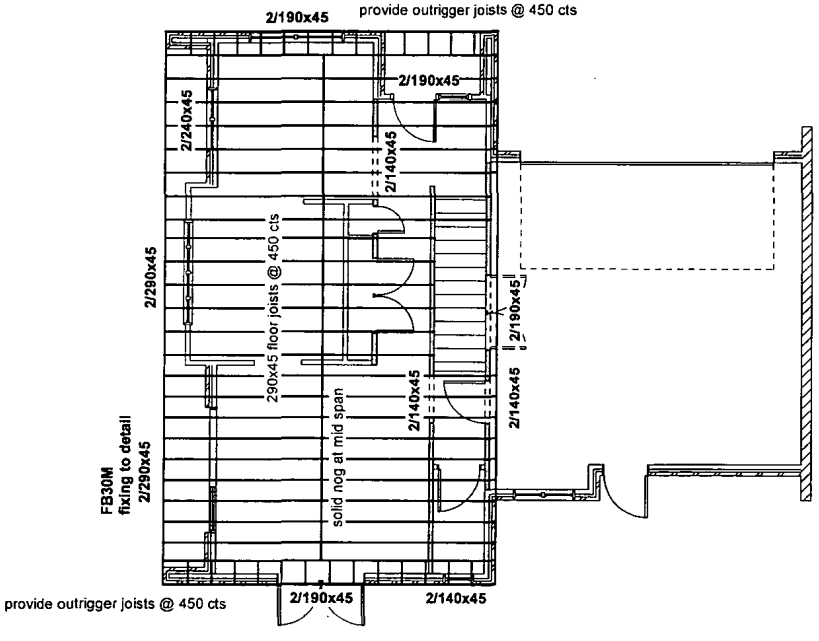


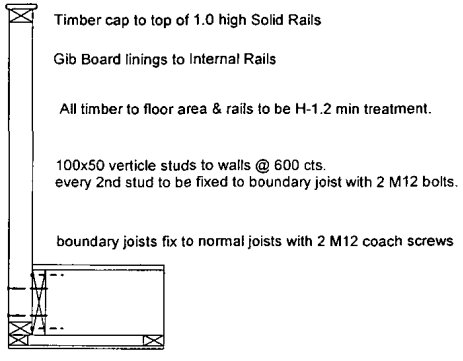
2/6 Internal Gutter Detail

Job TYPE 4a HOUSE NEW ZEALAND HOUSING FOUNDATION WEST COAST ROAD DEVELOPMENT	
Builder GOLDSMITH DEVELOPMENTS LTD	
Date 09/08	
Page Scale 1:100	
Drawn By **BENNETT DRAUGHTING** 116 RED HILL ROAD PAPAKURA ph: (09) 296 6369	
Page No 6	**Total Pages** 21

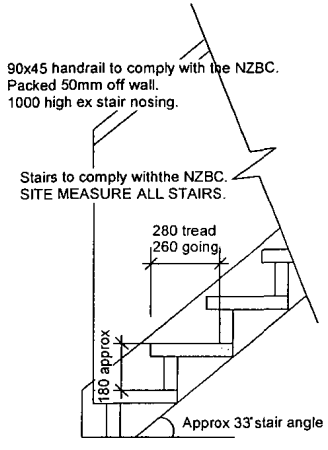
MID FLOOR NOTES:

- All floor joists 290x45 @ 450 cts.
- Solid nog all joists to NZS 3604.1999.
- All structural timber to be MSG8 min grade.
- JOISTS MUST BE 290x45 MSG8 TO SUIT CANTILEVER (1.0 max to NZS 3604)
- Use H-1.2 joists thoughout with H-3.1 joists in "Wet Areas".
- Use H-3 ply flooring in "Wet Areas".





Internal rail detail



Internal Stairs Detail

PLANS AND SPECIFICATIONS
APPROVED
SUBJECT TO CONDITIONS ENDORSED
ON BUILDING CONSENT
SIGNED _____ DATE 10 FEB 2009
AUTHORISED OFFICER

7 Mid Floor Plan
Scale: 1:100

Job
TYPE 4a HOUSE
NEW ZEALAND HOUSING FOUNDATION
WEST COAST ROAD DEVELOPMENT

Builder
GOLDSMITH DEVELOPMENTS LTD

Date
09/08

Page Scale
1:100

Drawn By
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116 RED HILL ROAD
PAPAKURA
ph: (09) 296 6369

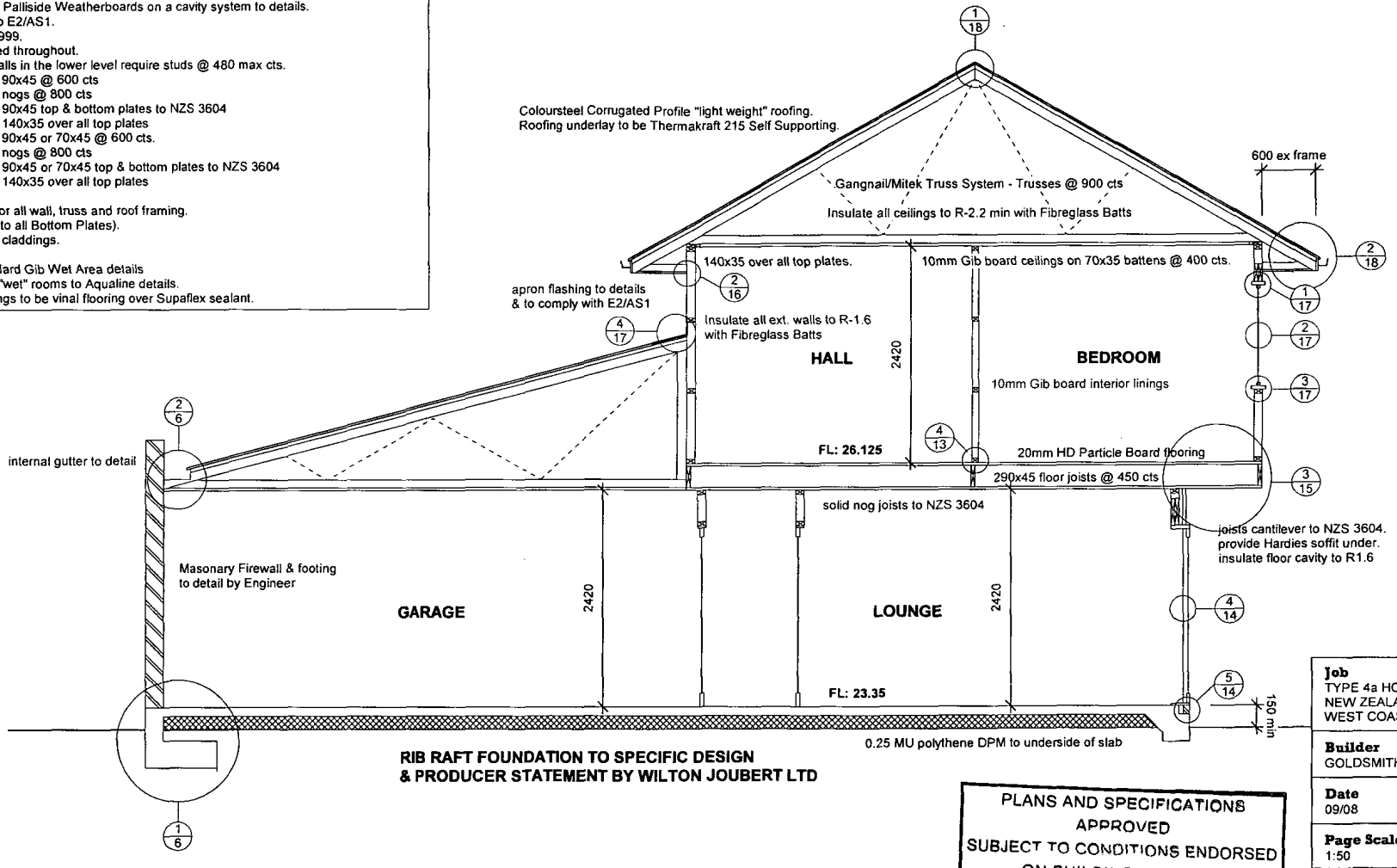
Page No 7 **Total Pages** 21

X SECTION NOTES:

- Lower Roof - 15°pitch. Coloursteel Corrugated Profile fixed strictly to manufacturers specs & E2/AS1
- Upper Roof - 28°pitch. Coloursteel Corrugated Profile fixed strictly to manufacturers specs & E2/ASI
- Gangnail / Mitek trusses @ 900.
- Design no. R41
- 70x45 purlins @ 900 max cts.
- External fascia / gutter.
- Hardies soffit.
- **Ground Floor** cladding will be 70 Series Brick Veneer with 40mm cavity to E2/ASI.
- **Top Floor** cladding will be Palliside Weatherboards on a cavity system to details.
- Approved building paper to E2/AS1.
- All framing to NZS 3604.1999.
- MSG8 framing is to be used throughout.
- All load bearing exterior walls in the lower level require studs @ 480 max cts.

Loadbearing Studs -	90x45 @ 600 cts
	nogs @ 800 cts
	90x45 top & bottom plates to NZS 3604
	140x35 over all top plates
Non Loadbearing Studs -	90x45 or 70x45 @ 600 cts.
	nogs @ 800 cts
	90x45 or 70x45 top & bottom plates to NZS 3604
	140x35 over all top plates

- All timber to B2/ASI
- Use H-1.2 treated timber for all wall, truss and roof framing. (Use H-3.1 in wet areas & to all Bottom Plates).
- Refer to elevations for GE claddings.
- **Wet Area Details.** Refer to sheet 20 for standard Gib Wet Area details
  All wall & ceiling linings in "wet" rooms to Aqualine details.
  All "wet" room floor coverings to be vinal flooring over Supaflex sealant.



RIB RAFT FOUNDATION TO SPECIFIC DESIGN & PRODUCER STATEMENT BY WILTON JOUBERT LTD

PLANS AND SPECIFICATIONS
APPROVED
SUBJECT TO CONDITIONS ENDORSED
ON BUILDING CONSENT
SIGNED _____ DATE 10 FEB 2009
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8 X Section
Scale: 1:50

Job
TYPE 4a HOUSE
NEW ZEALAND HOUSING FOUNDATION
WEST COAST ROAD DEVELOPMENT

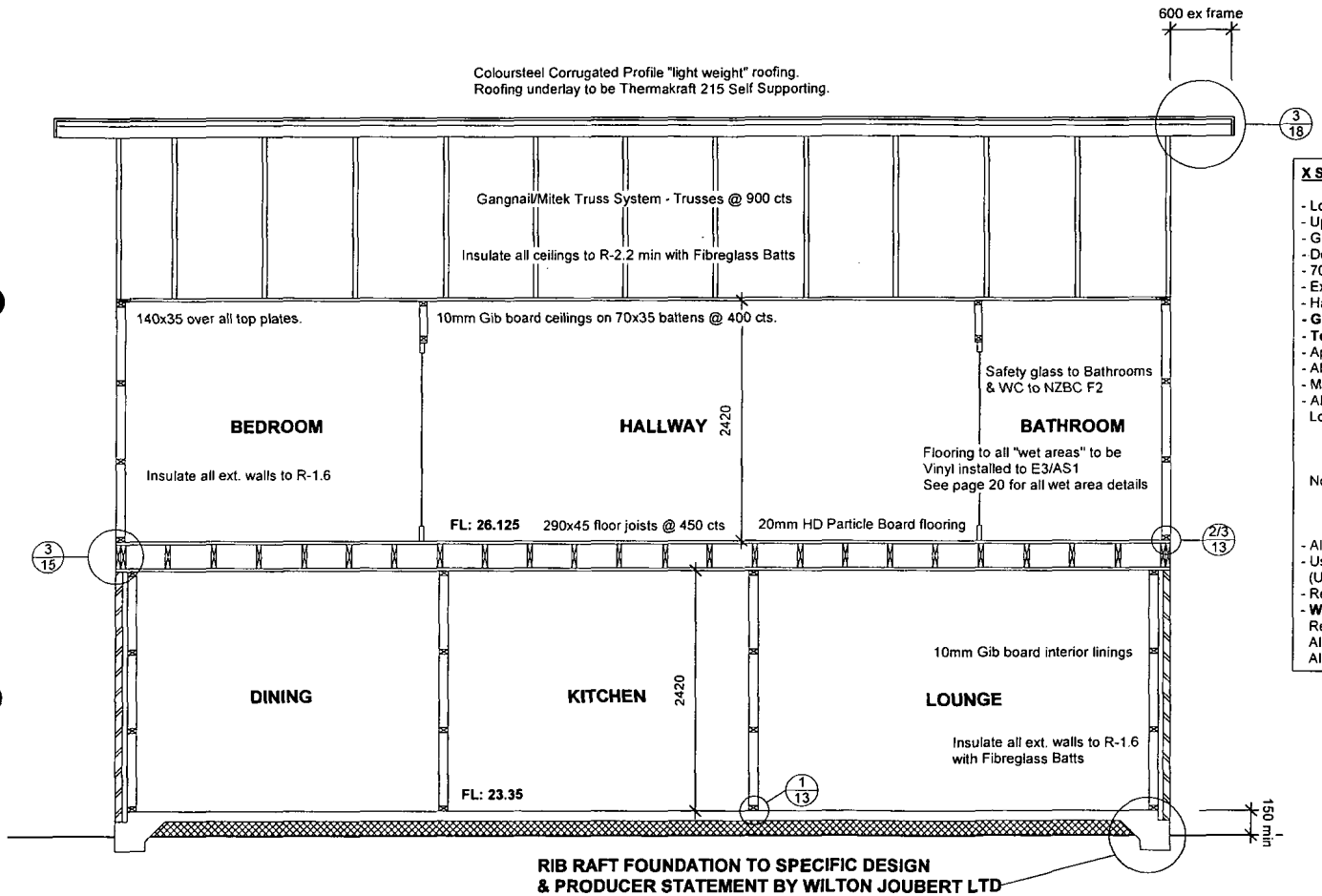
Builder
GOLDSMITH DEVELOPMENTS LTD

Date
09/08

Page Scale
1:50

Drawn By
BENNETT DRAUGHTING
116 RED HILL ROAD
PAPAKURA
ph: (09) 296 6369

Page No	Total Pages
8	21



ALTERNATIVE SOLUTION APPROVED
DETAIL/FEATURE Thermacraft 215 Self Supporting
SIGNED Rata DATE 30/10/07
AUTHORISED OFFICER

X SECTION NOTES:

- Lower Roof - 15° pitch. Coloursteel Corrugated Profile fixed strictly to manufacturers specs & E2/AS1
- Upper Roof - 28° pitch. Coloursteel Corrugated Profile fixed strictly to manufacturers specs & E2/ASI
- Gangnail / Mitek trusses @ 900.
- Design no. R41
- 70x45 purlins @ 900 max cts.
- External fascia / gutter.
- Hardies soffit.
- **Ground Floor** cladding will be 70 Series Brick Veneer with 40mm cavity to E2/ASI.
- **Top Floor** cladding will be Palliside Weatherboards on a cavity system to details.
- Approved building paper to E2/AS1.
- All framing to NZS 3604.1999.
- MSG8 framing is to be used throughout.
- All load bearing exterior walls in the lower level require studs @ 480 max cts.

Loadbearing Studs - 90x45 @ 600 cts
nogs @ 800 cts
90x45 top & bottom plates to NZS 3604
140x35 over all top plates

Non Loadbearing Studs - 90x45 or 70x45 @ 600 cts.
nogs @ 800 cts
90x45 or 70x45 top & bottom plates to NZS 3604
140x35 over all top plates

- All timber to B2/ASI
- Use H-1.2 treated timber for all wall, truss and roof framing. (Use H-3.1 in wet areas & to all Bottom Plates).
- Refer to elevations for GE claddings.
- **Wet Area Details.**
  Refer to sheet 20 for standard Gib Wet Area details
  All wall & ceiling linings in "wet" rooms to Aqualine details.
  All "wet" room floor coverings to be vinal flooring over Supaflex sealant.

PLANS AND SPECIFICATIONS APPROVED
SUBJECT TO CONDITIONS ENDORSED ON BUILDING CONSENT
SIGNED _____ DATE 10 FEB 2008
AUTHORISED OFFICER

9 Y Section
Scale: 1:50

Job
TYPE 4a HOUSE
NEW ZEALAND HOUSING FOUNDATION
WEST COAST ROAD DEVELOPMENT

Builder
GOLDSMITH DEVELOPMENTS LTD

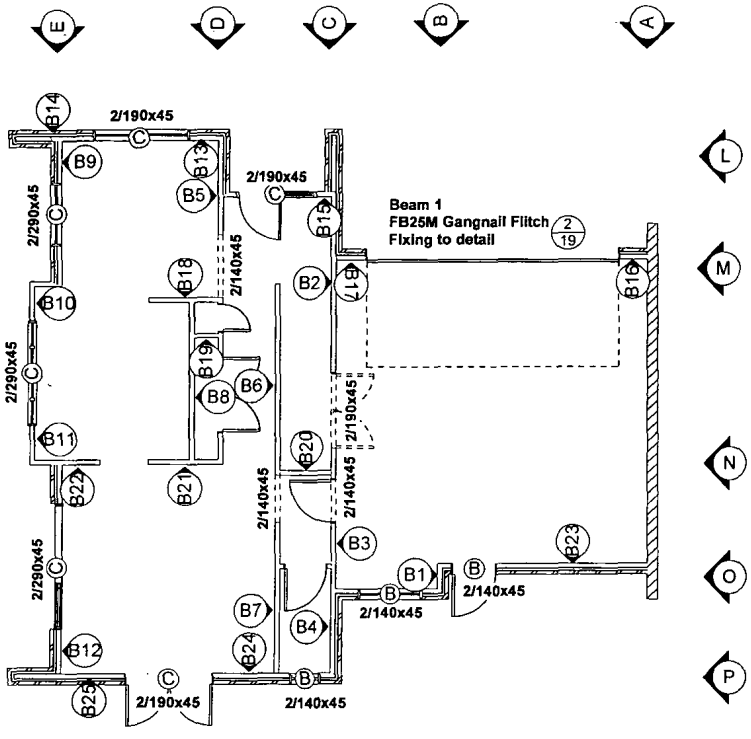
Date
09/08

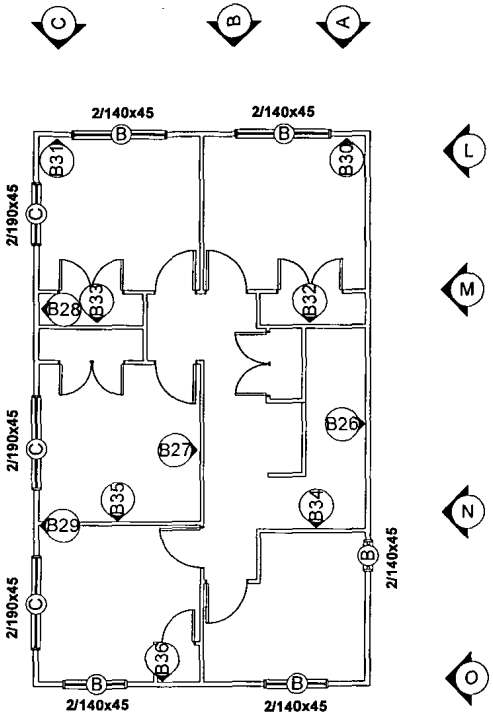
Page Scale
1:50

Drawn By
BENNETT DRAUGHTING
116 RED HILL ROAD
PAPAKURA
ph: (09) 296 6369

Page No 9 **Total Pages** 21

ALL TOP PLATE / STUD FIXINGS TO BE TYPE C TO THE LUMBERLOK SCHEDULE





GROUND LEVEL		
ALONG		
A		
MASONARY WALL		
(Engineer design)		
B		
B1	BLP	0.6
C		
B2	GS2	3.5
B3	BL1	0.6
B4	BLP	1.8
D		
B5	GS1a	1.8
B6	GS2	2.4
B7	GS1a	2.4
B8	GS1a	1.8
E		
B9	BL1	0.6
B10	BL1	0.6
B11	BL1	0.6
B12	BL1	0.6

GROUND LEVEL		
ACROSS		
L		
B13	BL1	0.6
B14	BLP	1.2
B15	BL1	0.4
M		
B16	BL1	0.6
B17	BL1	0.6
B18	BLG	1.4
B19	BL1	0.4
N		
B20	BLG	1.0
B21	BLG	1.4
B22	BLG	0.7
O		
B23	BLP	2.3
P		
B24	BLP	1.2
B25	BLP	1.2

UPPER LEVEL		
ALONG		
A		
B26	GS1a	2.4
B		
B27	GS2	2.4
C		
B28	GS1a	2.4
B29	BL1	1.2

UPPER LEVEL		
ACROSS		
L		
B30	BL1	0.6
B31	BL1	0.6
M		
B32	GS2	1.8
B33	GS2	1.8
N		
B34	GS1a	1.8
B35	GS2	2.4
O		
B36	BL1	1.2

TIMBER:

- All timber must comply with B2/AS1.
- Framing - All framing must be treated to H-1.2 min with H-3.1 bottom plates. "Wet" areas to have H-3.1 framing.
- Exterior Use Timber - All exterior use timber (decks etc) must be treated to H-3.2 min treatment.
- Ground Contact Timber - Timber in ground contact must be treated to H-5 min.

FIXINGS:

- Purlin/Truss - Min of 2 - 100x3.75 nails & 1 wire dog.
- Truss/Plate - Min of 2 wire dogs each end Fabricator must confirm.
- Top Plate/Stud - As noted refer to Lumberlok schedule (ALL TYPE C)
- Lintel Fixings - As noted refer to Lumberlok schedule (TYPE B or C)

- All lintels must be MSG8 min grade.
- Refer to supplementary sheet for bracing details
- Lintels sized ex NZS 3604.1999
- Beams sized ex the Gangnail charts - see spec.

PLANS AND SPECIFICATIONS APPROVED
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AUTHORISED OFFICER

10 Bracing & Lintels
Scale: 1:100

Job
TYPE 4a HOUSE
NEW ZEALAND HOUSING FOUNDATION
WEST COAST ROAD DEVELOPMENT

Builder
GOLDSMITH DEVELOPMENTS LTD

Date
09/08

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116 RED HILL ROAD
PAPAKURA
ph: (09) 296 6369

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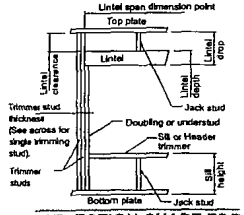
LUMBERLOK® WALL FIXING CHART 01/10

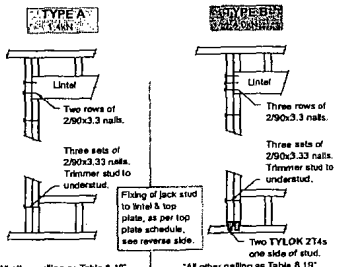
LINTEL FIXING SCHEDULE

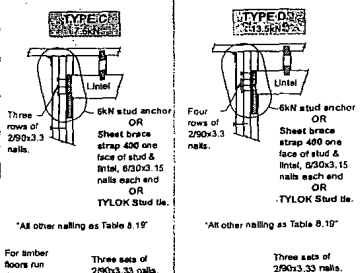
(ALTERNATIVE TO NZS 3604:1999 TABLE 8.14 & FIGURE 8.12)

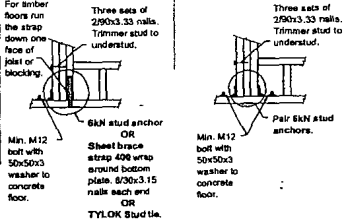
DEFINITIONS



LINTEL FIXING TYPES







SELECTION CHART FOR LINTEL FIXING

Lintel Span	Loaded Dimension (See reverse side)	Light Roof Wind Zone L	M	H	VH	Heavy Roof Wind Zone L	M	H	VH
1.5	2.0	A	A	A	B	A	A	B	C
	3.0	A	A	B	C	A	A	C	D
	4.0	A	B	C	D	A	A	D	D
	5.0	B	C	D	D	A	A	D	-
	6.0	C	D	D	-	A	A	D	-
2.0	2.0	A	A	B	C	A	A	C	D
	3.0	A	B	C	D	A	A	D	D
	4.0	B	C	D	D	A	A	D	-
	5.0	C	D	D	-	A	A	D	-
	6.0	D	D	-	-	A	B	D	-
2.4	2.0	A	B	C	D	A	A	D	D
	3.0	B	C	D	D	A	A	D	-
	4.0	C	D	D	-	A	B	D	-
	5.0	D	D	-	-	A	C	D	-
	6.0	D	-	-	-	A	D	D	-
3.0	2.0	A	C	D	D	A	A	D	D
	3.0	C	D	D	-	A	B	D	-
	4.0	D	D	-	-	A	C	D	-
	5.0	D	-	-	-	A	D	D	-
	6.0	-	-	-	-	B	D	D	-
3.6	2.0	B	D	D	-	A	B	D	-
	3.0	D	D	-	-	A	C	D	-
	4.0	D	-	-	-	A	D	D	-
	5.0	-	-	-	-	B	D	D	-
	6.0	-	-	-	-	C	D	D	-
4.2	2.0	C	D	D	-	A	C	D	-
	3.0	D	D	-	-	A	D	D	-
	4.0	D	-	-	-	B	D	D	-
	5.0	-	-	-	-	C	D	D	-
	6.0	-	-	-	-	D	D	D	-
4.8	2.0	D	D	-	-	A	D	D	-
	3.0	D	-	-	-	B	D	D	-
	4.0	D	-	-	-	C	D	D	-
	5.0	-	-	-	-	D	D	D	-
	6.0	-	-	-	-	D	D	D	-

NOTES:

- Lintels accepting Girder trusses for ALL load cases use: Fixing type C where contributary area = 10m²; Fixing type D where contributary area = 20m²
- All cases outside this require specific design

MiTek New Zealand Ltd.
AUCKLAND PO Box 58-314, Greenmount Phone: (09) 274 7100 Fax: (09) 274 7100
CHRISTCHURCH PO Box 8387, Riccarton Phone: (03) 348 8861 Fax: (03) 348 8314
MiTek HOME OF GANG-NAIL® BUILDING SYSTEMS

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LUMBERLOK® WALL FIXING CHART 01/10

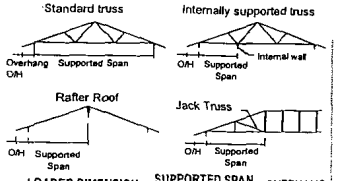
STUD TO TOP PLATE FIXING SCHEDULE

(ALTERNATIVE TO NZS 3604:1999 TABLE 8.18)

NOTE:

- All fixings are designed for vertical loads only. Dead loads include the roof weight and standard ceiling weight of 0.20kPa. Refer to table 8.19, NZS3604:1999 for nailing schedule to resist horizontal loads.
- These fixings assume the correct choice of rafter/truss to top plate connections have been made. Refer to the **LUMBERLOK®** Truss Fixing Chart.
- Gable end wall top plate/stud connections require only 2x90x3.33 nails driven vertically into stud through top plate.
- All Fixings assume top plate thickness of 45mm maximum.
- Wall framing arrangements under girder trusses are not covered in this schedule.

LOADED DIMENSION DEFINITION



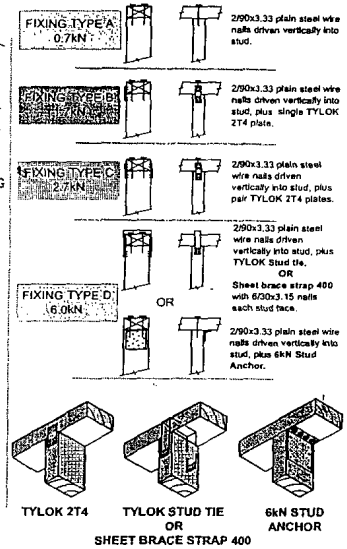
LOADED DIMENSION = $\frac{\text{SUPPORTED SPAN}}{2}$ + OVERHANG

SELECTION CHART FOR FIXING LOADS - TOP PLATE TO STUD

Loaded Dimension	Light Roof Wind Zone L	M	H	VH	Heavy Roof Wind Zone L	M	H	VH
1.5	A	A	B	C	A	A	C	D
2.0	A	B	C	D	A	A	D	D
2.5	B	C	D	D	A	A	D	-
3.0	C	D	D	-	A	A	D	-
3.5	D	D	-	-	A	B	D	-
4.0	D	-	-	-	A	C	D	-
4.5	-	-	-	-	A	D	D	-
5.0	-	-	-	-	B	D	D	-
5.5	-	-	-	-	C	D	D	-
6.0	-	-	-	-	D	D	D	-

- All studs at 600 crs.
- For studs at 400 crs decrease loaded dimension by 33%.
- All trusses at 900 crs.
- For trusses at 1200 crs increase loaded dimension by 33%.

FIXING OPTIONS



MiTek New Zealand Ltd.
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MiTek HOME OF GANG-NAIL® BUILDING SYSTEMS

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PLANS AND SPECIFICATIONS APPROVED SUBJECT TO CONDITIONS ENDORSED ON BUILDING CONSENT

SIGNED _____ DATE 10 FEB 2009

AUTHORISED OFFICER

Job NEW ZEALAND HOUSING FOUNDATION WEST COAST ROAD DEVELOPMENT	
Builder GOLDSMITH DEVELOPMENTS LTD	
Date 08/08	
Page Scale NTS	
Drawn By Lumberlok / Mitek	
BENNETT DRAUGHTING	
Page No 11	**Total Pages** 21

Design Steps 4 and 5 – Bracing Units Achieved (Wind and Earthquake)

MARCH 2006

TABLE 1: Bracing Unit Ratings for 10mm GIB® Standard Plasterboard and any other 10mm and 13mm GIB® plasterboard.

TYPE	LENGTH (m)	LINING REQUIREMENT	OTHER REQUIREMENTS	BU PER METRE	
	MINIMUM		DIAGONAL BRACE	WIND	EARTHQUAKE
GS1a	1.8	10mm GIB® Standard Plasterboard one face fixed horizontal or vertical	yes	65	55
	2.4			75	65
GS2	1.2	10mm GIB® Standard Plasterboard both sides fixed horizontal or vertical[1]	no	70	60
	1.8			80	70
	2.4			90	80

TABLE 2: Bracing Unit Ratings for 10mm GIB Braceline®, 10mm and 13mm[4] GIB Noiseline® and 13mm[4] GIB Toughline® (fixed with GIB Braceline® screws or GIB Braceline® nails)

TYPE	LENGTH (m)	LINING REQUIREMENT	OTHER REQUIREMENTS		BU PER METRE	
	MINIMUM		DIAGONAL BRACE	HOLD DOWNS	WIND	EARTHQUAKE
BL1	0.4	GIB Braceline® one face fixed horizontal or vertical[2]	no	yes	120	115
	0.6		no	yes	125	115
BL1a	1.8	GIB Braceline® one face fixed horizontal or vertical[2]	yes	yes	130	115
BLP	0.6	GIB Braceline® one face fixed horizontal or vertical, 7mm D-D plywood on the other[1,2]	no	yes	145	135
	0.9				145	145
BLG	0.6	GIB Braceline® one face, 10mm GIB® Standard on the other face, linings fixed horizontal or vertical[1,2]	no	yes	145	130
	1.2				150[3]	130

Notes:

1) Where linings are specified on both faces, each face must be fastened as a bracing element.
2) GIB Aqualine® can be used in place of GIB Braceline® in bracing elements 900mm or longer, provided the perimeter of the element is fixed with GIB Braceline® nails or screws spaced at 100mm centres generally, using the GIB Braceline® corner fixing pattern.
3) A maximum of 150 BU/m is recommended for any bracing system used with NZS 3604:1999 construction. Higher ratings generate loads beyond the capacity of NZS 3604:1999 timber foundation and slab details. If ratings exceed 150 BU/m, hold downs and foundations must be the subject of specific structural engineering design.
4) Where 13mm GIB Noiseline® or 13mm GIB Toughline® is used in place of 10mm GIB Braceline® it is recommended that GIB Braceline® nails are used.

In order for GIB® systems to perform as tested, all components must be installed exactly as prescribed. Substituting components produces an entirely different system and may seriously compromise performance. Follow system specifications.

AUTHORISED OFFICER
SIGNED
DATE 30/10/08
DETAIL/FEATURE
ALTERATION TO APPROVED DWG

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DATE 10 FEB 2009
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Builder	GOLDSMITH DEVELOPMENTS LTD
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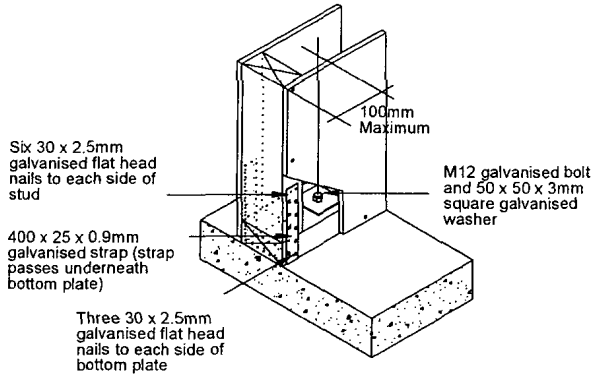
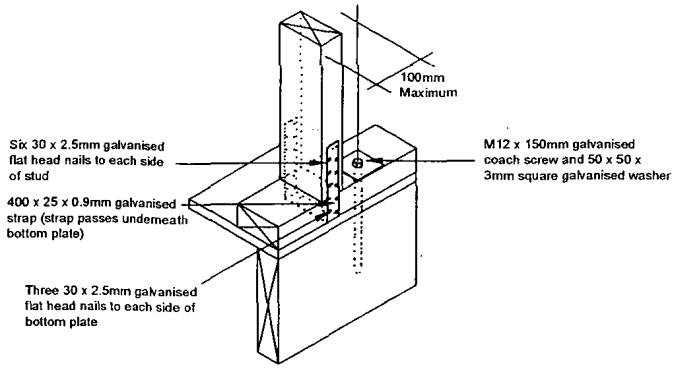
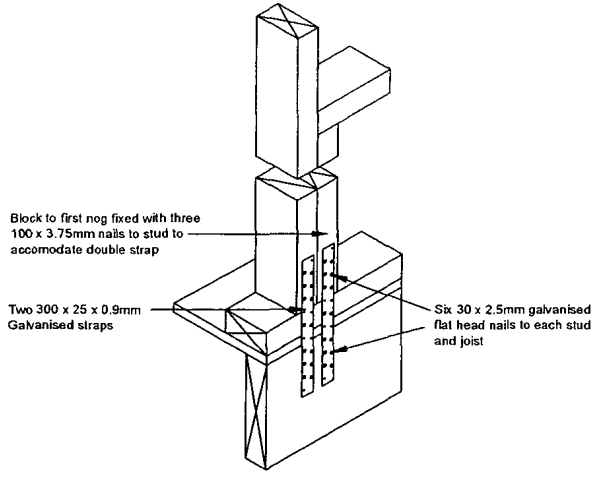
Drawn By	Gib Bracing
	BENNETT DRAUGHTING
Page No	12
Total Pages	21



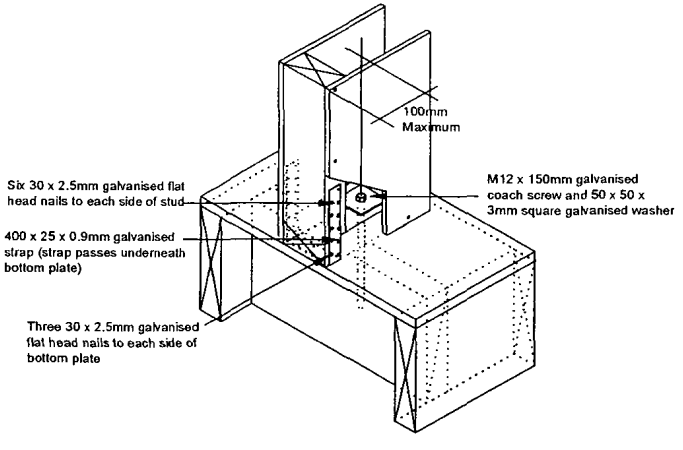
1/13 Concrete Floor - Internal / External Walls Hold Down
Scale: 1:10



2/13 Timber Floor - External Walls Hold Down - Option 1
Scale: 1:10



3/13 Timber Floor - External Walls Hold Down - Option 2
Scale: 1:10



4/13 Timber Floor - Internal Walls Hold Down
Scale: 1:10

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Builder GOLDSMITH DEVELOPMENTS LTD	
Date 08/08	
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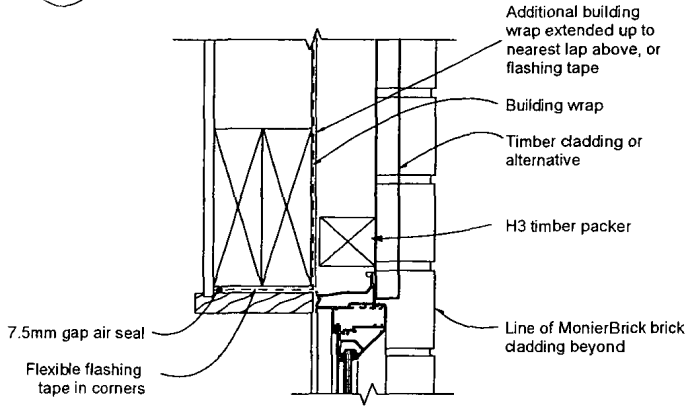
Drawn By Gib Panel Hold Downs	
BENNETT DRAUGHTING	
Page No 13	**Total Pages** 21

13 Wall Hold Down Details
Scale: 1:10

1/14 Window Head - Timber Cladding Above

Scale: 1:5

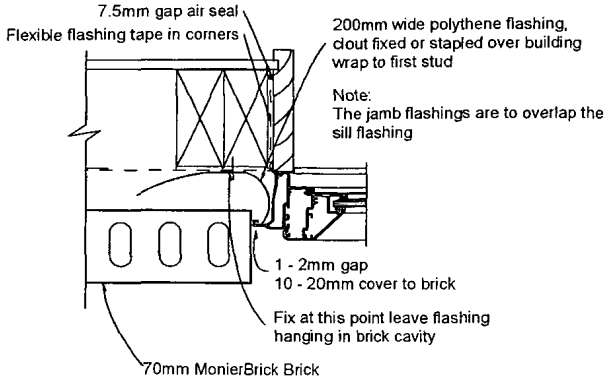


Important:

a. All lintel bars must be propped until mortar is set (7 days).
b. It is important to allow the first 3 courses of the brickwork over an opening to set before laying any more bricks above.
c. Provide brick ties within the bottom two courses.

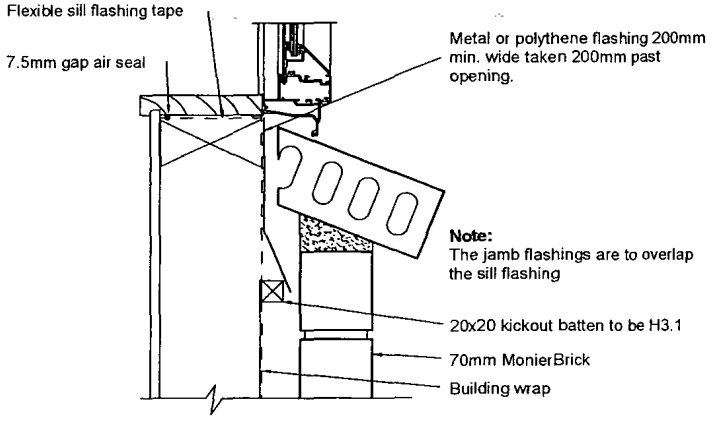
2/14 Window Jamb - Aluminium

Scale: 1:5



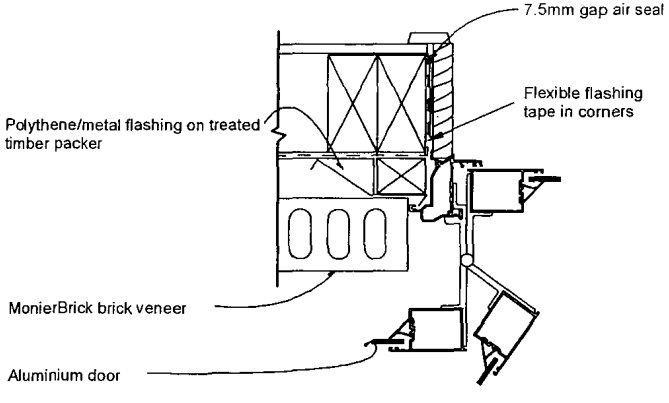
3/14 Window Sill - Aluminium

Scale: 1:5



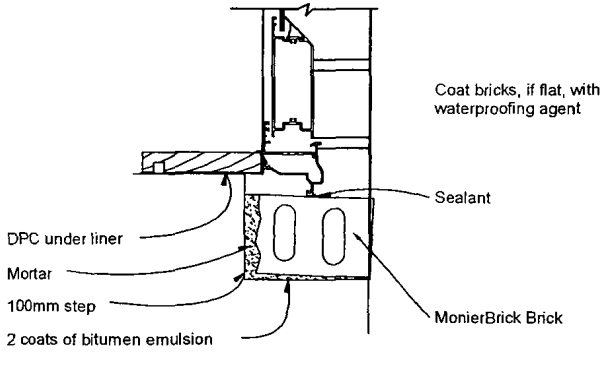
4/14 Door Jamb - Aluminium

Scale: 1:5



5/14 Brick Door Sill

Scale: 1:5



Note:
If brick is to be sloped further, either increase the depth of the step or reduce the thickness of the brick.

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14 Monier Details

Scale: 1:5

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Builder GOLDSMITH DEVELOPMENTS LTD	
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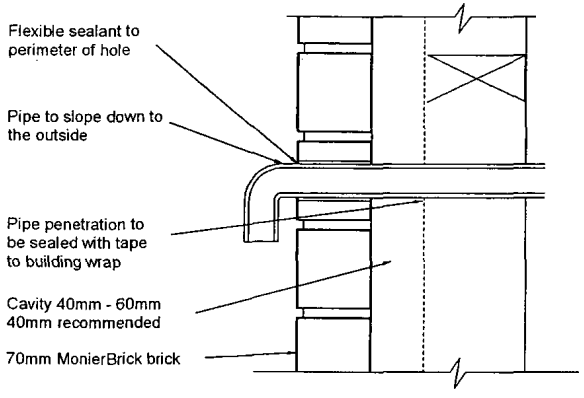
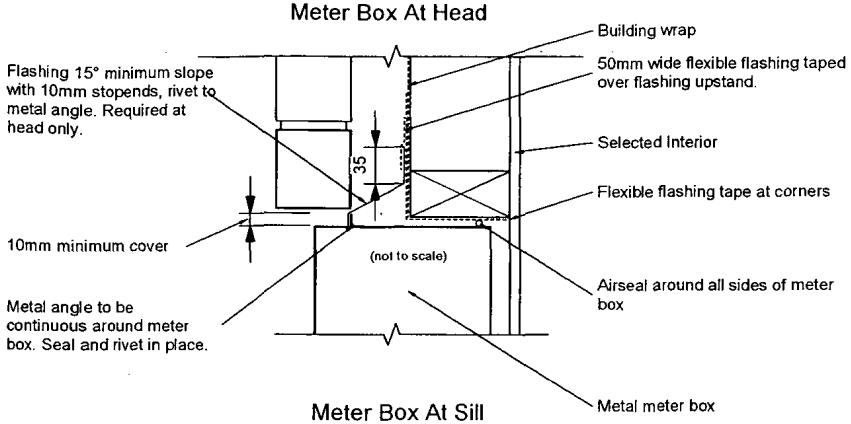
Drawn By Monier Brick	
BENNETT DRAUGHTING	
Page No 14	**Total Pages** 21

1/15 Pipe Penetration
Scale: 1:5

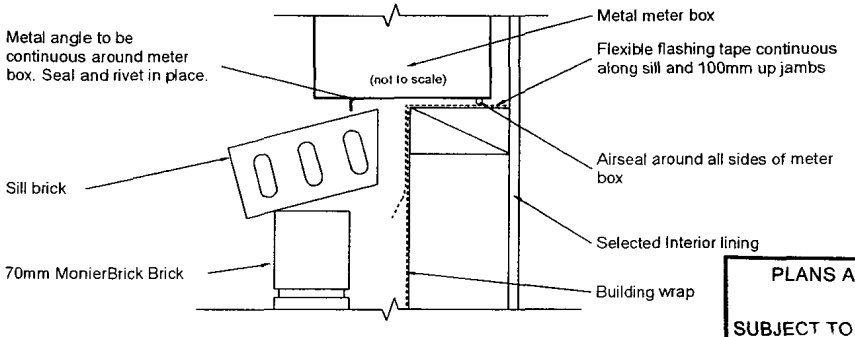


2/15 Meter Box Installation
Scale: 1:5

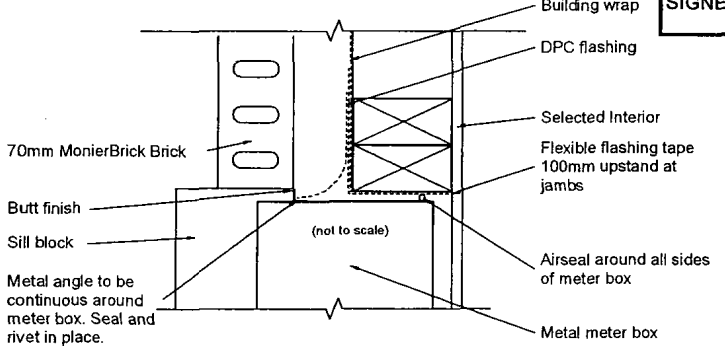
Meter Box At Head



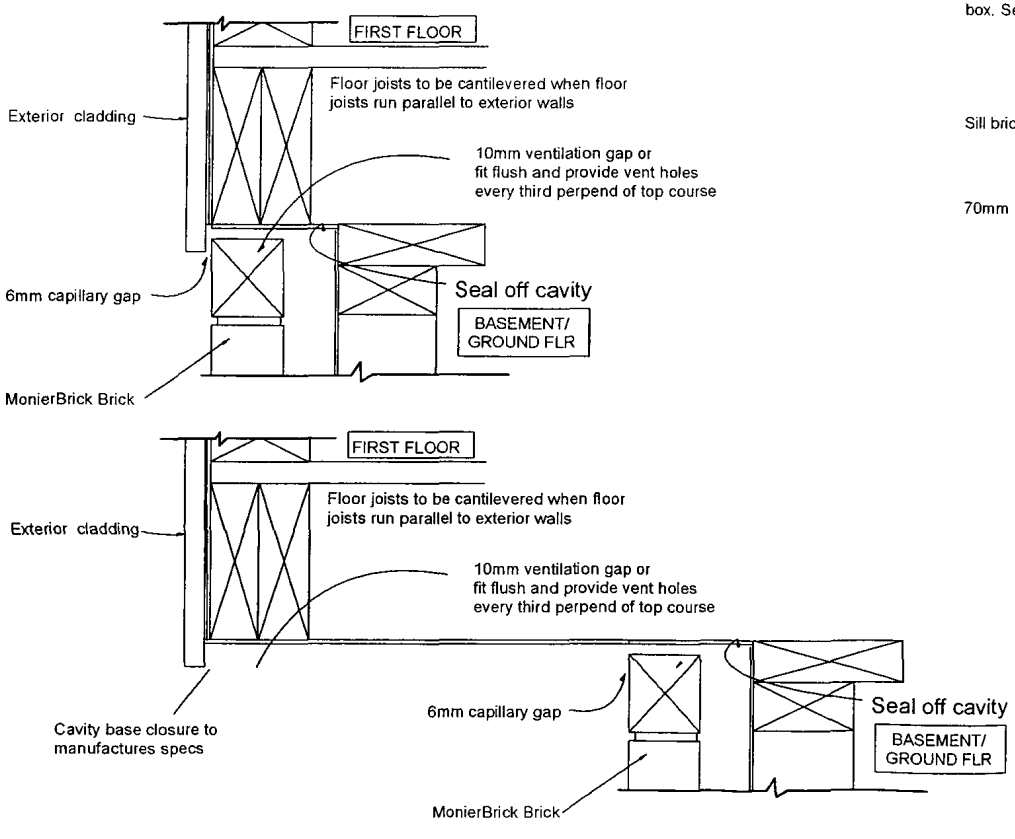
Meter Box At Sill



Meter Box At Jamb



3/15 Two Story - Ground Floor Veneer
Scale: 1:5



15 Monier Details
Scale: 1:5

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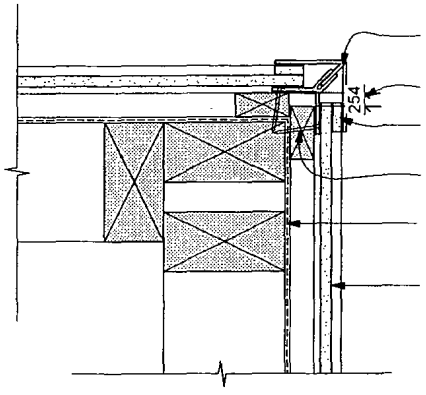
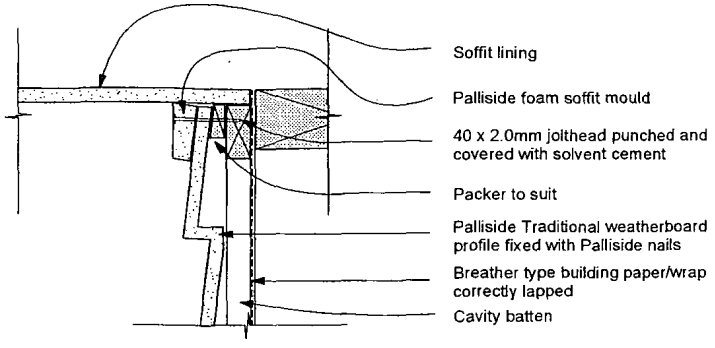
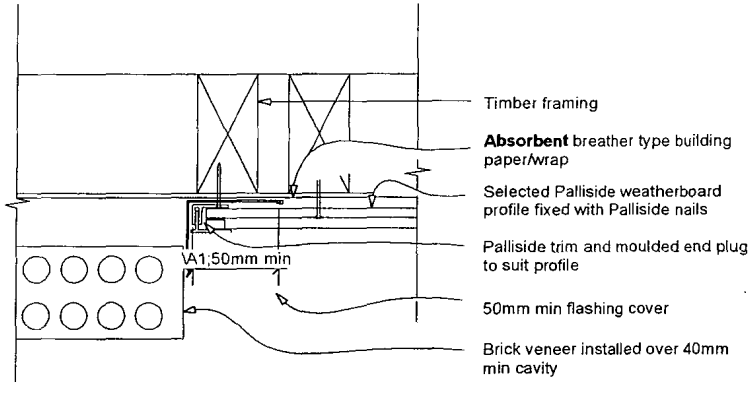
Total Pages	21



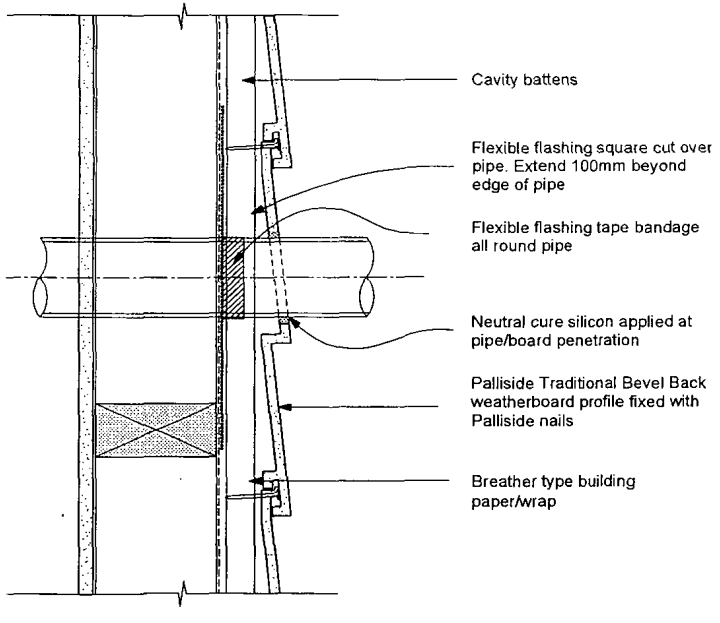
1/16 External 2 Part Boxed Corner



2/16 Finish at Soffit



3/16 Palliside / Brick - Verticle Join



4/16 Palliside - Pipe Penetration

PLANS AND SPECIFICATIONS
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Drawn By Palliside	
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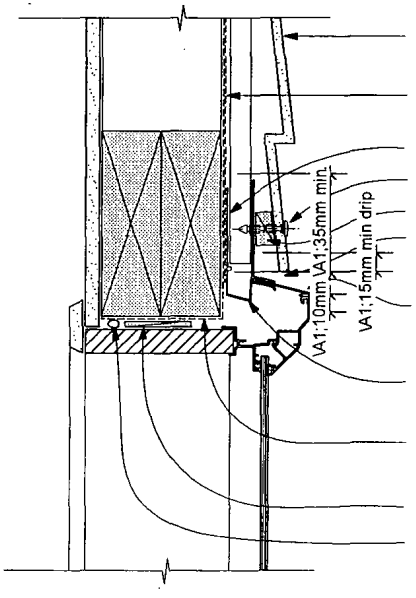
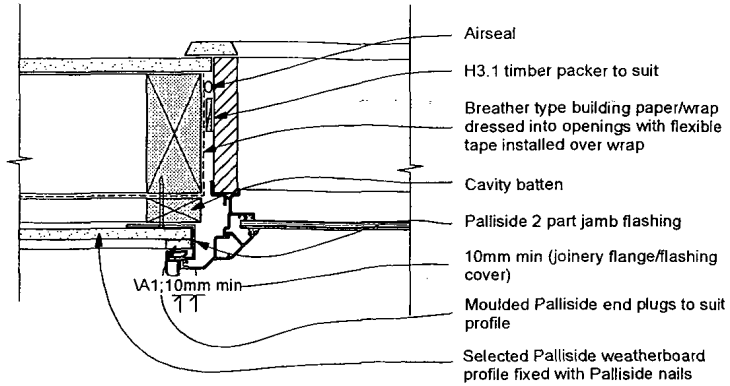
Page No 16	**Total Pages** 21

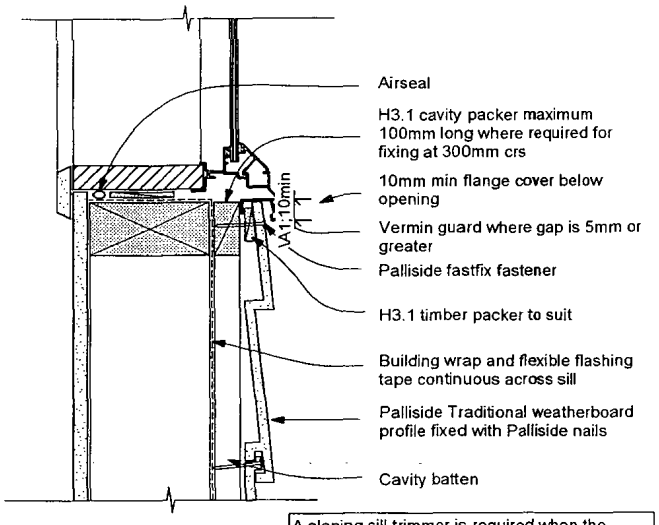
16 Palliside Details



1/17 Palliside - Window Head Detail

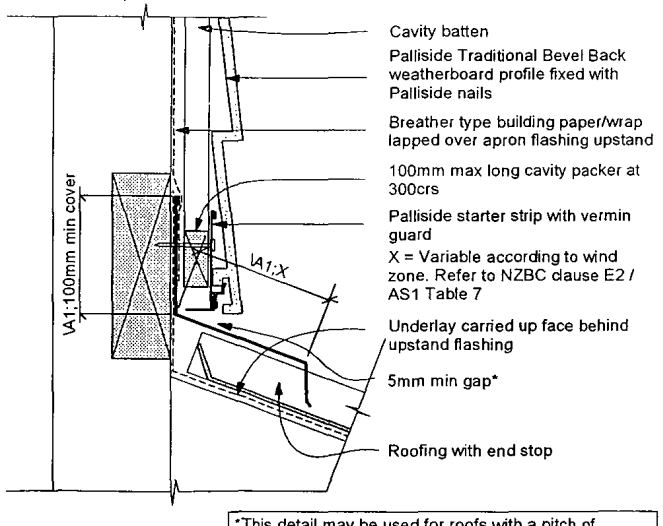


2/17 Palliside - Window Jamb Detail



A sloping sill trimmer is required when the glazing pocket of the window or door jionery is positioned back past the line of the wall frame

3/17 Palliside - Window Sill Detail



*This detail may be used for roofs with a pitch of 12degrees minimum. Where the pitch is less than 12degrees 35mm min clearance is required between the underside of the cladding and the apron flashing

4/17 Palliside - Horizontal Apron Flashing

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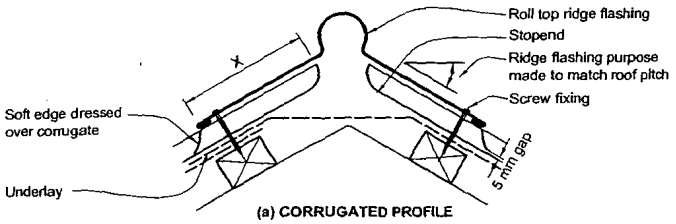
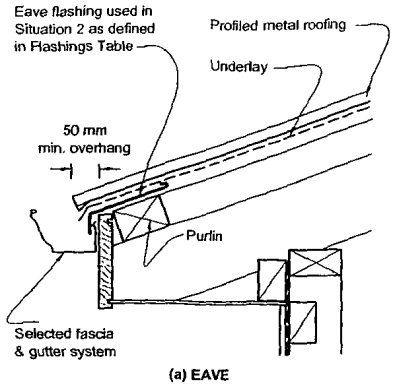
17 Palliside Details

NOTE: X = variable according to *wind zone* – refer Table 7.



(a) CORRUGATED PROFILE

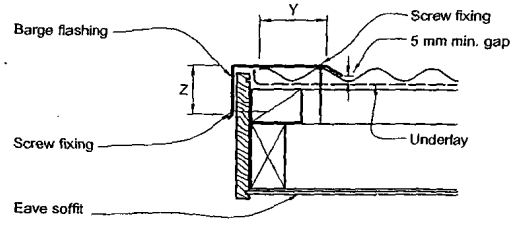
1/18 Ridge Flashing



(a) EAVE

2/18 Eave Flashing

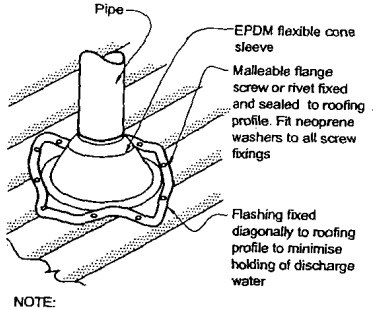
NOTE: (1) Y = variable according to *wind zone* – refer Table 7.
(2) Z = variable according to *wind zone* – refer Table 7.



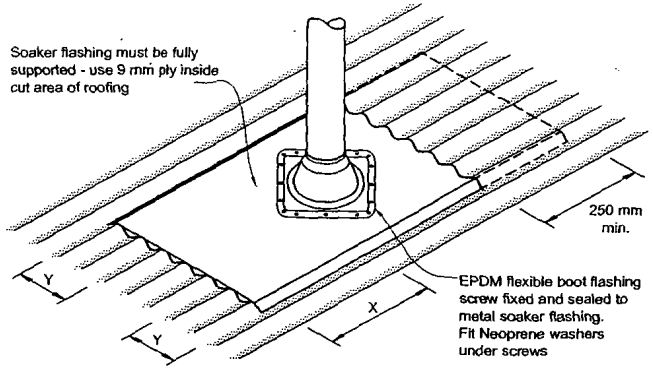
(a) CORRUGATED PROFILE

3/18 Barge Flashing

NOTE: (1) X = variable according to *wind zone* – refer Table 7.
(2) Y = to cover minimum of two crests – refer Table 7.
(3) Suitable for pipes from 60 mm to 200 mm diameter.
(4) Suitable only for roof pitches of 10° or higher.



NOTE:
(1) Max. roof pitch for this flashing 45°, minimum pitch 10°.
(2) For pipes up to 60 mm diameter.



4/18 Pipe Penetration Details

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18 Roof Details

Job NEW ZEALAND HOUSING FOUNDATION WEST COAST ROAD DEVELOPMENT	
Builder GOLDSMITH DEVELOPMENTS LTD	
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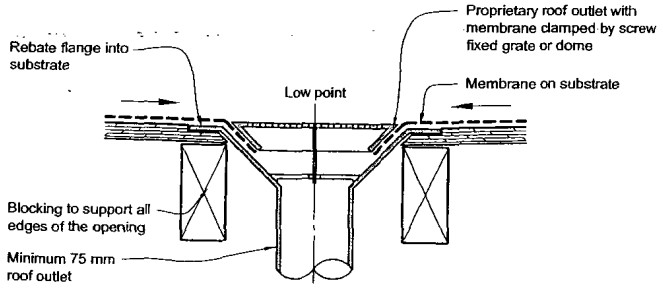
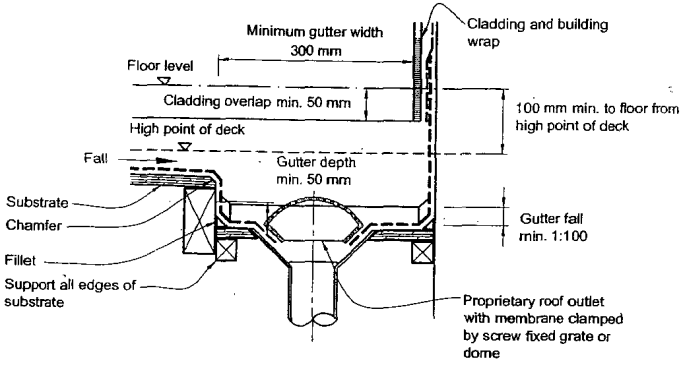
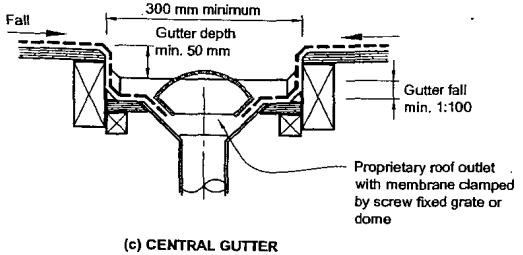
Page No 18	**Total Pages** 21



(a) TYPICAL GUTTER OUTLET

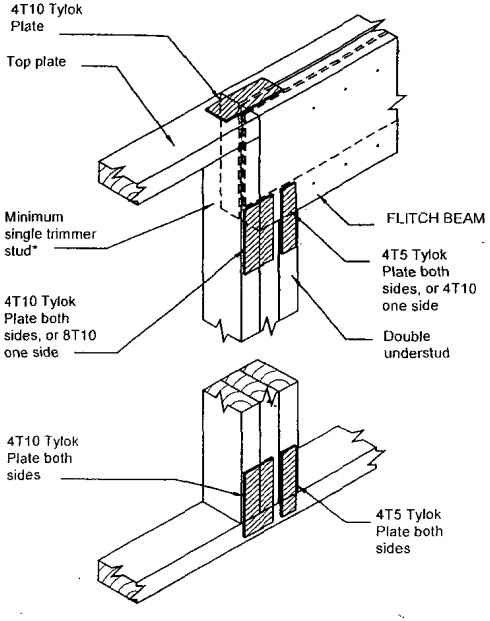


(b) EDGE GUTTER



(c) CENTRAL GUTTER

1/19 Gutters & Outlets in Membrane



Simply Supported Beam

* Refer NZS3604:1999 Section 8.5.2 for trimming stud requirements.

LINTEL SUPPORTING ROOF, WALL AND FLOOR JOISTS (2.4m MAX WALL HEIGHT)

	LINTEL SIZE	FLOOR SPAN 'F' (m)	MAXIMUM LINTEL SPAN (m) SUPPORTED ROOF SPAN 'S' (m) 5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0
LIGHT ROOF	FB15L	2.5	2.14	2.07	2.01	1.96	1.91	1.87	1.82	1.78	1.75	1.71	1.68
		4.0	1.91	1.86	1.82	1.78	1.74	1.71	1.67	1.64	1.61	1.59	1.56
		5.5	1.74	1.70	1.67	1.64	1.61	1.58	1.56	1.53	1.51	1.49	1.46
		7.0	1.61	1.58	1.55	1.53	1.51	1.48	1.46	1.44	1.42	1.40	1.38
	FB20M	2.5	3.38	3.28	3.19	3.10	3.02	2.95	2.89	2.82	2.76	2.71	2.66
		4.0	3.01	2.94	2.88	2.81	2.76	2.70	2.65	2.60	2.55	2.51	2.47
		5.5	2.75	2.69	2.64	2.59	2.55	2.50	2.46	2.42	2.39	2.35	2.32
		7.0	2.54	2.50	2.46	2.42	2.38	2.34	2.31	2.28	2.25	2.22	2.19
	FB25L	2.5	3.30	3.21	3.12	3.04	2.96	2.89	2.82	2.76	2.70	2.65	2.60
		4.0	2.95	2.88	2.81	2.75	2.70	2.64	2.59	2.54	2.50	2.46	2.42
		5.5	2.69	2.64	2.59	2.54	2.49	2.45	2.41	2.37	2.33	2.30	2.27
		7.0	2.49	2.44	2.40	2.37	2.33	2.29	2.26	2.23	2.20	2.17	2.14
	FB25M	2.5	4.28	4.17	4.05	3.94	3.85	3.75	3.67	3.59	3.51	3.44	3.38
		4.0	3.83	3.74	3.66	3.58	3.50	3.43	3.37	3.31	3.25	3.19	3.14
		5.5	3.49	3.42	3.36	3.30	3.24	3.18	3.13	3.08	3.03	2.99	2.94
		7.0	3.23	3.18	3.12	3.07	3.03	2.98	2.94	2.90	2.86	2.82	2.78
	FB30M	2.5	5.07	4.98	4.90	4.79	4.67	4.55	4.45	4.35	4.26	4.18	4.10
		4.0	4.65	4.54	4.44	4.34	4.25	4.17	4.09	4.01	3.94	3.87	3.81
		5.5	4.24	4.15	4.08	4.00	3.93	3.86	3.80	3.74	3.68	3.62	3.57
		7.0	3.92	3.85	3.79	3.73	3.67	3.62	3.56	3.51	3.47	3.42	3.37
HEAVY ROOF	FB15L	2.5	1.95	1.88	1.81	1.76	1.70	1.66	1.61	1.57	1.53	1.50	1.46
		4.0	1.77	1.72	1.67	1.62	1.58	1.54	1.51	1.47	1.44	1.41	1.38
		5.5	1.63	1.59	1.55	1.51	1.48	1.45	1.42	1.39	1.36	1.34	1.31
		7.0	1.52	1.49	1.46	1.43	1.40	1.37	1.34	1.32	1.30	1.28	1.25
	FB20M	2.5	3.09	2.97	2.87	2.78	2.69	2.62	2.55	2.48	2.42	2.37	2.31
		4.0	2.80	2.72	2.64	2.57	2.50	2.44	2.38	2.33	2.28	2.23	2.19
		5.5	2.58	2.52	2.45	2.40	2.34	2.29	2.24	2.20	2.16	2.12	2.08
		7.0	2.41	2.35	2.30	2.25	2.21	2.17	2.13	2.09	2.05	2.02	1.98
	FB25L	2.5	3.02	2.91	2.81	2.72	2.64	2.56	2.49	2.43	2.37	2.32	2.26
		4.0	2.74	2.66	2.58	2.51	2.45	2.39	2.33	2.28	2.23	2.18	2.14
		5.5	2.53	2.46	2.40	2.34	2.29	2.24	2.19	2.15	2.11	2.07	2.03
		7.0	2.36	2.30	2.25	2.21	2.16	2.12	2.08	2.04	2.01	1.97	1.94
	FB25M	2.5	3.92	3.78	3.65	3.53	3.43	3.33	3.24	3.16	3.08	3.01	2.94
		4.0	3.56	3.45	3.35	3.26	3.18	3.10	3.03	2.96	2.90	2.84	2.78
		5.5	3.28	3.20	3.12	3.04	2.98	2.91	2.85	2.79	2.74	2.69	2.64
		7.0	3.06	2.99	2.93	2.87	2.81	2.75	2.70	2.65	2.61	2.56	2.52
	FB30M	2.5	4.66	4.55	4.43	4.29	4.16	4.04	3.93	3.83	3.74	3.65	3.57
		4.0	4.32	4.19	4.07	3.96	3.86	3.76	3.67	3.59	3.51	3.44	3.37
		5.5	3.98	3.88	3.78	3.69	3.61	3.53	3.46	3.39	3.33	3.26	3.21
		7.0	3.72	3.63	3.55	3.48	3.41	3.34	3.28	3.22	3.17	3.11	3.06

TABLE 1: MSG8, VSG8, MSG6 or Unverified No. 1 Framing
LINTELS SUPPORTING ROOF AND CEILING ONLY

	LINTEL SIZE	MAXIMUM LINTEL SPAN (m) SUPPORTED ROOF SPAN 'S' (m) 3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0
LIGHT ROOF	FB15L	3.44	3.21	3.03	2.89	2.75	2.60	2.47	2.36	2.26	2.17	2.10	2.03	1.96
	FB20M	4.93	4.68	4.48	4.32	4.15	4.00	3.87	3.73	3.58	3.44	3.32	3.21	3.11
	FB25L	5.17	4.91	4.70	4.53	4.26	4.02	3.82	3.65	3.50	3.37	3.25	3.14	3.04
	FB25M	5.90	5.59	5.36	5.16	5.00	4.86	4.74	4.63	4.53	4.37	4.22	4.08	3.95
	FB30M	6.81	6.46	6.19	5.96	5.78	5.61	5.47	5.35	5.23	5.13	5.04	4.95	4.79
HEAVY ROOF	FB15L	2.92	2.72	2.57	2.45	2.30	2.17	2.06	1.97	1.89	1.82	1.75	1.69	1.64
	FB20M	4.21	3.99	3.82	3.68	3.52	3.39	3.26	3.12	2.99	2.87	2.77	2.68	2.59
	FB25L	4.41	4.19	4.01	3.79	3.56	3.36	3.19	3.05	2.92	2.81	2.71	2.62	2.54
	FB25M	5.03	4.77	4.57	4.41	4.27	4.15	4.04	3.95	3.80	3.65	3.52	3.40	3.30
	FB30M	5.81	5.51	5.28	5.09	4.93	4.79	4.67	4.56	4.47	4.38	4.27	4.13	4.00

2/19 Flitch Beam Fixing Detail

PLANS AND SPECIFICATIONS APPROVED SUBJECT TO CONDITIONS ENDORSED ON BUILDING CONSENT SIGNED _____ DATE 10 FEB 2009 AUTHORISED OFFICER

19 Gutter / Flitch Beam Details

Job
NEW ZEALAND HOUSING FOUNDATION
WEST COAST ROAD DEVELOPMENT

Builder
GOLDSMITH DEVELOPMENTS LTD

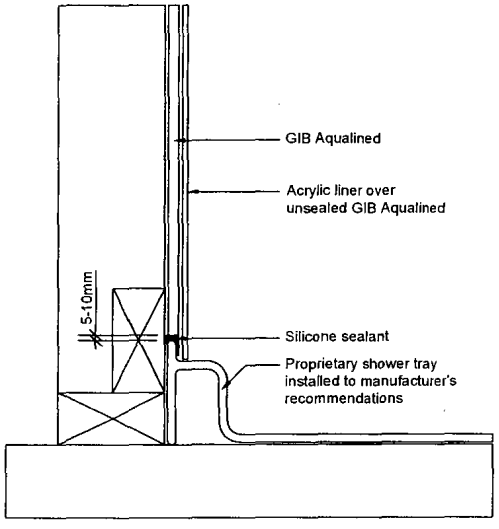
Date
08/08

Page Scale
1:10

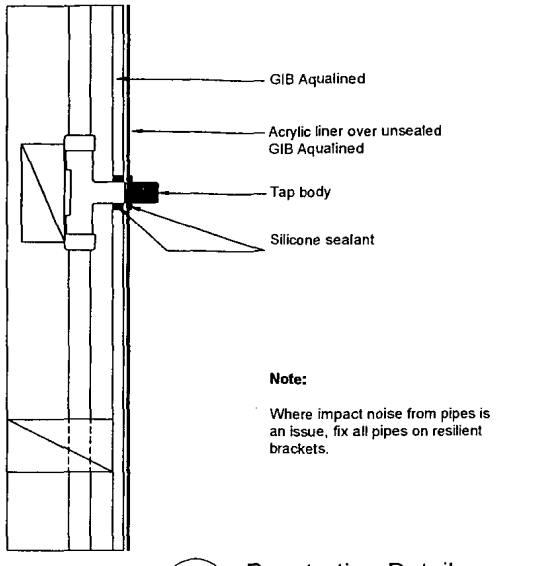
Drawn By
E2/AS1 / Mitek

BENNETT DRAUGHTING

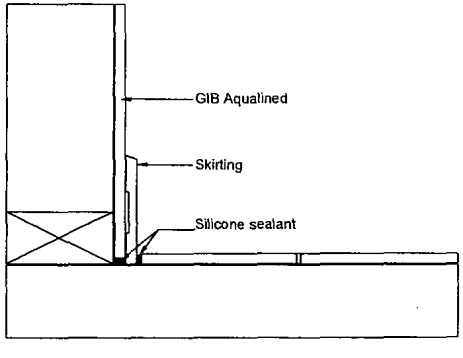
Page No 19 **Total Pages** 21



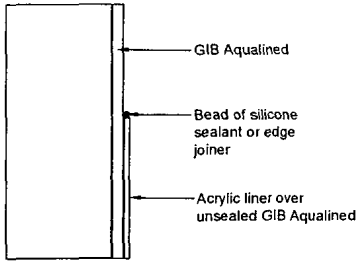
1/20 Shower Wall / Tray Detail
Scale: 1:5



2/20 Penetration Detail
Scale: 1:5



3/20 Wall / Floor Detail
Scale: 1:5



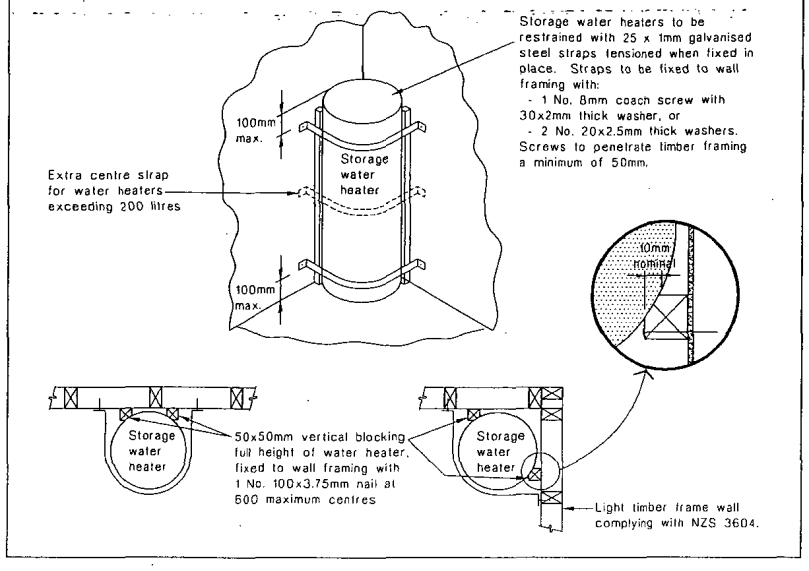
4/20 Liner Top Detail
Scale: 1:5

20 Wet Area Details
Scale: 1:5

PLANS AND SPECIFICATIONS
APPROVED
SUBJECT TO CONDITIONS ENDORSED
ON BUILDING CONSENT
SIGNED _____ DATE 10 FEB 2009
AUTHORISED OFFICER

Job NEW ZEALAND HOUSING FOUNDATION WEST COAST ROAD DEVELOPMENT	
Builder GOLDSMITH DEVELOPMENTS LTD	
Date 08/08	
Page Scale 1:5	
Drawn By Gib Wet Areas	
BENNETT DRAUGHTING	
Page No 20	**Total Pages** 21

Figure 14: Seismic Restraint of Storage Water Heaters 90 - 360 litres
Paragraph 6.11.4



6.11.4 Structural Support

NZBC B1.3.2 requires *building elements* (including *storage water heaters)* to be adequately supported including support against earthquake forces. The method illustrated in Figure 14 is acceptable for *water heaters* up to 360 litre capacity. Where fittings and pipework are attached to the *water heater* through the supporting platform or floor a 50 mm minimum clearance shall be provided between the fitting and the support structure.

6.11.5 Another acceptable solution for securing *storage water heaters* against seismic forces is given in Section 203 of NZS 4603.

6.12 Hot water pipe sizes

6.12.1 The *diameter* of hot water supply pipes from *storage water heaters* and to *sanitary fixtures* shall be no less than those required by Table 4.

EXTERIOR CLADDING RISK SCORE ANALYSIS

DATE: August 2008

ADDRESS Housing Foundation of New Zealand - Type 4 House
BUILDING FACE TYPICAL
ELEV ALL

RISK SCORE	LOW	MEDIUM	HIGH	VERY HIGH	SCORE
WIND ZONE	LOW	MEDIUM	HIGH	VERY HIGH	
	0	0	1	2	1
NUMER OF STOREY'S	1 STOREY	2 STOREY'S IN PART	2 STOREY'S	MORE THAN 2 STOREY'S	
	0	1	2	4	2
ROOF TYPE	HIP OR GABLE WITH EAVES	GABLE WITHOUT EAVES OR SIMPLE MONO-PITCH	COMPLEX SHAPES & DORMERS	MULTIPLE LEVELS COMPLEX SHAPES PARAPETS	
	0	1	3	5	0
EAVE WIDTH	GREATER THAN 600 MM @ FIRST FLOOR LEVEL	450-600 OR GREATER THAN 600 MM @ 2ND FLOOR LEVEL	100-450MM OR 450MM @ 2ND FLOOR LEVEL	0-100MM, 100-450MM @ 2ND FLOOR LEVEL 450-600MM @ 3RD FLOOR LEVEL	
	0	1	2	5	1
ENVELOPE CAPACITY	SIMPLE RECTANGULAR L, T OR BOOMERANG ALL WALLS COVERED BY EAVES.	BUILDINGS WITH ROOFS ABUTTING ADJACENT WALLS	BUILDINGS & MULTIPLE CLADDING AND ROOFLINE ABUTTING ADJACENT WALLS	AS HIGH WITH MULTIPLE PENETRATIONS, OTHER THAN DOORS & WINDOWS, THROUGH WALLS, COMPLEX JUNCTIONS	
	0	1	3	6	3
DECKS & BALCONIES	NONE, TIMBER SLAT DECK OR PORCH @ GROUND LEVEL	FULLY COVERED IN PLAN BY ROOF OR TIMBER SLAT DECK ATTACHED @ 1ST FLOOR OR 2ND FLOOR LEVELS	EXPOSED IN PLAN OR CANTILEVERED @ 1ST FLOOR LEVEL	EXPOSED IN PLAN OR CANTILEVERED @ 2ND FLOOR LEVEL OR ABOVE	
	0	2	4	6	0
KEY		0-10 MEDIUM RISK			7

PLANS AND SPECIFICATIONS APPROVED
SUBJECT TO CONDITIONS ENDORSED ON BUILDING CONSENT
SIGNED _____ DATE 10 FEB 2009
AUTHORISED OFFICER

Job
NEW ZEALAND HOUSING FOUNDATION
WEST COAST ROAD DEVELOPMENT

Builder
GOLDSMITH DEVELOPMENTS LTD

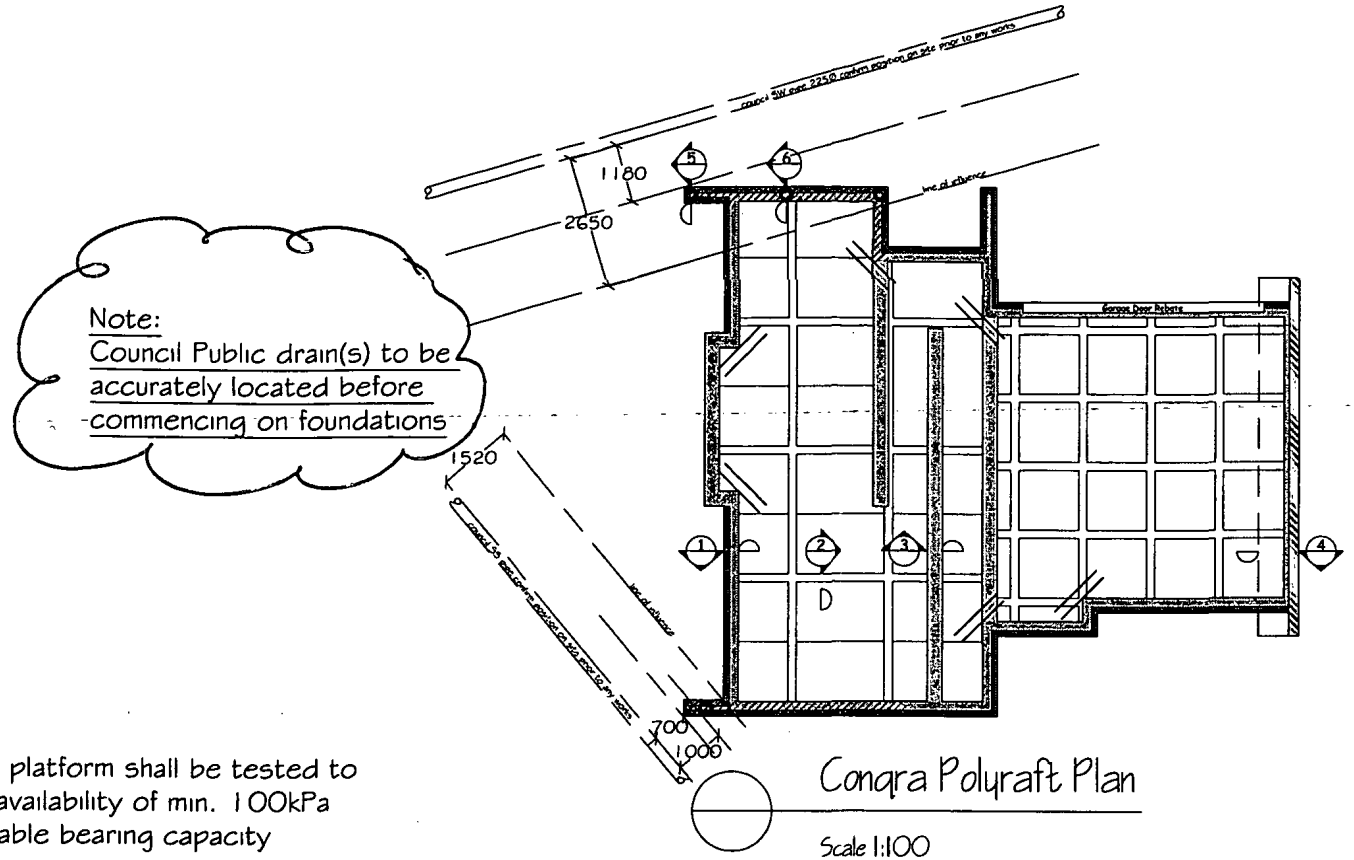
Date
08/08

Page Scale
NTS

Drawn By
G12

BENNETT DRAUGHTING

Page No 21 **Total Pages** 21



Conqra Polyraft Plan

Scale 1:100

Floor Area	Perimeter
97m²	52m

NOTE:
Building platform shall be tested to ensure availability of min. 100kPa dependable bearing capacity

It is increasingly common for building consent authorities to require a "PS4" for specifically designed structures. For Wilton Joubert Ltd. to issue this, we need to inspect prior to concrete pour. Ring 09 579 1114 to arrange a booking. A local, qualified engineer may also be engaged to carry out the inspection & issue a PS4 subsequently
NO INSPECTION EQUALS
NO PS4 ISSUED.

Legend:

Re Entrant corner steel 2-M12 x 1200mm at 200 crs

300Ø Bored Concrete Pile. 1-M12 placed centrally, min. 2.5m into good natural ground or 1.5m below invert level whichever depth is greater.

Edge Beam 300W×305D 5-M12 along

PLANS AND SPECIFICATIONS
APPROVED
SUBJECT TO CONDITIONS ENDORSED
ON BUILDING CONSENT
SIGNED _____ DATE 10 FEB 2009
AUTHORISED OFFICER

Conqra Polyraft
##

NOTES:

Only Conqra polystyrene pods and RG galvanised spacers to be used for this design.
Under no circumstances shall polystyrene spacers be used.
Where underfloor heating is installed, floor topping shall be increased to 120mm.
Unless otherwise noted;
All Concrete strength shall be minimum 25MPa in sea spary zone, 20MPa elsewhere (if in doubt check with local T.A.)
Do not scale from Drawings. Refer Architectural Drawings for overall dimensions.

Revision	Description	Date
01	Pipeline influence	27-01-09

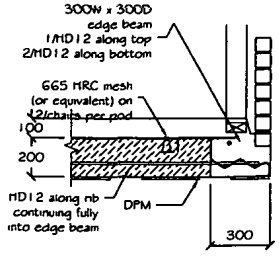
Structural Engineers:
WILTON JOUBERT Ltd
P.O. BOX 11-381
ELLERSLIE
AUCKLAND

Ph (09) 579 1114
Fax (09) 579 7778

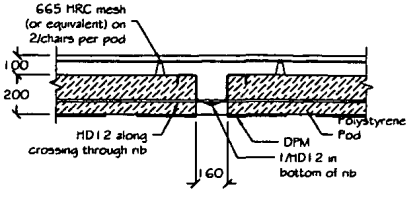
Job Title:
Proposed Residence
lot 32 of
Lot 2 : DP 339810
19 Titch Place

Sheet Title:
Conqra Polyraft Plan

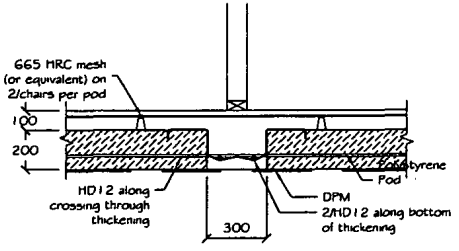
Drawn: BR	Chkd: TE
Date: DL	
Scale: 1:100	File: 19-05-08
JOB # WJ15193	Sheet: S1
Revision 01	



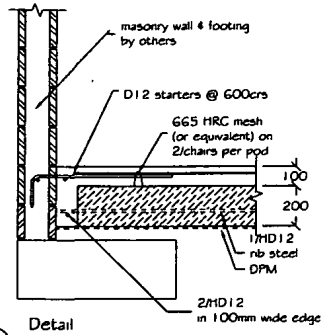
1 Detail
Conqra Polyraft
Perimeter Beam 300
Scale 1:25



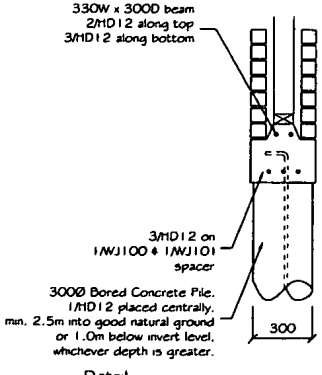
2 Detail
Conqra Polyraft
Internal Beam 160
Scale 1:25



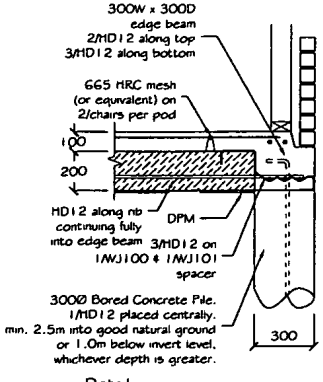
3 Detail
Conqra Polyraft
Internal Beam 300
Scale 1:25



4 Detail
Raftfloor to Wall
Scale 1:25



5 Detail
Wingwall Beam - 330 on
3000 BCP
Scale 1:25



6 Detail
Raftfloor Edge Beam - 300
on 3000 BCP
Scale 1:25

PLANS AND SPECIFICATIONS
APPROVED
SUBJECT TO CONDITIONS ENDORSED
ON BUILDING CONSENT
SIGNED _____ DATE 10 FEB 2009
AUTHORISED OFFICER

Conqra Polyraft
##

NOTES:

Only Conqra polystyrene pods and RG galvanised spacers to be used for this design.
Under no circumstances shall polystyrene spacers be used.
Where underfloor heating is installed, floor topping shall be increased to 120mm.
Unless otherwise noted;
All Concrete strength shall be minimum 25MPa in sea spary zone, 20MPa elsewhere (if in doubt check with local T.A.)
Do not scale from Drawings.
Refer Architectural Drawings for overall dimensions.

Revision	Description	Date
01	Pipeline Influence	27-01-09

Structural Engineers.
WILTON JOUBERT Ltd
P.O. BOX 11-381
ELLERSLIE
AUCKLAND
Ph (09) 579 1114
Fax (09) 579 7778

Job Title.
Proposed Residence
lot 32 of
Lot 2 : DP 339810
19 Titch Place

Sheet Title.
Conqra Polyraft
Details

Drawn BR	Chkd TE
Design DL	
Scale 1:25	Date 19-05-08
JOB # WJ15193	Sheet S2
Revision 01	

COM-2008-1464

Building Consent

SECTION 51, BUILDING ACT 2004

Waitakere City Council
Te Taiao o Waitakere

THE BUILDING

Street address of building:	19 Titch Place, Glen Eden
Legal description of land where building is located:	LOT 32 DP 389289
‡Building name:	
‡Location of building within site/block number:	LOT 32 DP 389289
‡Level/unit number:	

THE OWNER

Name of owner: NEW ZEALAND HOUSING FOUNDATION

*Contact person: NEW ZEALAND HOUSING FOUNDATION

Mailing address: C/- Housing Foundation, PO Box 36027, Northcote, NORTH SHORE CITY 0748

Street address/registered office:

Phone number: Landline: Mobile:

Daytime: After hours:

Facsimile number:

Email address:

Website:

First point of contact for communications with the council/building consent authority: †

BUILDING WORK

The following building work is authorised by this building consent:

New 4 bedroom dwelling with attached garaging. Type 4A. CAT2

This building consent is issued under section 51 of the Building Act 2004. This building consent does not relieve the owner of the building (or proposed building) of any duty or responsibility under any other Act relating to or affecting the building (or proposed building).

This building consent also does not permit the construction, alteration, demolition, or removal of the building (or proposed building) if that construction, alteration, demolition, or removal would be in breach of any other Act.

‡This building consent is subject to the attached conditions: 3 pages

COMPLIANCE SCHEDULE

A compliance schedule is not required for the building.

‡ATTACHMENTS

Copies of the following documents are attached to this building consent:

Signature

Position

On behalf of: Waitakere City Council

Date: 5 March 2009

*Delete if the applicant is an individual.

†Contact details must be in New Zealand.

‡ Delete items not applicable.

§Delete if the building is intended to have a life of 50 years or more.

Notes (The following are not applicable for amendments):

1. On completion of the work covered by this building consent application must be made on the prescribed form for Code Compliance Certificate, once final inspection(s) have passed.
1. The building consent will lapse and be of no effect if the building work has not been commenced within 12 calendar months of the date of issue of the consent.
2. Work must be completed and the Code Compliance Certificate issued within 2 years of the date of approval for granting of the consent.

BUILDING CONSENT CONDITIONS

Waitakere City Council
Te Tatao o Waitakere

The above Building Consent has been approved today subject to the following conditions:-

1. To notations on plans.

2. The applicant shall take all steps necessary to avoid damaging the street, footpath or verge area and shall reinstate any damage to those areas to the satisfaction of Council.

3. Where one is not already constructed, the owner shall construct to a standard satisfactory to Council a vehicle crossing between the carriageway and the owner's land in accordance with Council Code of Practice.

   If a non-standard crossing is required approval must be obtained from Transport Assets prior to construction of the crossing.

   When excavating for the crossing the owner shall take all steps necessary to avoid damaging Council's watermain, which is generally located in the berm area with 450mm minimum cover. Where more than 250mm is being excavated the depth and location of the watermain should be confirmed by hand digging prior to commencement of excavation. (For further information please contact Council on phone 836-8045). In the event of any damage to the watermain the cost of any repairs will be charged to the owner.

4. Officers of Council are entitled at all times during normal working hours or while work is being carried out, to inspect
   - land on which building work is being or is proposed to be carried out
   - building work that has been or is being carried out on or off the building site
   - any building

5. All handrails/barriers shall comply with N.Z.B.C. F4 & B1/AS 2. Stairs and Landings shall comply with N.Z.B.C. D1.

6. Where mechanical ventilation is provided to remove moisture and other contaminants from kitchens, bathrooms, toilet spaces and laundries the air shall be exhausted to the outside of the building.

7. The floor surfaces of any space containing sanitary fixtures shall be impervious in accordance with N.Z.B.C. E3:3.1. Glazing in Bathrooms shall comply with N.Z.S. 4223, Part 3, Tables 3. D4.

8. Opening windows which permit a fall of greater than 1.000m, shall have restrictors fitted in accordance with F4 of the NZ Building Code.

9. Domestic smoke alarms complying with at least one of UL 217, CAN/ULC S531, AS 3786, BS 5446:Part 1 standards shall be installed in accordance with NZBC clause F7.

10. Drainage shall be inspected and tested by Waitakere City Council Plumbing & Drainage Surveyor prior to backfilling.

11. Stormwater / sanitary drainage shall be carried out by a registered drainlayer in compliance with the NZ Building Code or an alternative solution approved by Council.

12. Prior to commencing work the owner shall ensure that the proposed building is clear of any sewers and shall ensure gravity fall of foul and stormwater drains is obtained within required gradients.

13. Sanitary plumbing to be carried out by a registered plumber in compliance with the NZ Building Code or an alternative solution approved by Council and shall be inspected by Waitakere City Council Plumbing & Drainage Surveyor prior to closing in walls, cavities and under floor.

14. A storm water cesspit is to be located in yard / driveway in accordance with NZBC E1/AS1 3.6 to obtain best storm water control. Yard / driveways to be kerbed or channelled to direct stormwater to cesspit.

15.

Figure 8: Type-one surface water sump
Paragraph 3.6.2

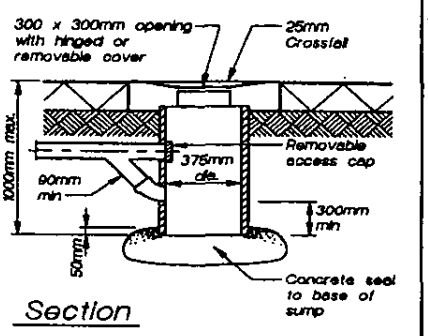
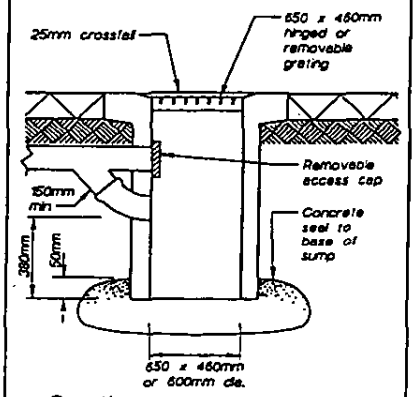


Figure 9: Type-two surface water sump
Paragraph 3.6.2



16. Provide an overflow relief gully as per AS/NZS 3500.2.2 1996.

17. As-Built Drawings:
The drainlayer must provide an 'as-built' drainage drawing to the drainage surveyor at the time of the inspection.

18. The builder/drainlayer is to check and verify all drainage depths, positions and connections before commencing any work on site.

19. Subject to compliance with the conditions of Resource Consents (LUC2006-1077/1078)granted 30/10/06 pursuant to Sections 104, 105 & 108 of the Resource Management Act 1991.

20. A Licensed Cadastral Surveyor shall certify to Council in writing prior to work progressing beyond the pre-lining stage that the buildings are located exactly as proposed in the application and will not exceed the degree of infringement applied for in relation to the overall height and height in relation to boundary controls of the District Plan and elsewhere complies with the height in relation to boundary and overall height rules of the District Plan. No work shall proceed beyond this stage until receipt of such certification, to the satisfaction of the Manager Resource Consents.

21. Recommendations of soils report are to be read in conjunction with building consent and strictly adhered to.

22. Soils engineer is to be retained to inspect all excavations, foundations over public & private drains and site conditions exposed during construction prior to pouring any concrete, to check that ground conditions encountered are consistent with those assumed in soils report and certify same to Council.

23. Structural Engineer is required to observe the construction of the following building elements to ensure compliance with the design assumptions, requirements, and details has been achieved, and to certify the same to Council. Specifically, observation and certification is required in respect of:-

1. **Rib-raft Foundation slab**
2. **Boundary Block firewall**

24. **PUBLIC DRAINAGE INFRASTRUCTURE – ECOWATER CONDITIONS**

(DE 1) Provide certification from the engineer that the foundations have been constructed in accordance with the approved plans and methodology to protect the public drain. Provide a **post-construction CCTV** inspection of the public drains undertaken after the foundations/piles have been constructed, and prior to commencing construction of the walls. Where the post-construction CCTV reveals a defect in the public drain, the owner shall bear all costs of any remedial measures necessary to ensure proper and safe operation of the drain, before resuming building works.

(DE 2) All outstanding **fees** incurred during the construction process are required to be paid in full prior to releasing the Code Compliance Certificate.

(DE 3) A separate new application for a new 15mm water meter connection has been lodged together with this consent under 3WATER2008 – 607 and will be paid separately before the works can be done by Council's contractor.

WILTON JOUBERT Ltd
Consulting Engineers
STRUCTURAL • GEOTECH • STORMWATER • WASTEWATER

Goldsmith Development Ltd
P. O. Box 272 1664
Papakura
Auckland

Ref No. 16316

09th February 2009

Attn: Lance Goldsmith

Dear Lance,

Re – LOT 32, # 19 TITCH PLACE, GLEN EDEN

As requested by Saby Virdi of Waitakere City Council, we have reviewed the Earthworks Completion Report and Supplementary Geotechnical Assessment Report prepared by Babbage Consultants Ref No. 42608/GE, dated October 2007 and Ref No. 42608 dated November 2006.

After reviewing the report the ground is suitable for the proposed development of residential structures.

We have reviewed the Ribraft floor designed by our company Ref No. 15193 rev 1 and bearing capacity of 100kPa was used to design the ribraft floor are suitable for the soil conditions encountered under this site. Also the rib raft foundation slab for the proposed structure is been designed in accordance with Section 3 of AS2870:1996 for CLASS M (Moderately Expansive) soils.

This report has been prepared for the particular project described to us and no responsibility is accepted for the use of any part of this report in any other context or for any other purpose.

Yours faithfully,
Wilton Joubert Ltd

Prepared by:

Salen Shankar
Senior Geotechnical Engineer

Reviewed by:

Andrew Wilton
B.E. MIPENZ , CPEng IntPE Dip. MS

- 2 FEB 2009

Request to Process Amended Plans

Waitakere City Council
Te Tatao o Waitakere

Send to: Building Consent Processing Unit
Waitakere City Council
Private Bag 93109
Henderson
WAITAKERE CITY 1231

Please complete and return to the Council with your response

Further information / amendment requested by the Council

Application Number: COM-2008-1464 Account Manager: Radmila Ristic

Property address: 19 Titch Place, Glen Eden

Itemise changes:

Geotech letter from Wilton Joubert Engineers confirming suitability of site for the foundation design supplied.

Confirmation Wilton Joubert will do a site inspection prior to construction to confirm the conditions

Revised foundation design showing the public drainage locations & zone of influence of public drains.

Note that all public drains must be accurately located on site before commencing.

Name: Louise Dunn Signed: Date: 2/2/09
Housing Foundations Ltd

Note: Processing of amendments or further information to building consent applications will be charged at the actual processing time at the staff hourly rates listed in the current Regulatory Fees & Charges Schedule.

Bennett Draughting

Draughting Services
P O Box 75 -529
Manurewa
AUCKLAND

Phone / Fax (09) 296 6369
Email Rob: rhbennett@xtra.co.nz
Email Daniel: danielbennett@xtra.co.nz

19.01.09

Waitakere City Council,
Private Bag 93 109,
Henderson,
WAITAKERE CITY 0650.

Attention: Rhonda Hobson.

Dear Rhonda,

Re: Building Consent application for New Zealand Housing Foundation at – (Lot 32)- 19 Titch Place, Place , Glen Eden. Consent : COM-2008-1464.

Further to our meetings with Quentin Dagger and Doug Naylor we attach the additional information requested for this application which relates to Geotech issues and Eco Water queries.

A geotech letter has been obtained from Wilton Joubert Engineers confirming the suitability of the site for the foundation design supplied.
They also confirm that they will do a site inspection for this lot prior to construction to confirm the conditions.

Wilton Joubert have also provided revised foundation designs showing the public drain locations and the "zone of influence" of public drains.
They have also added a note that all public drains must be accurately located on site before commencing.

Attached are 2 copies of the geotech letter and 2 copies of the revised foundation plans from Wilton Joubert.

At this meeting Louise Dunn was advised that we had to send this information to you and that you would forward it to the appropriate person.

Yours faithfully,

R.H.Bennett.

WILTON JOUBERT Ltd

Goldsmith Development Ltd
P. O. Box 272 1664
Papakura
Auckland

16th January 2009

Attn: Lance Goldsmith

Dear Lance,

Re – LOTS 8, 24 TO 32, FOUNDATION AND TITCH PLACE, GLEN EDEN

As requested, we have reviewed the Earthworks Completion Report and Supplementary Geotechnical Assessment Report prepared by Babbage Consultants Ref No. 42608/GE, dated October 2007 and Ref No. 42608 dated November 2006.

After reviewing the report the ground is suitable for the development of residential structures designed in accordance with:

The following bearing capacity values are considered appropriate for design purposes for the Ribraft foundation for the dwelling:

Ultimate Bearing Capacity	300 kPa
Allowable Bearing Capacity (F.O.S =3)	100 kPa
Dependable Bearing Capacity (Φ=0.5)	150 kPa

On the basis of the assessment that the soils on site are moderately expansive, we consider that for foundations other than the rib raft system, a minimum founding depth of 600 mm below cleared ground levels provides an appropriate specific foundation design embedment depth so as to minimise the effect of ground swelling and shrinkage.

For the design of a conventional slab, the above bearing capacities should be used as well.

All foundation excavations should be subject to inspections prior to construction. If any weaker subsoil is encountered at this time foundations can be deepened and/or widened as considered appropriate.

P.O. BOX 11-381 ELLERSLIE, AUCKLAND, NEW ZEALAND PH: +64 (9) 579 1114 FAX: +64 (9) 579 7778
EMAIL: kobus@wiltonjoubert.co.nz EMAIL: andy@wiltonjoubert.co.nz www.wiltonjoubert.co.nz

We have reviewed the Ribraft floor designed by our company on Lots 24 to 26 and find they are suitable for the soil conditions encountered under these sites.

Limitation:

The recommendations and opinions contained in this report are based on our visual reconnaissance of the site, information from geological maps and upon data from the field investigation as well as the results of in-situ testing of soil from Babbage Consultants report.

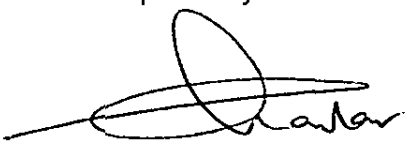
During construction, an engineer competent to judge whether the conditions are compatible with the assumption made in this report should examine the site. In all circumstances, if variations in the subsoil occur which differ from that described or assumed to exist, then the matter should be referred back to Wilton Joubert Ltd.

The performance behaviour outlined by this report is dependent on the construction activity and actions of the builder/contractor. Inappropriate actions during the construction phase may cause behaviour outside the limits given in this report.

This report has been prepared for the particular project described to us and no responsibility is accepted for the use of any part of this report in any other context or for any other purpose.

Yours faithfully,
Wilton Joubert Ltd

Prepared by:



Salen Shankar
Senior Geotechnical Engineer

Reviewed by:

Andrew Wilton
B.E. MIPENZ , CPEng IntPE Dip. MS

Waitakere City Council
Te Taiao o Waitakere

Waitakere City Council
Waitakere Central
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DX CX 10250 Auckland Mail Centre
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Website: www.waitakere.govt.nz

7 January 2009

NEW ZEALAND HOUSING FOUNDATION
C/- Housing Foundation
P O Box 36027
Northcote
NORTH SHORE CITY 0748

RR1

Description: New 4 bedroom dwelling with attached garaging. Type 4A. CAT2

Application Location: 19 Titch Place, Glen Eden

Our Reference: COM-2008-1464

Dear Sir/Madam

Your application for building consent was processed for compliance with the requirements of the New Zealand Building Code and processing was suspended and a letter sent requesting further information.

To date we do not appear to have received a response to our letter and so we are now issuing a second request for this information. If no reply has been received within 7 working days this application will be refused under Section 50 of the Building Act 2004 without further reference.

Attached is a copy of our previous letter for your reference. All requested items must be collated together and submitted to Council as **one document.** Should this not occur the material will be returned to the applicant and the processing of your consent **will not recommence** until such time as all items requested below are received.

Please supply all requested information in duplicate, complete the enclosed Request to Process Amended Plans form and send to:

Building Consent Processing Unit
Waitakere City Council
Private Bag 93109
Henderson
Waitakere City

Please note: It is important that your replies are not sent directly to the technical units or marked to the attention of specific officers.

Should you wish to discuss any of the technical requests above, please contact the staff member as indicated by phone on 839 0400.

Yours faithfully

Quentin Dagger
Team Leader
Building Consent Processing Unit

Waitakere City Council
Te Taiao o Waitakere

Waitakere City Council
Waitakere Central
6 Henderson Valley Road
Henderson 0612

Private Bag 93109
Henderson 0650
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Website: www.waitakere.govt.nz

18 November 2008

NEW ZEALAND HOUSING FOUNDATION
C/- Housing Foundation
P O Box 36027
Northcote
NORTH SHORE CITY 0748

Building Consent Application: COM-2008-1464

Application Location: 19 Titch Place, Glen Eden

Description of Project: New 4 bedroom dwelling with attached garaging. Type 4A. CAT2

A) Please note that District Plan compliance is assessed separately with the PIM application. You should refer to the PIM to identify all requirements in terms of District Plan matters. If changes are required to the Building Consent application as a result of resolving District Plan issues, a new Building Consent application may be required.

B) Council's Technical Specialists have now completed the initial processing of your consent. We request that you supply **two copies** of each of the following:

1. STRUCTURAL ENGINEER

Please contact Saby Virdi on 839 0400 extension 8782 or
Email: saby.virdi@waitakere.govt.nz for enquiries or clarification only, relating to the requirements listed below.

a. We refer to Section 4.1 & 4.2, Babbage Consultants Limited Geotechnical Completion Report, Ref 42608/GE, October 2007. The report requires the footings to be taken to at least 600mm below FFL. This includes the perimeter footing of Waffle slabs. Geotechnical Engineer is requested to clarify, as the edge beams to the slab shown in structural drawing S1 / 15039 does not satisfy the above requirements.
Geotechnical Engineer is requested to clarify and confirm the design recommendations for the proposed foundations rib-raft slab.

b. The building consent documentation suggests that Producer Statement PS1 was supplied for the design of rib-raft foundation slab with this applications but it seems to be missing from the application. Please clarify.

2. PUBLIC DRAINAGE INFRASTRUCTURE – ECOWATER REQUIREMENTS

Please contact Luz Tandingan on 836 8000 extension 8985 for enquiries or clarification relating to the requirements numbered (DE 1-2) below.

(DE 1) Council Asset Engineer has special requirement for the proposed foundations as they are within close proximity of the public stormwater drain. Provide / amend details to show **bridging of foundations** or retaining walls that are over or within 2.0m of the outside wall of public drain(s). Driven piles to be kept a minimum of 2.0m from the outside wall of the pipe unless pre-drilled to 0.5m below the drain invert. Foundations (with piles if required) further than 1.0m from the outside wall of the drain are to be kept 0.5m below the 45-degree zone of influence taken from the pipe invert. Bored piles are to be kept 1.0m clear

of the outside wall of the pipe and taken 0.5m below the pipe invert. Specify on the plans the chosen construction methodology and design details for the piles/foundations.

(DE 2) Specify on the plans '**Council's public drain(s) to be accurately located** before **commencing on foundations'.**

Please highlight all changes on amended plans.

The enclosed Request to Process Amended Plans form must be completed and sent only to the following:

Building Consent Processing Unit
Waitakere City Council
Private Bag 93109
Henderson
Waitakere City 0650

We would appreciate the return of the **complete set** of information by **16 December 2008**, so that processing can continue without delay.

Please note, electronic submission of separate requirements will not be processed

Please also advise us in writing immediately should you no longer wish to proceed with this application.

Should you wish to discuss any of the technical requests above, please contact the staff member as indicated by phone on 839 0400.

Yours faithfully

Radmila Ristic

cc: **Owner:**
NEW ZEALAND HOUSING FOUNDATION
PO Box 36027
Northcote
NORTH SHORE CITY 0748

Waitakere City Council
Te Taiao o Waitakere

Waitakere City Council
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18 November 2008

NEW ZEALAND HOUSING FOUNDATION
C/- Housing Foundation
P O Box 36027
Northcote
NORTH SHORE CITY 0748

Building Consent Application: COM-2008-1464

Application Location: 19 Titch Place, Glen Eden

Description of Project: New 4 bedroom dwelling with attached garaging. Type 4A. CAT2

A) Please note that District Plan compliance is assessed separately with the PIM application. You should refer to the PIM to identify all requirements in terms of District Plan matters. If changes are required to the Building Consent application as a result of resolving District Plan issues, a new Building Consent application may be required.

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Geotechnical Engineer is requested to clarify and confirm the design recommendations for the proposed foundations rib-raft slab.

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of the outside wall of the pipe and taken 0.5m below the pipe invert. Specify on the plans the chosen construction methodology and design details for the piles/foundations.

(DE 2) Specify on the plans '**Council's public drain(s) to be accurately located** before **commencing on foundations'.**

Please highlight all changes on amended plans.

The enclosed Request to Process Amended Plans form must be completed and sent only to the following:

Building Consent Processing Unit
Waitakere City Council
Private Bag 93109
Henderson
Waitakere City 0650

We would appreciate the return of the **complete set** of information by **16 December 2008**, so that processing can continue without delay.

Please note, electronic submission of separate requirements will not be processed

Please also advise us in writing immediately should you no longer wish to proceed with this application.

Should you wish to discuss any of the technical requests above, please contact the staff member as indicated by phone on 839 0400.

Yours faithfully

Radmila Ristic

cc: **Owner:**
NEW ZEALAND HOUSING FOUNDATION
PO Box 36027
Northcote
NORTH SHORE CITY 0748

Waitakere City Council
Te Taiao o Waitakere

Waitakere City Council
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18 November 2008

NEW ZEALAND HOUSING FOUNDATION
PO Box 36027
Northcote
NORTH SHORE CITY 0748

(Copy for your interest - Original sent to authorised representative)

Waitakere City Council
Te Taiao o Waitakere

Waitakere City Council
Waitakere Central
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31 October 2008

NEW ZEALAND HOUSING FOUNDATION
C/- Housing Foundation
P O Box 36027
Northcote
NORTH SHORE CITY 0748

SUPERSEDED
18 NOV 2008

Building Consent Application: COM-2008-1464

Application Location: 19 Titch Place, Glen Eden

Description of Project: New 4 bedroom dwelling with attached garaging. Type 4A. CAT2

A) Please note that District Plan compliance is assessed separately with the PIM application. You should refer to the PIM to identify all requirements in terms of District Plan matters. If changes are required to the Building Consent application as a result of resolving District Plan issues, a new Building Consent application may be required.

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Please contact Saby Virdi on 839 0400 extension 8782 or
Email: saby.virdi@waitakere.govt.nz for enquiries or clarification only, relating to the requirements listed below.

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Geotechnical Engineer is requested to clarify and confirm the design recommendations for the proposed foundations rib-raft slab.

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of the outside wall of the pipe and taken 0.5m below the pipe invert. Specify on the plans the chosen construction methodology and design details for the piles/foundations.

(DE 2) Specify on the plans '**Council's public drain(s) to be accurately located** before **commencing on foundations'.**

3. BUILDING SURVEYOR REQUIREMENTS

Please contact Radmila Ristic on 839 0400 extension 8313 or
Email: Radmila.Ristic@waitakere.govt.nz for enquiries or clarification only, relating to the requirements listed below.

a) Please could you provide verification for the building cost, had been provided at application form
b) On sheet 14 brick venier windows details please cross-reference to sections and elevations.
c) On sheet 17 apron flashing detail please cross-reference .
d) On sheet 18 , details 1,2,3 please cross reference.
e) On sheet 20 please confirm the type of waterproofing membrane.
f) On sheet 22 details1, 2, 3 please cross reference to sections and elevations.
g) .Please provide specifications for roof underlay Thermacraft 215, self supporting.
h) (Product specified on sheet 9 cross-section)
i) Please provide lintels sizes on the plans.

Please highlight all changes on amended plans.

The enclosed Request to Process Amended Plans form must be completed and sent only to the following:

Building Consent Processing Unit
Waitakere City Council
Private Bag 93109
Henderson
Waitakere City 0650

We would appreciate the return of the **complete set** of information by **28 November 2008**, so that processing can continue without delay.

Please note, electronic submission of separate requirements will not be processed

Please also advise us in writing immediately should you no longer wish to proceed with this application.

Should you wish to discuss any of the technical requests above, please contact the staff member as indicated by phone on 839 0400.

Yours faithfully

Radmila Ristic

cc: **Owner:**
NEW ZEALAND HOUSING FOUNDATION
PO Box 36027
Northcote
NORTH SHORE CITY 0748

PROJECT INFORMATION MEMORANDUM NO: COM-2008-1464

Section 31, Building Act 2004
ISSUED BY: WAITAKERE CITY COUNCIL

Waitakere City Council
Te Taiao o Waitakere

APPLICANT	PROJECT
Name: NEW ZEALAND HOUSING FOUNDATION **Mailing Address:** C/- Housing Foundation P O Box 36027 Northcote NORTH SHORE CITY 0748	**Proposed Work** New 4 bedroom dwelling with attached garaging. Type 4A. CAT2 **Intended Use(s) in detail:** Unknown **Intended Life:** Indefinite, but not less than 50 years **This is:**
PROJECT LOCATION	☑ **Confirmation that the proposed** building work may be undertaken, subject to the provisions of the Building Act 2004, and any requirements of the Building Consent.
Street Address: 19 Titch Place, Glen Eden	
LEGAL DESCRIPTION	Not yet applied for ☐ No: attached ☐ Not yet issued ☐
Property Number: **Valuation Roll Number:** **Legal Description:** LOT 32 DP 389289	

This project information memorandum includes:

Information identifying relevant special features of the land concerned.	Yes
Information about the land or buildings concerned notified to the Council by any statutory organisation having the power to classify land or buildings.	No
Details of relevant utility systems.	Yes
Details of authorisations which have been granted.	Yes
Notification of any other authorisations which must be obtained before the proposed building work may be undertaken.	No
Details of authorisations which have been refused.	No

Signed for and on behalf of Council:

Name:

Position: Account Manager - Building Consents Date: 31-Oct-2008

WAITAKERE CITY COUNCIL

Waitakere City Council
Te Tatao o Waitakere

PROJECT INFORMATION MEMORANDUM

PIM : **COM-2008-1464**

SITE ADDRESS: **19 Titch Place, Glen Eden**

LEGAL DESCRIPTION: **LOT 32 DP 389289**

BUILDING

Use of a Public Building

In accordance with Section 363 of the Building Act 2004, please note that it is an offence to permit the use of a public building for which no building consent or code compliance certificate has been issued.

Electricity Transmission Lines and Towers

If there are high-tension electricity transmission lines over or adjacent to the property or there are transmission towers/pylons on or adjacent to the property the applicant must ensure that the proposed building complies with the line clearances and/or the requirements for excavation in the vicinity of towers/pylons prescribed in the New Zealand Electrical Code of Practice for Electrical Safe Distances.

It is the responsibility of the applicant to ensure compliance and if necessary to contact the line owner to determine whether the proposed building will comply prior to commencing construction.

Hazard Register:

a. The Owner shall not carry out any development nor place, erect, construct or permit to remain any buildings on any part of the land unless the foundations of all buildings have been the subject of specific design by a registered engineer who is familiar with the content of the Geotechnical Completion Report prepared by Babbage Consultants Reference 42608/GE and dated October 2007 (held in Council's records under RMA20061078) (hereinafter referred to as "the said Geotechnical Completion Reports)

b. All earthworks, development and construction on any part of the land shall be carried out in accordance with:

   (i) The report referred to herein where applicable; and

   (ii) All specific design requirements referred to herein where applicable; and

   (iii) To the entire satisfaction of the Waitakere City Council.

Wind Zone: Low Wind Zone

Sea Spray Zone: No

PLUMBING

Existing foul water drains:	NO	**Existing storm water drains:**	NO
Sanitary Sewer:	YES	**Stormwater Sewer:**	YES

If no state any disposal requirements: N/A

Watercare Services Limited Sewer clearance required: NO

Watercare Services Limited Bulk Watermain clearance required: NO

Miscellaneous Comments

N/A

HEALTH/DANGEROUS GOODS:

Not applicable.

DRAINAGE
Requirements for building over or adjacent to Council sewer: YES

If yes:

This consent seeks to apply for the construction of a new dwelling on a vacant lot with an attached garage at the property 19 Titch Place, Glen Eden. The site is legally described as Lot 32 DP 339810 and has a total land area of about 349m^2. The site is a result of a recent subdivision consent (SUB-2006-1078) that was earlier granted by Council. Under the current district plan the site is classified as *Living* human environment and *General* natural environment. The sites topography and GIS records of Council shows that the site slightly dips towards the road carriageway.

Under the associated subdivision consent Council ensured that the site has provisions to connect to reticulated networks for stormwater, wastewater and water supply. The site has existing connections to these services. The proposal to build a new 4 bedroom dwelling along with a garage, and the proposal seems to be in accordance with EcoWater policies, except for the close proximity of the dining foundations from the public stormwater drain by about 1.2metres. The proposed new total impermeable areas on site are within the allowed limit under the district plan. The stormwater from the site is collected via spouting, drains, cesspit and downpipes and is disposed of to Council's reticulated network using an existing stormwater connection. The wastewater is collected from the site and is disposed off to the wastewater network via existing connection on site.

This application has been assessed by EcoWater drainage engineer and the following are the requirements:

(DE 1) Council Asset Engineer has special requirement for the proposed foundations as they are within close proximity of the public stormwater drain. Provide / amend details to show **bridging of foundations** or retaining walls that are over or within 2.0m of the outside wall of public drain(s). Driven piles to be kept a minimum of 2.0m from the outside wall of the pipe unless pre-drilled to 0.5m below the drain invert. Foundations (with piles if required) further than 1.0m from the outside wall of the drain are to be kept 0.5m below the 45-degree zone of influence taken from the pipe invert. Bored piles are to be kept 1.0m clear of the outside wall of the pipe and taken 0.5m below the pipe invert. Specify on the plans the chosen construction methodology and design details for the piles/foundations.

(DE 2) Specify on the plans '**Council's public drain(s) to be accurately located** before commencing on foundations'.

The following conditions maybe applicable once the above requirements have been satisfactorily met.

(DE 3) Provide certification from the engineer that the foundations have been constructed in accordance with the approved plans and methodology to protect the public drain. Provide a **post-construction CCTV** inspection of the public drains undertaken after the foundations/piles have been constructed, and prior to commencing construction of the

walls. Where the post-construction CCTV reveals a defect in the public drain, the owner shall bear all costs of any remedial measures necessary to ensure proper and safe operation of the drain, before resuming building works.

(DE 4) All outstanding **fees** incurred during the construction process are required to be paid in full prior to releasing the Code Compliance Certificate.

(DE 5) A separate new application for a new 15mm water meter connection has been lodged together with this consent under 3WATER2008 – 607 and will be paid separately before the works can be done by Council's contractor.

MISCELLANEOUS REQUIREMENTS

PLANNING

Operative District Plan:

Natural Area: General

Natural Landscape Elements: NA

Human Environment: Living

Heritage, Designation or Scheduled Site Notation: NA

Road Hierarchy: Local

Natural Hazards: None indicated but take note S224 c certificate not issued yet for SUB 2006-1078.

Impact on Waahi Tapu?: refer LUC/SUB20061077/1078.

Archaeological Site?: In the event of archaeological evidence being uncovered (e.g. shell, middens, hangi or ovens, pit depressions, defensive ditches, artifactual material or human bones) work shall cease in the vicinity of the discovery, the area secured, and the Council (Ph 839-0400) contacted. Activity on the site will remain halted until the Manager Resource Consents gives approval for operations to recommence.

District Plan:

Site Identified to be potentially or subject to Erosion/Stability or subsidence: NO

Site Identified to be potentially or subject to Flooding : NO

Resource Consent Requirements:

Land Use Consent requirements: *1, *2
*1 YES / ALREADY GRANTED
Subject to compliance with the conditions of Resource Consent (LUC2006-1077)granted 30/10/06 pursuant to Sections 104, 105 & 108 of the Resource Management Act 1991.

*2 Please take note of the following requirements:
Geotechnical Conditions (LUC2006-1077)

30. **A geotechnical investigation shall be completed by an experienced geotechnical engineer for the detailed design of earthworks at the site**. This shall include

recommendations for the batter slopes and an assessment of overall stability off site slopes (supported by limit equilibrium analysis), consolidation characteristics of the soils, fill quality and compaction requirements. All the requirements for constructing and controlling engineered fill shall be detailed. The report on this work shall accompany the earthworks construction management report.

31. Groundwater drainage measures for the development shall be designed by an experienced geotechnical engineer, taking into account existing information on shallow groundwater levels, anticipated maximum winter high and summer low groundwater levels, and potential effects on adjacent developed properties or roadways.

32. Building consents shall be required for the retaining walls which shall be no higher that 2.0 metres on all boundaries.

33. Pavement designs shall be confirmed by an experienced geotechnical engineer following the completion of earthworks.

34. A producer statement must be provided on completion of earthworks together with an earthworks completion report stating what requirements if any are necessary for the individual lots.

35. Unless there is clear evidence in the earthworks completion report to be provided by an engineer that NZS 3604 requirements have been fully met, all foundations shall require specific design.

36. Foundations of all lots shall be verified by an experienced geotechnical engineer familiar with the geotechnical report and shall take into account the potential for shrink/swell behaviour.

37. Stormwater pond construction shall be supervised by an experienced engineer familiar with the geotechnical report.

38. The proposed stormwater management systems to be used during construction shall be reviewed by an experienced engineer familiar with the geotechnical report.

39. The proposed stormwater management systems to be used during construction shall be reviewed by an experienced engineer familiar with the geotechnical report.

Subdivision Consent Requirements: *1, *2

*1 YES / ALREADY GRANTED

Subject to compliance with the conditions of Resource Consent (SUB2006-1078)granted 25/1/07 pursuant to Sections 104, 105 & 108 of the Resource Management Act 1991.

*2 Take note of the following conditions:

GEOTECHNICAL CONDITIONS (SUB2006-1078)

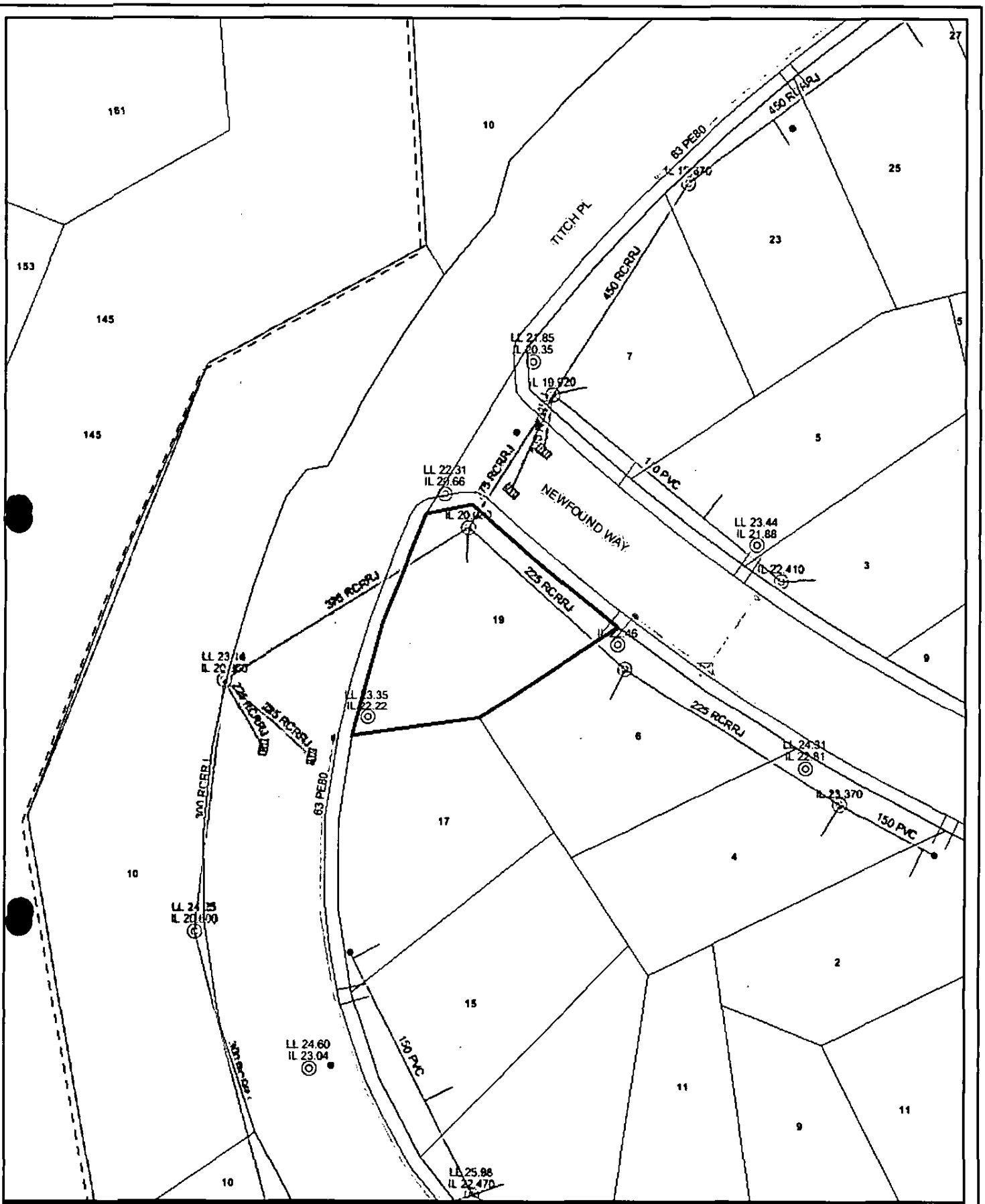
(GT 1) Arising from **GEOTECHNICAL CONDITIONS 30-39** in **Part A (Resource Consent LUC2006-1077), further foundation design conditions may be applicable on receipt of the earthworks completion report**. A **consent notice** pursuant to Section 221 of the Act may be required to be issued and registered on the new titles to be issued for any affected lots.

Any Other Requirements:
YES

A Licensed Cadastral Surveyor shall certify to Council in writing prior to work progressing beyond the pre-lining stage that the buildings are located exactly as proposed in the application and will not exceed the degree of infringement applied for in relation to the overall height and height in relation to boundary controls of the District Plan and elsewhere complies with the height in relation to boundary and overall height rules of the District Plan. No work shall proceed beyond this stage until receipt of such certification, to the satisfaction of the Manager Resource Consents.

Vehicle Crossing/Street Damage Deposit: REQUIRED

If a vehicle crossing is required or the value of work requires a street damage deposit, pursuant to Waitakere City Council Bylaw No. 22 you are required to complete an application in the prescribed form for a vehicle crossing and street damage deposit with your application for building consent.



UNDERGROUND SERVICES

Scale = 1:500

Print Date: 14/10/2008

19 Titch Place Glen Eden

LOT 32 DP 389289

Cadastral Information from Land Information New Zealand Digital Cadastral Database DCDB Crown Copyright Reserved.

Services shown on public amenity land are not public drains unless used as through drains. While Council endeavours to provide accurate spatial data no guarantee as to the completeness and accuracy of the data shown on this plan can be given. All information, including levels and locations, are not of survey grade accuracy and should be verified on site. For enquiries about the information shown please phone the call centre (09) 839 0400.

Waitakere City Council
Te Taiao o Waitakere

UNDERGROUND SERVICES LEGEND

Water

Water Supply Facility
- Water Pump Station
- Drinking Water Sampling Manual

Water Supply Bulk Meter
- Bulk Meter
- Standard Meter Installation

Water Supply Valve
- Air Valve
- Backflow
- No Return Valve
- Peet Valve
- Zone Valve Peet
- Pressure Reducing Valve
- Sluice Valve
- Zone Valve Sluice
- Scour Valve
- Water Control Valve

Water Supply Hydrant
- Water Supply Hydrant

Water Supply Node
- Caps
- End Point
- Junction
- Reduce

Water Supply Storage Unit
- Reservoir

Water Supply Miscellaneous
- Valve Chamber

Water Supply Main Line
- WCC Assets
- Pipe Bridge
- Water Care Assets
- Abandoned Assets
- Private Assets

Water Suupply Service Line
- WCC Assets
- Abandoned Assets
- Private Assets

Stormwater

Stormwater Manhole
- Catchpit Manhole
- Drop Manhole
- Standard Manhole
- Inspection Chamber

Stormwater Inlet
- Catchpit - Super
- Catchpit - Double
- Catchpit - Single
- Culvert / Pipe Inlet / Outlet / Wingwall
- Open Pipe End
- Debris Control Structure

Stormwater Node
- End Point / Outlet Point / Trap

Stormwater Miscellaneous
- Overflow Path

Stormwater Storage Basin
- Stormwater Pond
- Low Impact Devices
- Filtration Devices
- Detention Device

Stormwater Main Line
- Subsoil Drain
- WCC Assets
- Abandoned Assets
- Private Assets

Stormwater Service Line
- WCC Assets
- Abandoned Assets
- Private Assets

Stormwater Channel
- Stormwater Channel

Wastewater

Wastewater Manhole
- Drop Manhole
- Manhole
- Inspection Chamber

Wastewater Miscellaneous
- Campervan Dumping Point
- Septic Tank Standard
- Septic Tank High Tech

Wastewater Node
- End Point

Wastewater Pumpstation
- Pumpstation

Wastewater Main Line
- Pipe Bridge
- Rising Main
- WCC Assets
- Water Care Assets
- Abandoned Assets
- Private Assets

Wastewater Service Line
- WCC Assets
- Abandoned Assets
- Private Assets

Information Communication Technology

- ICT Node

ICTManhole
- ICT Inspection Chamber
- ICT Manhole
- ICT Traffic Chamber

ICTDuct
- ICT Duct
- ICT Fibre Optic Duct
- ICT Traffic Cable Duct

Miscellanous
- Error in Unit Type
- Error in Unit Type

Gas Petroleum

- High Pressure Gas Pipeline

Contour

- 2 metre

Pauline Benest

From: Adrienne Ward
Sent: Thursday, 2 October 2008 10:23 a.m.
To: Pam Vonk; Pauline Benest
Subject: FW: Confirmation lodgement appointment 4pm with Adrienne Ward

Sorry here is the email I forgot to bring down to confirm they will be paying by direct credit but processing can proceed.

thanks

Adrienne Ward
Multi-skilled Customer Service Advisor
Counter Services Level 2
8368000 extn 7849
Waitakere City Council
adrienne.ward@waitakere.govt.nz

From: Rhonda Hobson
Sent: Monday, 29 September 2008 10:27 a.m.
To: Adrienne Ward
Cc: 'Louise Dunn'; Tracey Tamakehu
Subject: Confirmation lodgement appointment 4pm with Adrienne Ward

Hello Adrienne,
As discussed Louise Dunn will be coming in this afternoon with 12 new building consents for the Housing Foundation.
As agreed with Micheal and Tracey we will start the entry of the consents and raise a lodgement invoice which will then be emailed to Louise at Housing Foundation.
Once received, Louise will settle the invoice by automatic transfer, during this time the consents will continue processing.

Thanks

Rhonda Hobson
Key Account Manager Resource and Building Consents
Waitakere City Council
836 8000 extn 8670
Mob 021 926 346

NEW ZEALAND
HOUSING
FOUNDATION

17 September 2008

Waitakere City Council
Private Bag 93109
HENDERSON 0650

Att: Rhonda Hobson

Dear Rhonda

This letter serves as authorisation for Housing Foundation Ltd to act on behalf of New Zealand Housing Provider Trust / New Zealand Housing Foundation, owner of 423 – 429 West Coast Road, Glen Eden, Waitakere City.

This authorisation covers the Building Consent applications for this site and applications will be signed by either Louise Dunn and / or Frank Rientjes.

Yours sincerely

Brian Donnelly
Executive Director

PO Box 36027
Northcote 0748
Auckland

NEW ZEALAND HOUSING FOUNDATION

17 September 2008

Rhonda Hobson
Waitakere City Council
Private Bag 93109
Waitakere City 0650

Dear Rhonda

Re: New Zealand Housing Provider Trust, New Zealand Housing Foundation and Housing Foundation Ltd

As requested, this letter is to clarify of the connection between New Zealand Housing Provider Trust (NZHPT), New Zealand Housing Foundation (NZHF) and Housing Foundation Ltd (HFL).

In September 2007 the Trust, known as New Zealand Housing Foundation, which was established in 2001, changed its name to New Zealand Housing Provider Trust (NZHPT) and a new Trust was established using the name New Zealand Housing Foundation (NZHF). The Trustees are the same for both entities.

These changes were necessary as the objects of the (now known as) NZHPT limited that Trust to making grants and loans available through intermediaries called 'Low Income Housing Providers' to needy families. The New Zealand Housing Foundation needs to be able to deal directly with needy families. The deed establishing the new NZHF gives the new Trust the ability to sell homes directly to the families the Trust wishes to assist.

All assets under NZHPT will be transferred to NZHF as at 1st October 2008 and NZPHT will be wound up by the end of this calendar year.

Housing Foundation Ltd (HFL) is the Charitable Company operated by NZHF, with the same Trustees as NZHPT and NZHF. HFL is acting as the agent for NZHF for the construction of the houses in NZHF's West Coast Road development.

I trust this clarifies the situation for you, however if you have any further questions please contact Louise on 0275 594 524, or 849 4395 or louise.d@housingfoundation.co.nz.

Yours sincerely

Brian Donnelly
Executive Director

PO Box 36027
Northcote 0748

Adrienne Ward

From: Rhonda Hobson
Sent: Tuesday, 30 September 2008 3:50 p.m.
To: Adrienne Ward
Cc: Doug Naylor
Subject: Housing Foundation

Adrienne,
As discussed with Doug Naylor the 12 consents for Housing Foundation are valued at lower than the DBH reccommendation.
This development is an 'affordable housing' project and this is the reason they are able to keep their costings at the very lower end of the scale.
Would you kindly ensure that the CPU receives a copy of this email as confirmation that Doug has been made aware of the situation and is in agreement that the levies may be calculated at the cost provided.

Rhonda Hobson
Key Account Manager Resource and Building Consents
Waitakere City Council
836 8000 extn 8670
Mob 021 926 346

Waitakere City Council
Te Taiao o Waitakere

Waitakere City Council
Waitakere Central
6 Henderson Valley Road
Henderson 0612

Private Bag 93109
Henderson 0650
Waitakere

Telephone
09 836 8000

24Hr Call Centre
09 839 0400

Facsimile
09 836 8001

DX CX 10250 Auckland Mail Centre
Email: info@waitakere.govt.nz

Website: www.waitakere.govt.nz

31 October 2008

NEW ZEALAND HOUSING FOUNDATION
PO Box 36027
Northcote
NORTH SHORE CITY 0748

(Copy for your interest - Original sent to authorised representative)

Waitakere City Council
Te Taiao o Waitakere

Waitakere City Council
Waitakere Central
6 Henderson Valley Road
Henderson 0612

Private Bag 93109
Henderson 0650
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09 836 8001

DX CX 10250 Auckland Mail Centre
Email: info@waitakere.govt.nz

Website: www.waitakere.govt.nz

Consent Issued ___/___/___

Receipt No _____

Issued by _____
(GEMS CODE)

12 February 2009

NEW ZEALAND HOUSING FOUNDATION
C/- Housing Foundation
PO Box 36027
Northcote
NORTH SHORE CITY 0748

Dear Sir/Madam

RE: BUILDING CONSENT APPLICATION: COM-2008-1464
New 4 bedroom dwelling with attached garaging. Type 4A. CAT2

ADDRESS: 19 Titch Place Glen Eden

Thank you for your Building consent application lodged with Council on 01-Oct-2008. This consent is now ready to be issued.

The following fees for processing the application are outstanding (GST invoices enclosed). The payment of these additional fees and invoices are required within 14 days of this letter

Invoice: 405270	$518.25

Our counter staff will produce additional invoices when you collect your Building consent as per the following fee schedule:

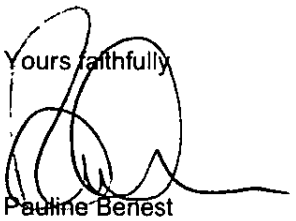
Base Inspection Fees	$2,595.00
Code Compliance Base Fee	$296.00
WS Pop-on 15mm Water Meter (to extg connection)	$540.00
Footpath / Street Damage Bond (Refundable)	$2,500.00
Boxing Vehicle Crossing Inspection Fee	$94.00
Final Vehicle Crossing Inspection Fee	$94.00
Preliminary Vehicle Crossing Inspection Fee	$94.00
Total To Pay:	**$6,731.25**

If Payment is made by cheque(s) to a value of more than $3,000.00, there will be a five working day clearance period before the consent is issued. If payment is made by Bank Cheque, this consent can be uplifted immediately. Council is unable to accept Credit Card payments.

Note: **Your Building consent must be picked up within 42 days of the date of this letter, or we will refuse to issue and return your consent application. Any outstanding fees will still be payable. Until payment is made and the consent picked up, no work is allowed to commence.**

Please note that District Plan compliance is assessed separately with the PIM application. You should refer to the PIM to identify all requirements in terms of District Plan matters. If amendments are made to the PIM as a result of resolving District Plan issues a new Building Consent application may be required.

Yours faithfully



Pauline Benest
PROCESS SUPPORT
(Copy sent to owner)

Waitakere City Council
Te Taiao o Waitakere

Waitakere City Council
Waitakere Central
6 Henderson Valley Road
Henderson 0612

Private Bag 93109
Henderson 0650
Waitakere

Telephone
09 836 8000

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09 839 0400

Facsimile
09 836 8001

DX CX 10250 Auckland Mail Centre
Email: info@waitakere.govt.nz

Website: www.waitakere.govt.nz

12 February 2009

NEW ZEALAND HOUSING FOUNDATION
PO Box 36027
Northcote
NORTH SHORE CITY 0748

Dear Sir/Madam

RE: BUILDING CONSENT APPLICATION: COM-2008-1464
New 4 bedroom dwelling with attached garaging. Type 4A. CAT2

ADDRESS: 19 Titch Place Glen Eden

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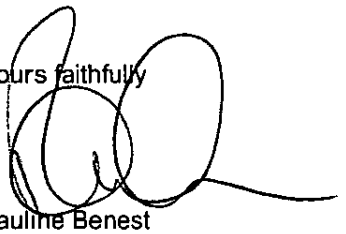

Pauline Benest

PROCESS SUPPORT

(Copy for your interest - Original sent to authorised representative)

Waitakere City Council
Te Taiao o Waitakere

Waitakere Central
6 Henderson Valley Rd
Henderson 0612
Waitakere

Waitakere City Council
Private Bag 93109
Henderson 0650
Waitakere

Telephone
09 839 0400

TAX INVOICE

GST Registration Number

52-211-247

HOUSING FOUNDATION LIMITED
PO Box 36027
Northcote
NORTH SHORE CITY 0748

Date: 12 February 2009
Customer No: 322986
Invoice No: 405270

Application Location: 19 Titch Place, Glen Eden

Application: COM-2008-1464

Fee Code	Transaction Description	Amount
6	Base Process Fee Category 6 Building Consent	-2,005.00
COUNTR	Counter Processing Fee	94.50
PLNPRO	Plan Processing Fee	1,782.90
DSNCHK	Design Check Fee	187.50
PLNGCK	Planning Check Fee	69.60
ECWPRO	Drainage Engineer - Ecowater Processing Fee	330.75
RECORD	Records Fee	36.00
PICKUP	Issuing Fee	22.00

This account includes a total GST content of $57.57

Invoice Total 518.25
Invoice Due 26 February 2009

(Please Detach and return with payment)

Waitakere City Council
Te Taiao o Waitakere

Waitakere Central
6 Henderson Valley Rd
Henderson 0612
Waitakere

Waitakere City Council
Private Bag 93109
Henderson 0650
Waitakere

Telephone
09 839 0400

Invoice Date:	12 February 2009	Application:	DAP
Invoice Number:	405270	Debtor Number:	322986
Name:	HOUSING FOUNDATION LIMITED	Payment Reference:	336773
Application:	COM-2008-1464	Invoice Total:	518.25

ENTERED

COM-20081464

BCI-117

WCC Record of inspection Miscellaneous (MISC)

Waitakere City Council
Te Taiao o Waitakere

Surveyor's Name	ANDREW COLLIER	Time in	11.23
Date	05/10/09	Time out	11.33
ABA #	08-1464	Time total	10 min
Address	19 TITCH PLACE		

Record details of miscellaneous inspection here, if applicable: **Type of inspection:** _____

	Y	N	N/A
	Y	N	N/A
	Y	N	N/A

	Y	N	N/A
	Y	N	N/A
	Y	N	N/A

Result of inspection:

Passed ☑ Subject to production as stipulated of the documents indicated overleaf (if any)

Failed ☐

Notice to Fix Resolved ☐

Additional Inspections Required: Yes ☐ No ☑

Issue Notice to Fix ☐
Field Note ☐
Failed Letter ☐
Amendments Required ☐
Additional Inspections Required: Yes ☐ No ☐

Producer statement check			**Engineer's name:**
Author on approved list	Y	N	

CERTIFICATES	Required	Received	CERTIFICATES	Required	Received
ENGINEERS (PS4)			**CLADDING**		
Soil/Geotechnical Engineers Certificate			Applicators Certificate for Plaster Cladding		
Engineers Certificate for Foundations (Structural)			Manufacturers Warranty for Plaster Cladding		
Engineers Certificate for Pile Driving			Applicators Certificate for Installation ff Cladding		
Engineers Certificate for A/B Grade Masonry			**OTHER**		
Engineers Certificate for Speciality Slab			Electrical Certificate		
Engineers Certificate for Hardfill Compaction			Gas Certificate		
Engineers Certificate for Structural Framing			Glazing Certificate		
Engineers Certificate for Concrete Structure			Installers Certificate for Barrier Installation		
Engineers Certificate for Stormwater Mitigation Devices			Installers Certificate for Solid Fuel/Gas Heaters		
Manufacturers/Suppliers Certificate for Spread of Flame Index			**PLUMBING & DRAINAGE**		
Manufacturers/Suppliers Cert. for Smoke Development Index			Drainage As-Built		
SURVEYORS			Plumbers Form		
Surveyors Certificate for Siting			Drainlayers Form		
Surveyors Certificate for Height in Relation to Boundary			Engineers Cert. for Waste-Water Installation		
Surveyors Certificate For Finished Floor Level (Linz Datum)			Installers Certificate for Waste-Water Installation		
WATERPROOFING			Quality Assurance Certificate		
Applicators for Water Proofing to Wet Areas			Licensed Cadastral Surveyors As-Built		
Applicators For Water Proofing To Decks			Backflow Preventer Test Certificate		
Applicators for Water Proofing to Roof/Gutters			Installers Certificate for Backflow Preventer		
Applicators for Tanking to Retaining Wall			Water Saving Inventory Device		
Waterproofing Manufacturers Guarantee			Solar Heating Certificate		
TIMBER			EcoWater Conditions		
Manufacturers Certificate for Timber Treatment and Grading			Other:		
Manufacturers Certificate and Layout for Roof Trusses			Other:		
Other:			Other:		

CERTIFICATES (AS TICKED ABOVE) ARE REQUIRED AT THE _____ INSPECTION.

Instructions: If outcome is no (i.e. not approved), identify reasons in non-compliance / comment section. All sections must be completed
Key: Yes = approved: No = not approved: N/A = not applicable:

BCI-117

WCC Record of inspection
Miscellaneous (MISC)

Waitakere City Council
Te Taitoko o Waitakere

List of non-compliances / comments

NO WORK HAS STARTED.

Signed by:

Instructions: If outcome is no (i.e. not approved), identify reasons in non-compliance / comment section. All sections must be completed
Key: Yes = approved: No = not approved: N/A = not applicable:

#Please return file to Alana to complete cancellation Thanks!

BCI-194

WCC Record of inspection Commencement of work (MISC)

Waitakere City Council
Te Tatau o Waitakere

Building area BA4

Project address 19 Titch Place

Date 1/10/09

COM/~~ABA~~ 2008 - 1464

Type of work New Dwelling + Garage.

Owner N2 Housing Foundation (Louise Dunn)

Phone number 849 4395 or 027 559 4524

PLEASE CHECK ON SITE FOR WORK STARTED

To: Inspection Support

The above site has been inspected and reveals:

- No work has been started ☑
- Work has commenced ☐
- Work is complete ☐

Additional Comments:

Signed

Building Surveyor ANDREW COLLIER

Date 05/10/09.

Time recording 11.23 - 11.33.

Waitakere City Council
Te Taiao o Waitakere

Waitakere City Council
Waitakere Central
6 Henderson Valley Road
Henderson 0612

Private Bag 93109
Henderson 0650
Waitakere

Telephone
09 836 8000

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09 839 0400

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09 836 8001

DX CX 10250 Auckland Mail Centre
Email: info@waitakere.govt.nz

Website: www.waitakere.govt.nz

19 November 2009

NEW ZEALAND HOUSING FOUNDATION
C/- Housing Foundation
PO Box 36027
Northcote
NORTH SHORE CITY 0748

Dear Sir / Madam

Re: **Application Number:** COM-2008-1464
Proposal: New 4 bedroom dwelling with attached garaging. Type 4A. CAT2
Project Address: 19 Titch Place, Glen Eden

The above building consent has now been cancelled as per the email received from Louise Dunn on 30/9/2009.

All invoices on this consent number have been credited and the copies of all credit notes and invoices are attached for your reference.

The only remaining fee not included in the credits is the BRANZ Levy of $213.75 (paid on receipt # 2088212 on 22/10/08) which can only be refunded by writing to:

BRANZ
Private Bag 50908
Porirua

Please attach a copy of this letter.

The refundable amount was included in the Debtor reconciliation and refund recently carried out in discussion with Adrienne Ward from our Counter Services. If you need any further information please do not hesitate to contact us.

Yours faithfully

Alana Fish
Process Support

Adrienne Ward

From: Louise Dunn [louise.d@housingfoundation.co.nz]
Sent: Tuesday, 10 November 2009 12:12 p.m.
To: Adrienne Ward
Subject: RE: New Zealand Housing Foundation

Hi Adrienne

I have discussed this with Joanne Campbell, our Financial Manager, and she is happy for you to offset the outstanding invoices against the credit and refund us, by cheque, the remaining balance.

There are a few of the outstanding invoices that Lance should pay, but we need to reconcile them with him so it is easier to keep WCC out of that process! ☺

Appreciate all your work to sort this out!

Kind regards

Louise Dunn

New Zealand Housing Foundation

PO Box 44018
Point Chevalier
Auckland 1246

Phone: 09 849 4395
Fax: 09 849 4396
Mobile: 027 559 4524
Email: louise.d@housingfoundation.co.nz

Be nice to the world. Please don't print this e-mail unless you really need to

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From: Adrienne Ward [mailto:Adrienne.Ward@waitakere.govt.nz]
Sent: Monday, 9 November 2009 2:38 p.m.
To: Louise Dunn
Cc: Adrienne Ward
Subject: New Zealand Housing Foundation

Hi Louise

As mentioned on previous occassions there is a credit on your account, what we propose to do if NZHF agree is to pay any outstanding invoices then send the balance to NZHF. We have two debtor numbers at the moment which has caused a bit of confusion, this came about when NZ Housing Foundation was known as Housing Foundation.

This is the way it looks at the moment, invoices that are outstanding and credit notes that have been raised.

Debtor #322986

Invoice 438704 **$178.00 Reinspection on COM20081474**
Credit note 516779 -$346.00 Refund base inspections fees x 2 COM20081480
Invoice 435002 **$269.00 Cancellation processing on COM20081464- credited back on credit note**

517161
Credit note 516425 -$421.09 Refund of Building levy on COM20081470
Credit note 516404 -$346.00 Refund base inspections fees x 2 COM20081470
Invoice 430079 $178.00 Reinspection on COM20081480
Invoice 429540 $178.00 Reinspection on COM20081478
Credit note 517161 $2792.25 Processing fees, amendment fee etc for COM20081464 (cancelled)

Credit balance $3102.34

Debtor #302176

Invoice 438823 $76.00 Ecowater processing COM2009938
Invoice 436576 $178.00 Reinspection on COM20081480
Invoice 433925 $60.00 Shortpaid on 3waters200938
Credit note 516426 $2891.00 Inspection fees, CCC fee for COM20081464
Credit note 516424 $94.00 VXG inspection for COM20081464 (cancelled)
Receipt 2832209 $114.00 - paid twice

Credit balance $2785.00

Total amount to be given back to NZHF is $5887.34, this will bring both debtor numbers back to a zero balance, we will then continue with only one debtor number.

If you have any questions please ask.

Kind regards
Adrienne Ward
Multi-skilled Customer Service Advisor
Counter Services Level 2
8368000 extn 7849
Waitakere City Council
adrienne.ward@waitakere.govt.nz

;Please consider the environment before printing this e-mail

Note:

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Any views expressed in this message are those of the individual sender, except where the message states otherwise and the sender is authorised to state them to be the views of any such entity. Thank You.

http://www.waitakere.govt.nz <http://www.waitakere.govt.nz/>

}

Rhonda Hobson

From: Louise Dunn [louise.d@housingfoundation.co.nz]
Sent: Wednesday, 30 September 2009 3:30 p.m.
To: Rhonda Hobson
Subject: Building Consent COM-2008-1464

Hi Rhonda

As per our conversation yesterday, please cancel this consent – has been taken over by COM-2009-1374

Thanks and regards

Louise Dunn

New Zealand Housing Foundation

PO Box 44018
Point Chevalier
Auckland 1246

Phone: 09 849 4395
Fax: 09 849 4396
Mobile: 027 559 4524
Email: louise.d@housingfoundation.co.nz

Be nice to the world. Please don't print this e-mail unless you really need to

Cancellation from Rhonda.
Please advise Rhonda who is
dealing with it, once it has
been allocated to process support

1/10/09

File ordered 1/10/09.

Waitakere City Council
Te Taiao o Waitakere

Waitakere Central
6 Henderson Valley Rd
Henderson 0612
Waitakere

Waitakere City Council
Private Bag 93109
Henderson 0650
Waitakere

Telephone
09 839 0400

CREDIT NOTE

GST Registration Number

52-211-247

NEW ZEALAND HOUSING FOUNDATION
PO Box 44018
Point Chevalier
AUCKLAND 1246

Date: 06-Oct-2009
Customer No: 322986
Credit Note No: 516426

Application Location: 19 Titch Place, Glen Eden

Application: COM-2008-1464

Fee Code	Transaction Description	Amount
INSBSE	Base Inspection Fees	-2,595.00
CCCBSE	Code Compliance Fee	-296.00

This account includes a total GST content of -321.21

Credit Note Total -2891.00

Remittance Advice :
(Please Detach and return with payment)

Vaitakere City Council
Te Taiao o Waitakere

Waitakere Central
6 Henderson Valley Rd
Henderson 0612
Waitakere

Waitakere City Council
Private Bag 93109
Henderson 0650
Waitakere

Telephone
09 839 0400

Credit Note Date:	06-Oct-2009	Application:	DAP
Credit Note Number:	516426	Debtor Number:	322986
Name:	NEW ZEALAND HOUSING FOUNDATION	Payment Reference:	336773
Application:	COM-2008-1464	Credit Note Total:	-2891.00

Waitakere City Council
Te Taiao o Waitakere

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Henderson 0612
Waitakere

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Henderson 0650
Waitakere

Telephone
09 839 0400

TAX INVOICE

GST Registration Number

52-211-247

HOUSING FOUNDATION LIMITED
PO Box 36027
Northcote
NORTH SHORE CITY 0748

Date: 6 October 2009
Customer No: 322986
Invoice No: 435002

Application Location: 19 Titch Place, Glen Eden

Application: COM-2008-1464

Fee Code	Transaction Description	Amount
PLNPRO	Plan Processing Fee	91.00
INSP	Inspection Fee	173.00
INSBKI	Inspection Booking Fee - Inspection Support	5.00

This account includes a total GST content of $29.88

Invoice Total 269.00
Invoice Due 20 October 2009

Remittance Advice

(Please Detach and return with payment)

Waitakere City Council
Te Taiao o Waitakere

Waitakere Central
6 Henderson Valley Rd
Henderson 0612
Waitakere

Waitakere City Council
Private Bag 93109
Henderson 0650
Waitakere

Telephone
09 839 0400

Invoice Date:	6 October 2009	Application:	DAP
Invoice Number:	435002	Debtor Number:	322986
Name:	HOUSING FOUNDATION LIMITED	Payment Reference:	336773
Application:	COM-2008-1464	Invoice Total:	269.00

Vaitakere City Council
Te Taiao o Waitakere

Waitakere Central
6 Henderson Valley Rd
Henderson 0612
Waitakere

Waitakere City Council
Private Bag 93109
Henderson 0650
Waitakere

Telephone
09 839 0400

CREDIT NOTE

GST Registration Number

52-211-247

HOUSING FOUNDATION LIMITED
PO Box 36027
Northcote
NORTH SHORE CITY 0748

Date: 06-Oct-2009
Customer No: 322986
Credit Note No: 516425

Application Location: 19 Titch Place, Glen Eden

Application: COM-2008-1464

Fee Code	Transaction Description	Amount
BLDL	Building Levy	-421.09

This account includes a total GST content of -46.78

Credit Note Total -421.09

Remittance Advice :
(Please Detach and return with payment)

Vaitakere City Council
Te Taiao o Waitakere

Waitakere Central
6 Henderson Valley Rd
Henderson 0612
Waitakere

Waitakere City Council
Private Bag 93109
Henderson 0650
Waitakere

Telephone
09 839 0400

Credit Note Date:	06-Oct-2009	Application:	DAP
Credit Note Number:	516425	Debtor Number:	322986
Name:	HOUSING FOUNDATION LIMITED	Payment Reference:	336773
Application:	COM-2008-1464	Credit Note Total:	-421.09

ok. 4 bedroom.

LODGEMENT. ✓ $ 94.50.
ADMIN. $ 211.20
ACC MANAGER. $ 170.10.
ENGINEER. ✓ $ 187.50.
BUILD. $ 579.60
ECO WATER $ 339.75.
P+D. $ 88.20.
PLAN. ✓ $ 69.60.
1740.45

Time/Cost Sheet for a Building Consent

no inspection

Application Number: COM-2008-1464

Address: 19 TITCH PLACE

	Accepted Amount		Pre Paid Fees
Plan Processing	1,049.10	–	
Planning Check Fee	69.60	–	
Counter Processing	94.50	–	
Issue Fee	22.00		
Records Fee	36.00		
Consultant Building Surveyor			
Administration Fee			
Disbursements			
Sub Total	**1,271.20**		
Base Processing Fee	2,005.00		
Base Fee Planning Area Cat. 5 or 6			
Plan Processing	1,049.10		
Total	**1,782.90**		
Base Processing Charges	2,005.00		
Building Research Levy			213.75
Building Levy			421.09
Section 37 Fee			
Copying Fees			
Drainage Engineer - Ecowater Processing Fee	330.75	–	
Design Check Fee	187.50	–	
Consultant Design Engineer			
Administration Fee			
Disbursements			
Roading and Traffic			
Fire and Egress			
Environmental Health			
Swimming Pools			
Fire Service			
Base Processing Fee	2,005.00		
Granted Invoice Total	**518.25**		
Inspection Fees	2,595.00		
CCC Fee	296.00		
VXG Fees	2,782.00		
3Water Fees	540.00		
EWA Fees			
Swimming Pool Registration			
Swimming Pool Inspection			
Compliance Schedule Fees			
Development Contributions			
Total Payable before Issuing	**$ 6,731.25**		

only $94.00 paid

transferred to Com 20091374.

Name: PAULINE BENEST

Signature

Date: 12/2/2009

Timesheet Details Report for com-2008-1464

Task Officer: Danny Chan

Date	H Chrg Rate	Task Time	Amount	Billable	U Act Type	User Action Description	Activity	Activity Description	Comments
01/10/2008	$126.00	0.75	$94.50	True	T-CON	Time recording - Customer Services	LODGE	Lodge Application	lodge

Total for Danny Chan: $94.50

Task Officer: Alana Fish

Date	H Chrg Rate	Task Time	Amount	Billable	U Act Type	User Action Description	Activity	Activity Description	Comments
02/10/2008	$88.00	0.55	$48.40	True	T-PRO	Time Recording Process support	FILEM	File Make Up	File make up and data entry

Total for Alana Fish: $48.40

Task Officer: Peter Vaoga

Date	H Chrg Rate	Task Time	Amount	Billable	U Act Type	User Action Description	Activity	Activity Description	Comments
08/10/2008	$126.00	0.35	$44.10	True	T-ACC	Time recording - Account Manager	ALLOC	Allocation of Work	Prepare referals

Total for Peter Vaoga: $44.10

Task Officer: Saby Virdi

Date	H Chrg Rate	Task Time	Amount	Billable	U Act Type	User Action Description	Activity	Activity Description	Comments
09/10/2008	$125.00	1.00	$125.00	True	T-DES	Time recording - Design Engineer	ASSESS	Assessment / Appraisal	suspended, see RFI.
05/02/2009	$125.00	0.25	$31.25	True	T-DES	Time recording - Design Engineer	ASSESS	Assessment / Appraisal	Discussion with Rhonda Hobson, Geotechnical engineer (WJL) regarding the issues with the geotech report and requested additional information.
09/02/2009	$125.00	0.25	$31.25	True	T-DES	Time recording - Design Engineer	ASSESS	Assessment / Appraisal	Final.

Total for Saby Virdi: $187.50

Task Officer: Luz Tandingan

Date	H Chrg Rate	Task Time	Amount	Billable	U Act Type	User Action Description	Activity	Activity Description	Comments
09/10/2008	$147.00	1.50	$220.50	True	T-DRE	Time recording - Drainage Engineer EcoWater	ASSESS	Assessment / Appraisal	assessed, draft conditions, prepared rqt letter, suspended

Total for Luz Tandingan: $220.50

Task Officer: Julianne Cowan

Date	H Chrg Rate	Task Time	Amount	Billable	U Act Type	User Action Description	Activity	Activity Description	Comments
10/10/2008	$126.00	0.15	$18.90	True	T-ACC	Time recording - Account Manager	CORRE	Letter/Email Correspondence	req one letter

Total for Julianne Cowan: $18.90

Task Officer: Ben Gelderbloem

Date	H Chrg Rate	Task Time	Amount	Billable	U Act Type	User Action Description	Activity	Activity Description	Comments
10/10/2008	$116.00	0.60	$69.60	True	T-PLN	Time Recording - Planner	ASSESS	Assessment / Appraisal	rma/dp/luc evaluation - PIM completion/checklisting/cross ref with luc - ok

Total for Ben Gelderbloem: $69.60

Task Officer: John Gutch

Date	H Chrg Rate	Task Time	Amount	Billable	U Act Type	User Action Description	Activity	Activity Description	Comments
14/10/2008	$126.00	0.70	$88.20	True	T-PD	Time Recording P& D - reticulated site	ASSESS	Assessment / Appraisal	plan processing approved

Total for John Gutch: $88.20

Task Officer: Radmila Ristic

Date	H Chrg Rate	Task Time	Amount	Billable	U Act Type	User Action Description	Activity	Activity Description	Comments
28/10/2008	$126.00	4.00	$504.00	True	T-BLD	Time recording - Building Surveyor	ASSESS	Assessment / Appraisal	Processing application
30/10/2008	$126.00	0.30	$37.80	True	T-ACC	Time recording - Account Manager	ADMIN	Administration - Filing/ Mail / Photocopying / Dat	prepare referals
18/11/2008	$126.00	0.30	$37.80	True	T-BLD	Time recording - Building Surveyor	ADMIN	Administration - Filing/ Mail / Photocopying / Dat	Req-letter reissued -18.11.08 - Building serveyor requirements deleted, no long requiment. Letter e -mailed to client. Rada

Total for Radmila Ristic: $679.60

Task Officer: Renee Menehira

Date	H Chrg Rate	Task Time	Amount	Billable	U Act Type	User Action Description	Activity	Activity Description	Comments
31/10/2008	$88.00	0.20	$17.60	True	T-PRO	Time Recording Process support	PSDOC	Process Support Letters/Amend/Cert & Prod Statemen	Requirement letter & PIM
18/11/2008	$88.00	0.15	$13.20	True	T-PRO	Time Recording Process support	PSDOC	Process Support Letters/Amend/Cert & Prod Statemen	re-print reqlet
07/01/2009	$88.00	0.15	$13.20	True	T-PRO	Time Recording Process support	PSDOC	Process Support Letters/Amend/Cert & Prod Statemen	RR1

03/02/2009	$88.00	0.15	$13.20	True	T-PRO	Time Recording Process support	PSDOC	Process Support Letters/Amend/Cert & Prod Statemen	RFI makeup & date entry

Total for Renee Menehira: $57.20

Task Officer: Brittany Roy

Date	H Chrg Rate	Task Time	Amount	Billable	U Act Type	User Action Description	Activity	Activity Description	Comments
03/02/2009	$126.00	0.35	$44.10	True	T-ACC	Time recording - Account Manager	ALLOC	Allocation of Work	Allocated RFI-01
10/02/2009	$126.00	0.50	$63.00	True	T-ACC	Time recording - Account Manager	ADMIN	Administration - Filing/ Mail / Photocopying / Dat	Referrals complete - approved

Total for Brittany Roy: $107.10

Task Officer: Ehtesham Owais

Date	H Chrg Rate	Task Time	Amount	Billable	U Act Type	User Action Description	Activity	Activity Description	Comments
03/02/2009	$147.00	0.75	$110.25	True	T-DRE	Time recording - Drainage Engineer EcoWater	ASSESS	Assessment / Appraisal	Assessed application reviewed plans submitted, approved and conditions drafted. updated pathways.

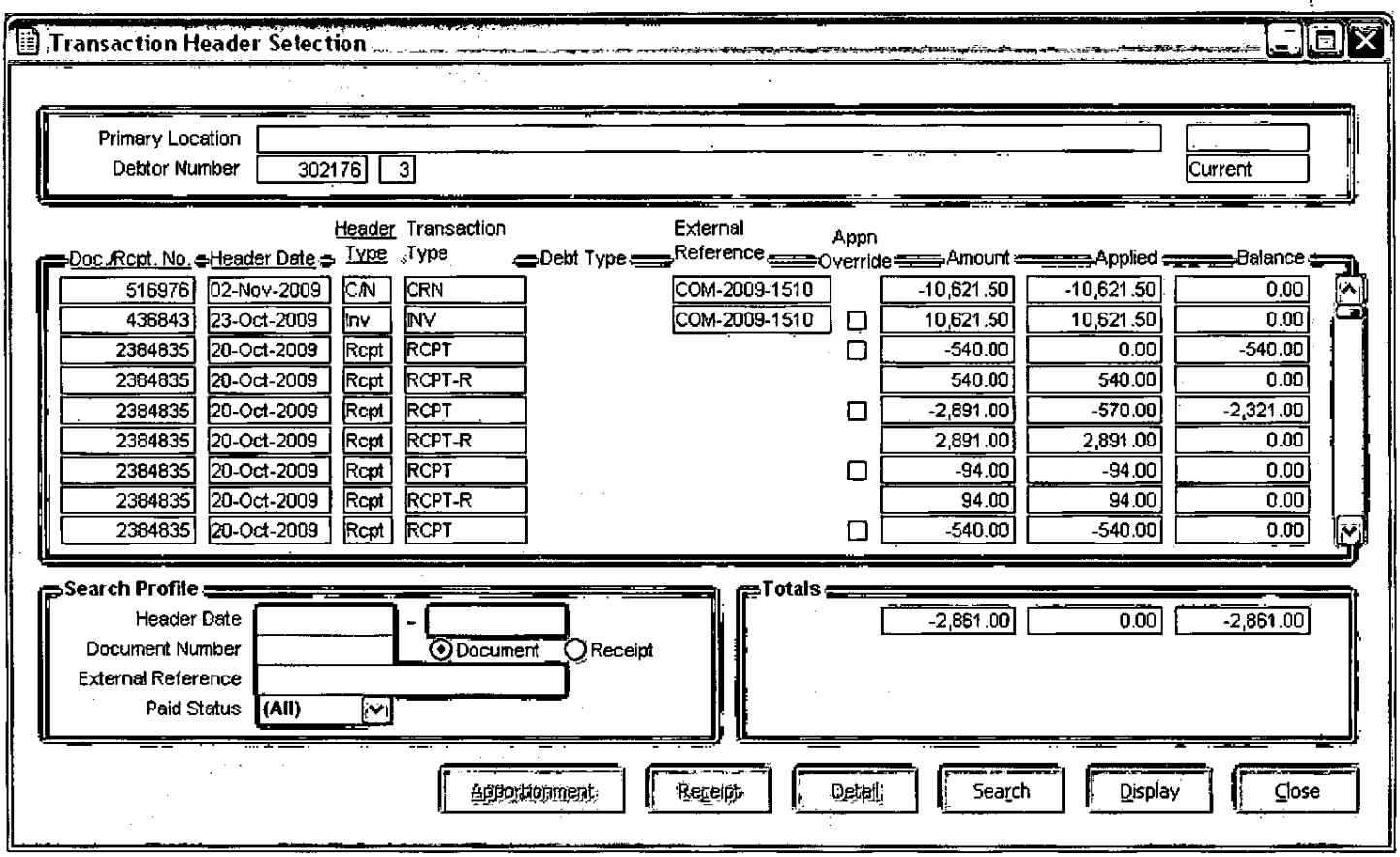
Total for Ehtesham Owais: $110.25

Task Officer: Pauline Benest

Date	H Chrg Rate	Task Time	Amount	Billable	U Act Type	User Action Description	Activity	Activity Description	Comments
12/02/2009	$88.00	1.20	$105.60	True	T-PRO	Time Recording Process support	ISSUE	Issue Consent	DOC PREP x 1 RFI

Total for Pauline Benest: $105.60

Total amount for 21 timesheet records: $1,731.45



Form: LDRSTHED
Entity: LDRTHED
Field: GETSFOCUS
Date/Time: 02-Nov-2009 09:54:44
Release: 03.02.000 (0011) With Fixes
Customer: WAIT
User: WARDA
Stage: Prod
Platform: WN1

- 3349-09

COM 2009 – 1374

As Built Drainage Plan

Counter Services
- 9 APR 2010

Waitakere City Council
Te Taitau o Waitakere

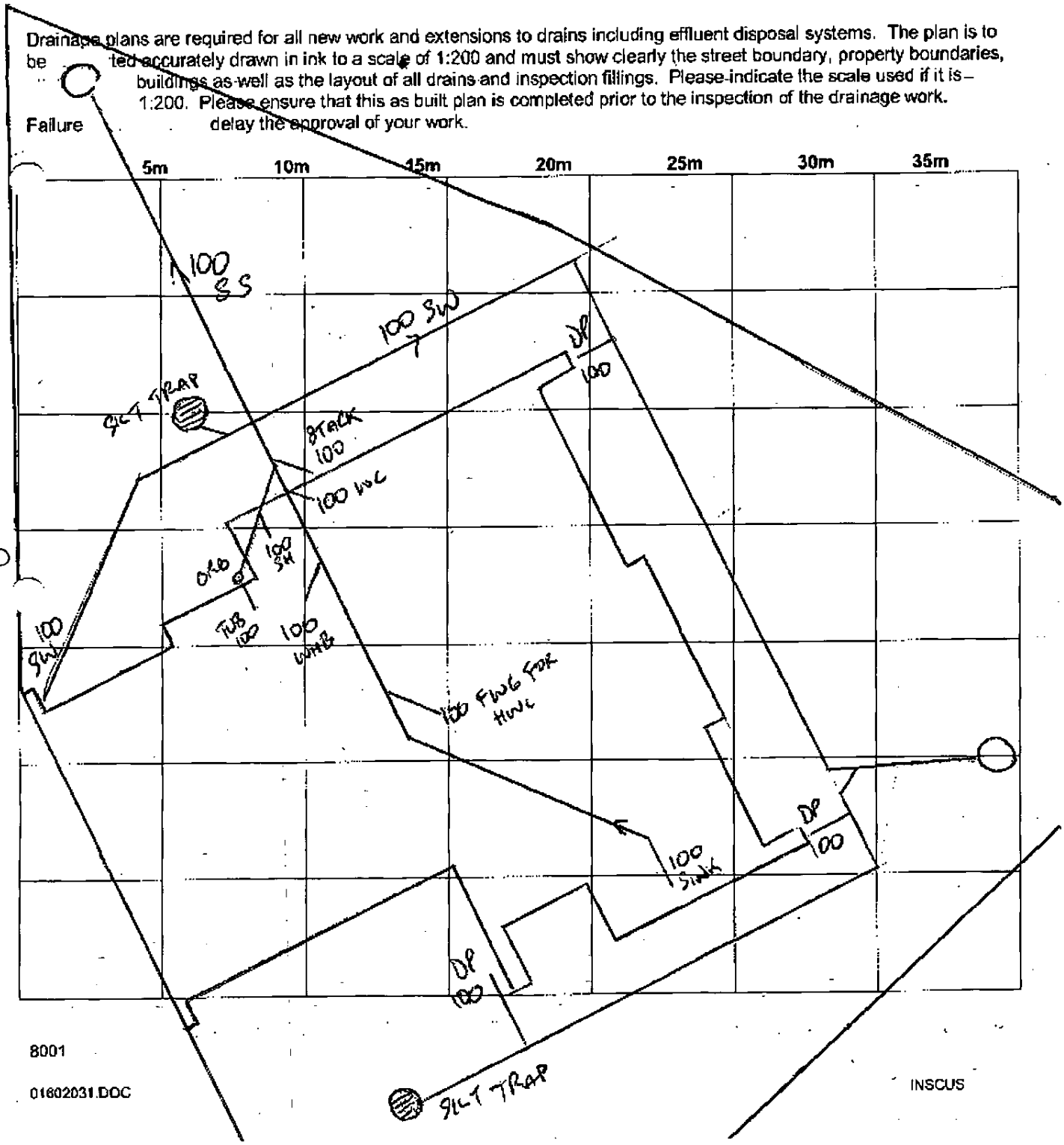
Building Consent Number: COM-2009-1374 Inspector: _____

Owner's Name: NEW ZEALAND HOUSING FOUNDATION Drainlayer's Name: BRYAN CHAPMAN

Site Address: 19 Titch Place, Glen Eden

Lot & DP: LOT 32 DP 389289 Date Inspected: _____

Drainage plans are required for all new work and extensions to drains including effluent disposal systems. The plan is to be ...ted accurately drawn in ink to a scale of 1:200 and must show clearly the street boundary, property boundaries, buildings as well as the layout of all drains and inspection fillings. Please indicate the scale used if it is – 1:200. Please ensure that this as built plan is completed prior to the inspection of the drainage work. Failure ... delay the approval of your work.



Plan key: 32706.

8001

01602031.DOC

INSCUS

Pink© Batts© R-value Insulation Guidelines for Small Buildings (Wall Framing)

(These guidelines are only applicable if read in conjunction with the NOTES)

Wall Cladding Details		Zone 1 & 2 (Minimum Construction R-value = R 1.9)	Zone 3 (Minimum Construction R-value = R 2.0)
Brick	Masonry Veneer	R 2.6	R 2.8
Weatherboard	Bevel Back Rusticated Fibre Cement (direct fixed only)	R 2.6	R 2.8
Monolithic	Stucco with Rigid Backing (cavity only)	R 2.8	R 2.8
	EIFS Direct fixed and Cavity	R 1.8*	R 1.8*
Metal	Vertical Profile (direct fixed only) Horizontal Profile (cavity only)	R 2.6	R 2.8
Sheet Cladding	Non Metal (direct fixed only)	R 2.8	R 2.8

NOTES

These insulation guidelines take into consideration Timber Framed Building designs (NZS 3604) and their respective framing spacing and cladding types to assist in meeting the minimum NZBC H1 Energy Efficiency (2007) requirements. To achieve higher performance, reference can be made to the better/best classification of PAS 4244.

This information is applicable if:

- the total glazing area is 30% or less than the total wall area,
- the sum of the glazing area is 30% or less than the external west, east and south facing wall area,
- total skylight area is less than 1.2m^2,
- All residential buildings and building up to 300m^2,
- non CA rated downlights used are less than 1 per 5m^2 of ceiling,
- insulation installed to NZS 4246.

If these criteria are not met, please consult with your building designer for Calculation and Modelling method (NZS 4218) to ensure compliance to the NZ Building Code.

The R-value guidelines determined from the Schedule Method (NZS 4218) are **minimum** insulation levels recommended by Tasman Insulation New Zealand to cover a range of similar framing systems. Lower levels of insulation R-value than those indicated may apply for some framing systems. **We strongly recommend a detailed analysis specific to your construction is carried out by a building designer on alternative R-value solutions to the above recommendation to ensure compliance to the NZ Building Code.**

*EIFS used with R 1.8 Insulation will generally result in construction R-values above the minimum, as EIFS has a R-value higher than most common cladding types.

This brochure supersedes all previous revisions. Tasman Insulation New Zealand retain the right to change specifications without prior notification. If a specification is critical to the end use, please consult Tasman Insulation New Zealand. Do not use this information in an application other than that detailed in this data sheet, without obtaining written advice from Tasman Insulation New Zealand. All claims are subject to any variation caused by normal manufacturing process and tolerances. This information is provided without prejudice to Tasman Insulation New Zealand standard terms and conditions of sale. Tasman Insulation is a Fletcher Building Company.

Pink© Batts© R-value Insulation Guidelines for Small Buildings (Roof Framing)

(These guidelines are only applicable if read in conjunction with the NOTES)

Roof Cladding Details		Zone 1 & 2 (non solid wall) (Minimum Construction R-value = R 2.9)	Zone 3 (non solid wall) (Minimum Construction R-value = R 3.3)	Zone 3 (solid wall) (Minimum Construction R-value = R 3.5)
Profiled Steel	Pitched	R 3.2	R 3.8*	R 4.2
	Skillion	R 3.2	R 3.6	R 3.8
	Low Slope Timber Frame	R 3.2	R 3.6	R 3.8
Concrete / Clay Tiles	Pitched	R 3.2	R 3.8*	R 4.2
	Skillion	R 3.0	R 3.4	R 3.6
	Low Slope Timber Frame	-	-	-
Membrane	Pitched	-	-	-
	Skillion	-	-	-
	Low Slope Timber Frame	R 3.0	R 3.4	R 3.8

NOTES

These insulation guidelines take into consideration Timber Framed Building designs (NZS 3604) and their respective framing spacing and cladding types to assist in meeting the minimum NZBC H1 Energy Efficiency (2007) requirements. To achieve higher performance, reference can be made to the better/best classification of PAS 4244.

This information is applicable if:

- the total glazing area is 30% or less than the total wall area,
- the sum of the glazing area is 30% or less than the external west, east and south facing wall area,
- total skylight area is less than 1.2m²,
- All residential buildings and building up to 300m²,
- non CA rated downlights used are less than 1 per 5m² of ceiling,
- insulation installed to NZS 4246.

If these criteria are not met, please consult with your building designer for Calculation and Modelling method (NZS 4218) to ensure compliance to the NZ Building Code.

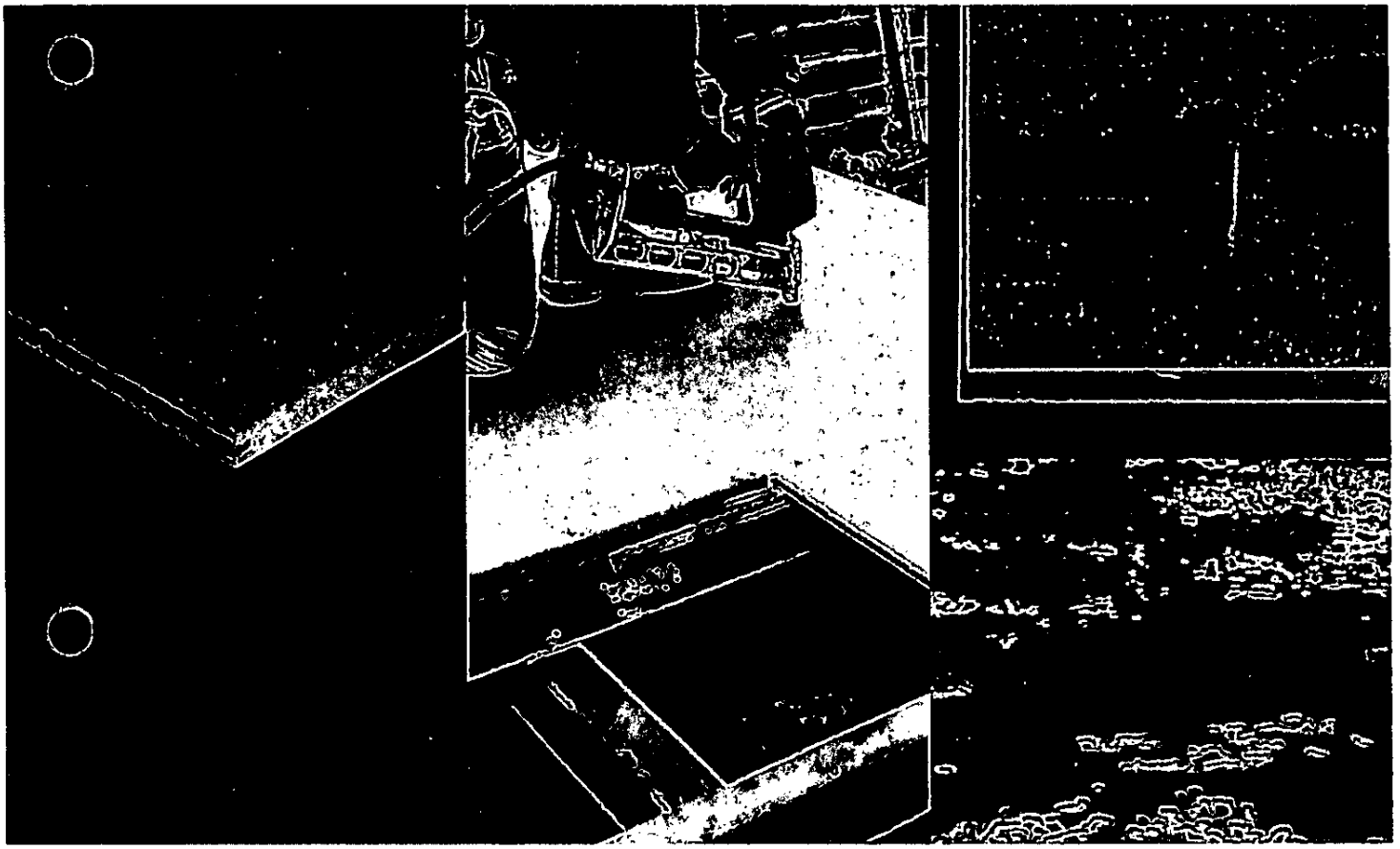
The R-value guidelines determined from the Schedule Method (NZS 4218) are minimum insulation levels recommended by Tasman Insulation New Zealand to cover a range of similar framing systems. Lower levels of insulation R-value than those indicated may apply for some framing systems. We ***strongly recommend a detailed analysis specific to your construction is carried out by a building designer on alternative R-value solutions to the above recommendation to ensure compliance to the NZ Building Code.***

*eg. In some instances a R 3.6 will suffice.

This brochure supersedes all previous revisions. Tasman Insulation New Zealand retain the right to change specifications without prior notification. If a specification is critical to the end use, please consult Tasman Insulation New Zealand. Do not use this information in an application other than that detailed in this data sheet, without obtaining written advice from Tasman Insulation New Zealand. All claims are subject to any variation caused by normal manufacturing process and tolerances. This information is provided without prejudice to Tasman Insulation New Zealand standard terms and conditions of sale. Tasman Insulation is a Fletcher Building Company.

Particleboard Flooring

The tradesman's essential guide



another **trade essential** from
THE laminex GROUP®

Particleboard Flooring

The tradesman's essential guide

Flooring even rotten weather can't flaw

Trade Essentials® Particleboard Flooring provides the best protection there is against damage caused by damp or humid conditions. Indeed, it is made to quality standards so high, not even the worst weather can flaw it if the guidelines in this brochure are followed. And, there are two product choices to cover your building requirements:

Green Tongue - 19mm for 450mm joists
Beige Tongue - 22mm for 600mm joists

There is also the option of Termite Treated Particleboard Flooring, should the specific situation demand this protection, as well as 25mm Brown Tongue particularly for commercial applications.

Superior moisture resistance

Unlike many particleboards, Trade Essentials® Particleboard Flooring is manufactured using extra fine wood particles. This ensures a far better distribution of the water resistant resins across the entire surface. In addition, all edges are coated with a wax edge seal.

The result is a level of moisture resistance, which is over **two times greater** than the required standards for flooring. Even when left exposed to the elements for up to three months Trade Essentials® Particleboard Flooring is guaranteed to meet the required standards (if guidelines are followed).

A safe, solid platform

Trade Essentials® Particleboard Flooring features an easy to use tongue and groove system that gives the flooring remarkable strength in the unsupported joints. This guarantees you a safe and solid platform on which to build your frame, or lay your floor coverings.

Applications

Trade Essentials® Particleboard Flooring is a three layered particleboard, bonded with moisture resistant resin and wax, specifically formulated for use as interior flooring.

It is suitable for all domestic housing as well as commercial installations, provided it is installed to the requirements of AS 1860 (Installation of Particleboard Flooring).

Trade Essentials® Particleboard Flooring can be used for a variety of framed building constructions including fitted floor, upper storey and platform constructions.

Physical Properties
(Typical physical properties when tested to AS/NZS 1860.1: 2002. Int)

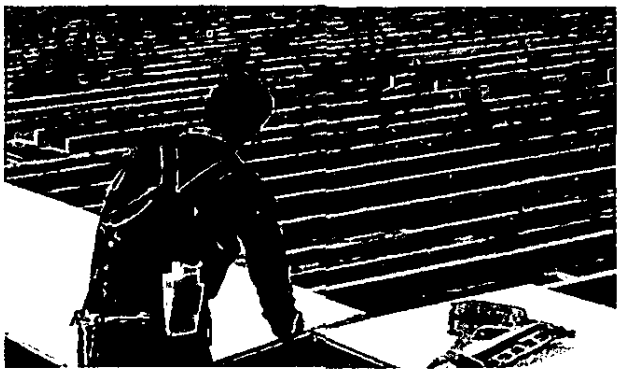
Board Thickness Property	Unit	19mm	22mm
Weight	Kg/m²	13.1	15.2
Modulus of Rupture	MPa	24 av.	24 av.
Modulus of Elasticity	MPa	3500 av.	3500 av.
Internal Bond	kPa	700 av.	700 av.
Thickness Swell 24hr	%	5 av.	5 av.
Wet Bending Strength	MPa	5	5
Surface Water Absorption	g/m²	70	70
Thickness Stability	%	12 av.	12 av.
Glue Bond Quality	MPa	12 av.	12 av.

Fire Hazard Indicies
(Typically achieved when tested to AS/NZS 1530.3: 1989)

Indicies	Result	Range
Ignitability	14	0 - 20
Spread of Flame	8	0 - 10
Heat Evolved	7	0 - 10
Smoke Developed	3	0 - 10

Fire Test Results
(Results when tested in accordance with AS/NZS 3837)

Classification:	Group Number 3 (in accordance with specification A2.4 of the BCA)
Average Extinction Area:	40.2Kg/m² (Refer to specification C1.10a section 3(c) of the BCA)



Moisture resistance - General information

Trade Essentials® Particleboard Flooring is capable of withstanding general weathering for up to 3 months. To maintain best practice, boards must be covered on building sites. It is recommended to avoid where possible, exposure of the panels to severe conditions, such as prolonged exposure to intense sun, cyclic soaking rain etc, as these exposures have the potential to alter the moisture gradient of the panels and may cause dimensional change, similar to natural timber. A moisture level of about 7% is present in the board at the time of despatch from the warehouse at Welshpool, Western Australia.

For further information refer: AS/NZS 1860.2: Particleboard Flooring Part 2 Installation.

Thermal properties

Thermal conductivity – 0.1 – 0.14 W/mk. Dimensionally stability and strength is unaffected over normal temperature range.

Acoustic properties

Sound transmission loss depends on the building element and its method of installation. Particleboard with thickness over 16mm should achieve 25dB loss.

Fire resistance

Trade Essentials® Particleboard Flooring is combustible. Burning is limited by charcoal formed on the board surface. The rate of burning is comparable to that of natural timber of similar density.

Particleboard flooring adhesives

The following information is provided as an adhesive usage guide and is based on the application of a 5mm bead to joists and tongues as outlined in the installation instructions in this brochure.

Flooring	Adhesive Required per Pack of Flooring
Green Tongue (19mm to span 450mm joists)	
800mm wide sheet (35 sheets per pack)	25 x 300 ml cartridge or 10 x 850 ml cartridge
Beige Tongue (22mm to span 600mm joists)	
800mm wide sheet (25 sheets per pack)	20 x 300 ml cartridge or 8 x 850 ml cartridge

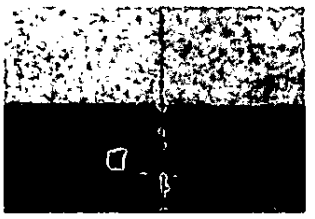
Product range

Trade Essentials® Particleboard Flooring has a plain core colour with a yellow wax edge seal to all edges. There are two product thicknesses each identified by the colour of their PVC tongue:

Green tongue (19mm) –
For use with floor joists spaced at 450mm

Beige tongue (22mm) –
For use with floor joists spaced at 600mm

Trade Essentials® Particleboard Flooring is available in different sheet sizes. There is also the option of Termite Treated Particleboard Flooring and Brown Tongue (25mm) for commercial applications. For full details contact your nearest branch of The Laminex Group.



Installation instructions

1. **Assess the site**
   Ensure correct sub-floor clearance and ventilation as per Australian Standard 1860 "Installation of Particleboard Flooring", or local building regulations. Particleboard Flooring is not suitable under conditions of permanent dampness, i.e. where particleboard moisture content is permanently in excess of 16 per cent moisture content.

2. **Positioning and fixing**
   Locate a string line parallel to the perimeter of the floor and at right angles to the joists. Fit the first new row of sheets with the tongued edge to the string line. This will ensure edge straightness. Tongue and grooved edges must run parallel to the span and sheeting must span no less than two floor joist spacings. Fix second sheet in a similar manner inserting plastic tongue into the groove of sheet one. Be sure to apply bead of adhesive to tongue prior to installation.

   DO NOT cramp or over-tighten. After each row is laid, fully nail or screw the previous row (refer to the fixing pattern).

   Install all sheets with the same face upwards, to ensure flush mating of adjoining faces. Butt joints should be staggered in alternative rows to give a rigid floor.

   Handy hints:
   The Laminex Group recommends **Trade Essentials® Particleboard Flooring Adhesive** for this application. This is a high performance, fast setting synthetic rubber based adhesive, specially formulated for the permanent and speedy installation of structural sheet flooring panels, in conjunction with supplementary mechanical fastenings.

   If the tongue and grooved profile is changed to a square edge during trimming or cutting of sheet, re-profile the edge with a circular saw and insert a tongue, or alternatively use as **square edged Particleboard Flooring.**

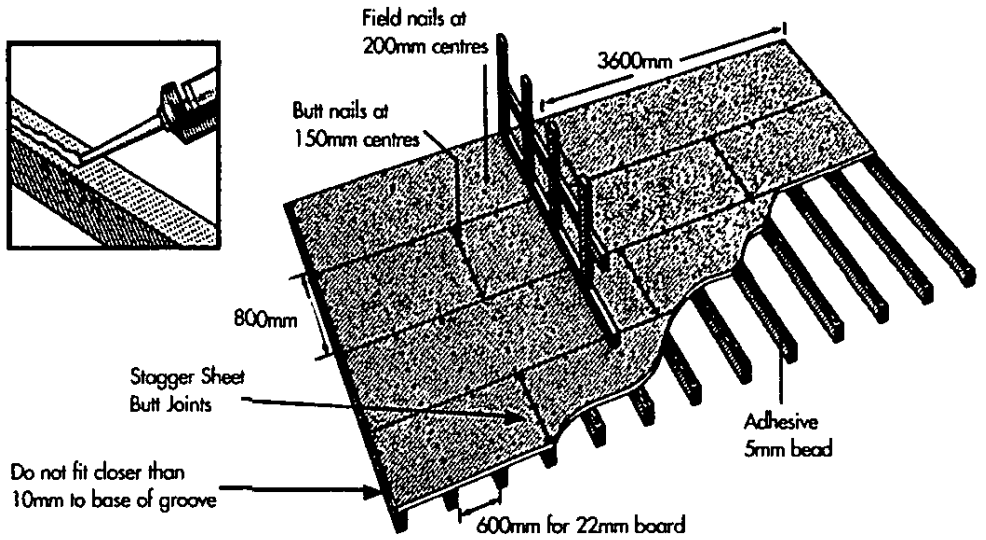
   Where Particleboard Flooring is used in square edge form, the sheets should be laid with their long edges supported by noggings or trimmers. Sheet butt joints must be staggered.

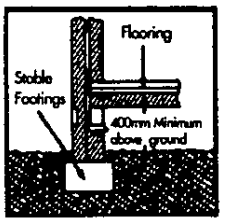
3. **Fixing technique**
   Particleboard Flooring may be fixed on the subfloor with hand or power-driven fasteners. For a rigid squeak-free floor system, ensure a continuous 5mm bead of **Trade Essentials® Particleboard Flooring Adhesive** is applied to all joists and along the top of the tongue. Two beads of adhesive need to be placed on the joist where the butt joint occurs.

   DO NOT apply too far ahead as adhesive cures quickly. At all times follow instructions on the adhesive pack.

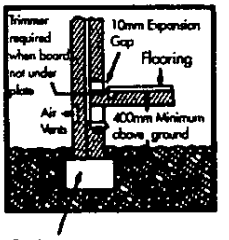
   Where gun nailing, nail heads should not penetrate the surface by more than 1.0mm. Adjust air pressure to suit softwood or hardwood joists. Gun nail only in accordance with gun nail specifications. Galvanised nails are recommended.

   Nails should be punched below the surface of the sheets just before the sanding or laying of floor coverings. This ensures firm seating of the flooring joists. Particleboard Flooring that is likely to be subjected to increased levels of traffic vibration should be fixed with spiral or helical shank nails.





Platform construction



Fitted floor

Nailing Method	Joist Type	Nail or Screw Size (mm)
Hand Hammer (nails)	Hardwood & Cypress Pine	50 X 2.80
	Softwood	55 X 3.15
Nail Gun (nails)*	All Timber	55 X 2.5 Tee - head or Finished head
Screw	Timber Type	No. 10 X 50mm, Type 17 Countersunk head, Self drilling
Screw	Steel Type	No. 10 X 45mm Countersunk head, Self embedding wing tip

4. Types of construction

4.1 Platform floor construction

Platform flooring construction involves flooring laid on the floor joists over the whole floor area prior to the erection of the wall and roof framing. Trade Essentials® Particleboard Flooring is capable of withstanding general weathering for up to 3 months. Less exposure however, is recommended. To maintain best practice, packs of Particleboard Flooring should be protected from the weather before installation. Particleboard Flooring will expand and contract as sheets respond to changes in atmospheric moisture. Allowance for the movement must be made throughout the floor area by providing gaps and special joints as appropriate to accommodate sheet expansion.

An expansion joint is a 20mm gap in flooring sheets located above a wide (50mm minimum) or double joist. Extra joist area is necessary so that sheet ends can be properly fixed while still allowing the 20mm gap. The joint may be covered by a metal or plastic moulding, screwed into the joist, or partitioning may be located over the joint. Spacing of expansion joints should be between 10 and 20m with the final decision depending upon the assessment of whether:

- the floor is elevated or on ground level
- the area is air conditioned
- it is a tropical region (coastal area, north of 27th parallel)
- what moisture variations are likely in the flooring

Exposure to very hot sun, particularly after the board has been soaked by rain, may cause panel shrinkage and cupping. If this occurs, then light wetting of the board and shading of the site may help minimise the effect by slowing the rate at which the flooring dries.

DO NOT stack heavy concentrated loads on the floor, e.g. bricks, heavy structural materials. **DO NOT** use the floor as a mixing table and avoid build up of plaster, concrete and paint on the floor.

4.2 Fitted floor construction

Fitted floor construction involves construction of the floor after the internal walls. An expansion gap of 1–2 mm per metre of room dimension (10mm minimum) should be left around the room perimeter. This is usually covered by the skirting board. For large floor areas an expansion joint should be provided (see 4.1).

4.3 Upper storey construction

Upper storey construction utilises Particleboard Flooring laid on timber joists and supported on wall framing/ internal brick work. Green and Beige Tongue Particleboard Flooring is ideal for internal upper storey construction and extensions.

5. Surface finishing

Australian Standard 1860 "Installation of Particleboard Flooring" provides guidelines for surface finishing.

(a) Inspect for dampness especially if board has been weathered before proceeding with finishing operations; if found to be excessively damp it shall be left until its moisture content is 15 percent or less.

(b) If the flooring is to be covered with carpet, the surface should be firm and tight with no loose flakes or particles:

(i) Nails should be inspected and hammered flush, screws should be flush with the surface.

(ii) If the surface has been exposed to the weather, some sanding may be required. Full sanding may not be necessary, but rough or uneven areas should be spot sanded. Nail punching and screw counter sinking will only be necessary in these areas.

NOTE: FULL SANDING may be necessary if the Particleboard Flooring has been subjected to prolonged rain while being exposed.

(iii) Sanding before carpet laying should be with 40-60 grit sand paper.

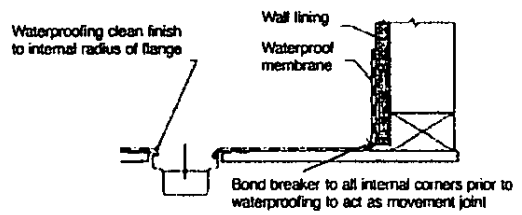
(c) For other surface finishes, full sanding will usually be required if the particleboard has been exposed to the weather. The surface shall be given a first cut with 40-60 grit sand paper followed by 80-100 grit sand paper.

(d) Depth of material removed shall not exceed the following except where otherwise specified by the manufacturer:

(i) Over the general sheet area – 1mm

(ii) Within 50mm of any supported edge – 2mm

(e) All surfaces shall be cleaned to remove dust.



6. Surface preparation - wet area rooms

(Bathrooms, kitchens, laundries)

- Procedures required by AS 3740 "Waterproofing of Wet Areas Within Residential Buildings", should be followed closely.
- Holes may be required in the floor to accommodate pipes, drains and plumbing wastes. These should be accurately drilled and cut ensuring that excessive material is not removed (rough punching is unacceptable).
- All edges should be sealed using pink primer, construction adhesive, or another suitable sealer.
- All building debris, plastic or other building matter should be completely removed and the floor surface sanded clean prior to waterproofing treatments.
- Joints between sheets should be carefully inspected and prepared. Flashing should be placed over joints.
- An impermeable membrane is required to seal the floor prior to the overlaying of surface finishes such as ceramic or PVC tiles. The Laminex Group recommends the following for application:

(a) Davco Dampfast
(b) Bostick Ultraseal

The Laminex Group recommends that the respective manufacturer's instructions are followed when applying these products.

7. Resilient sheet and tile

The requirements of Australian Standard 1884 "Floor Coverings – Resilient Sheet and Tiles-Laying and Maintenance Practices" should be followed when finishing with materials such as flexible and semi-rigid cork, rubber, linoleum and vinyl.

Unsatisfactory results may be obtained if resilient floor coverings are laid directly on to the Green Tongue or Beige Tongue Particleboard Flooring, due to movement of the flooring or subfloor structure with changes in moisture content or settling.

Use of an underlay will minimise the risk of either failure of the bond between the covering and the floor, or of particleboard flooring sheet joints showing through the coverings. Underlay joins should not coincide with the particleboard flooring joins.

Standards & relevant codes

Building Code of Australia
AS/NZS 1860.1
Particleboard Flooring Part 1 Specification.

AS 1170.1 SAA
Loading Code, Dead and Live Loads and Load Combinations.

AS 1860.2
Particleboard Flooring Part 2 Installation.

AS 1884
Floor Coverings – Resilient Sheet and Tiles - Laying and Maintenance Practice.

AS 3740
Waterproofing of Wet Areas Within Residential Buildings.

Design criteria

Industrial
Guidelines in Australian Wood Panels Association Flooring Design Manual. Obtainable online at www.woodpanels.org.au

Domestic
19mm to span 450mm maximum joist centres
22mm to span 600mm maximum joist centres

Hints & tips:

- Do ensure correct, sub-floor clearance and ventilation.
- Do lay out all sheets first when fixing a platform floor.
- Do leave an expansion gap around room perimeters of fitted floors (see positioning & fixing diagram).
- Do protect sheets from the weather before installation.
- Do store sheets prior to fixing to allow adjustment to site conditions.
- Do make sure to follow instructions when using adhesive.
- Avoid build-up of concrete, plaster and paint on floor.
- Do not allow water to pool on sheets – sweep away as soon as possible.
- Do not leave butt joints unsupported by joists or noggings.
- Do not stack heavy concreted loads on floor panels.
- Do not Bondcrete or otherwise seal floor during construction – this will prevent floor drying out properly.
- Do not use floor as a mixing table.
- Set out joists to suit sheet size and thickness.
- Underlay joins should not coincide with particleboard flooring joins.
- And a final hint – screws (rather than nails) produce a better squeak-free finish for DIY installers.

Storage and exposure of Particleboard Flooring

Trade Essentials® Particleboard Flooring should always be stored flat and in a dry area, with timber bearers spaced about 450mm apart to keep it off the floor or ground. Packs of board are best protected from the weather.

Covering should allow some air circulation during the storage period. Packs should be protected on the top and sides with waterproof material (such as plastic sheeting). Packing should be used to keep plastic sheeting clear of the flooring pack so that air circulation can occur.

To maintain best practice, packs of Particleboard Flooring should be protected from the weather before installation. Particleboard Flooring should be stored for about 1 week (where possible longer) prior to fixing to allow adjustment to site conditions. Water absorption will cause expansion of the sheets and this will lead to gaps in the floor later when the particleboard sheet dries out. It is recommended to avoid where possible, exposure of the panels to severe conditions, such as prolonged exposure to intense sun, cyclic soaking rain etc, as these exposures have the potential to alter the moisture gradient of the panels and may cause dimensional change, similar to natural timber.

Like nearly all timber products, Particleboard Flooring may react to changes in humidity and to direct wetting, but if laid in accordance with the required standards and the recommendations outlined in this brochure, Trade Essentials® Particleboard Flooring will withstand the conditions of platform construction.

Once it is laid, Trade Essentials® Particleboard Flooring may be exposed to the general effects of weather for up to three months and still meet the requirements of AS/NZS 1860.1 Part 1 Specifications for Class 1 flooring.

Water should not be allowed to lie on the flooring surface. Sweep it off or drill drain holes in positions that will be covered when the job is completed. It is recommended that protection by roof and walls be provided as soon as possible.

Safety and handling

Particleboard is a reconstituted wood product containing wood, resin and wax. Machine tools should be fitted with dust extractors and the wearing of a dust mask is recommended. Material Safety Data Sheets for Particleboard Flooring are available on request from any branch of The Laminex Group.

Particleboard Flooring

Trade Essentials Product Range

- Adhesives
- Particleboard
- White MDF
- Craftform®
- ReadiKits®
- Craftwood®
- Whiteboard

Particleboard Flooring is marketed, distributed and manufactured in Australasia by The Laminex Group

For more information visit **www.thelaminexgroup.com.au** or call **132 136.**

Particleboard Flooring is marketed, distributed and manufactured by The Laminex Group. A division of Laminex Group Pty Limited ABN 98 004 093 092. The information contained in this technical publication is intended to give a general indication of the characteristics of the material. While all possible care has been taken to ensure that the information is correct, the manufacturer cannot accept any liability, nor is any liability on the part of the manufacturer to be implied as a result of the data given. All measurements shown are in millimetres and nominal unless otherwise stated. The information contained in this publication supersedes all previous information and is subject to alteration without notice. Please obtain a copy of the terms and conditions of the Particleboard Flooring 7 Year Limited Warranty from The Laminex Group or visit www.thelaminexgroup.com.au. This Warranty is in addition to any rights that may exist under the Trade Practices Act.
Trade Essentials®, Craftform®, Craftwood®, ReadiKits®

another **trade essential** from
THE **laminex** GROUP®

08/07 advanz

Thermakraft
Industries (NZ) Ltd

CI/SfB	
	FEBRUARY 2005

DESIGNER AND USER GUIDELINES

THERMAKRAFT 215 BITUMINOUS SELF SUPPORTING ROOFING UNDERLAY

Product Description

Thermakraft 215 Bituminous Self Supporting Roofing Underlay is specifically designed for use in Domestic and Commercial type buildings.

Thermakraft 215 Bituminous Self Supporting Roofing Underlay will provide the following functions:

1) Permeable to water vapours.
2) Resistance to water and air penetration.
3) *Resistance to dust and excessive air movement.*
4) Is self supporting up to 1200mm rafter/purlin spacing.

Applications

Thermakraft 215 Bituminous Self Supporting Roofing Underlay provides the ideal temporary protection against wind, snow and rain prior to the application of the wall cladding or roofing material. It is ideally used to reduce condensation under roofing.

Care should be taken not to expose **Thermakraft 215 Bituminous Self Supporting Roofing Underlay** to continuous wet and windy conditions. Apply during mild conditions.

Note

Applications outside our recommendations or if unusual conditions exist the suitability of **Thermakraft 215 Bituminous Self Supporting Roofing Underlay** should be established by contacting a representative of **Thermakraft Industries (NZ) Ltd.**

Standard Roll Dimensions

Thermakraft 215 Bituminous Self Supporting Roofing Underlay is coloured black.

Rolls are girth wrapped and labelled with the company name and manufacture batch number.

Roll Sizes	1250mm x 40m	50m²	18 kg
	1250mm x 20m	25m²	9 kg (2 per pack)
	1450mm x 34.5m	50m²	18 kg

Standards

Thermakraft 215 Bituminous Self Supporting Roofing Underlay complies with the requirements of AS/NZS 4200.1: 1994 Pliable Building Membranes and Underlays.

Durability

Thermakraft 215 Bituminous Self Supporting Roofing Underlay when in accordance with the approved document E2 of the Building Code and:

- is installed correctly.
- is not subjected to unreasonable conditions of exposure.
- is not damaged due to design defects.
- is not covered by faulty or thin sheathing.
- must not be exposed to the weather for more than 7 days.
- *is not subjected to prolonged humidites in excess of 90% RH.*

Thermakraft 215 Bituminous Self Supporting Roofing Underlay will last for 50 years.

E. & O. E.

THERMAKRAFT 215 Bituminous Self Supporting Roofing Underlay

Installation	**Thermakraft 215 Bituminous Self Supporting Roofing Underlay** may be run vertically over purlins with a 150mm lap. Fix securely to purlins with galvanised fixing clips. The membrane should be firmly laid to avoid excessive dishing between purlins. Avoid prolonged exposure by installing the roof immediately.
NOTE:	However if used vertically individual runs should be limited to 10 metres.
	Thermakraft 215 Bituminous Self Supporting Roofing Underlay may be run horizontally across rafter/trusses with a 150mm lap, prior to fixing of purlins or battens. Secure to rafters/trusses using appropriate fixing clouts or clips. Avoid prolonged exposure by installing the roof immediately.
NOTE:	To conform to NZS 3604: 1999 Section 11.2, underlays under an 8° pitch shall be laid horizontally and the upper sheets shall be lapped over the lower sheet on the roof.
Availability	**Thermakraft 215 Bituminous Self Supporting Roofing Underlay** is available from leading hardware and builders supplies merchants and roofing manufacturers. In case of difficulty contact our office toll free 0800-806-595 for assistance.
Storage	**Thermakraft 215 Bituminous Self Supporting Roofing Underlay** should be stood on end and kept dry.
Fire Retardancy	**Thermakraft 215 Bituminous Self Supporting Roofing Underlay** is a bitumen based product and is therefore not intended for use as a fire retardant product.

Classification	**In accordance With AS/NZS 4200.1**	
	Duty:	Heavy
	Flammability Index:	Unclassified

Technical Data	**(As per AS/NZS 4200.1 and NZS 2295)**	
	Nominal Weight	370 g/m²
	Tensile Strength MD	15.57 kN/m
	Tensile Strength CD	7.50 kN/m
	Edge Tear	99.8 N
	Ph Reaction	7.3 nominal
	Permeability	197 g/m²/ day
	Water Absorption	277 g/m² nominal
	Water Penetration	Pass

The information contained in this document is believed to be correct and accurate. However all due care should be exercised by those who use it. If in doubt contact a **Thermakraft Industries (NZ) Ltd** representative for advice.
Care should be taken to ensure that fixing clips, nails and staples used with ***Thermakraft 215 Bituminous Self Supporting Roofing Underlay*** are of a type that will have a life of not less than 50 years.

Thermakraft Industries (NZ) Ltd
11 Turin Place, East Tamaki, Auckland, N.Z.
P.O. Box 58-112, Greenmount, Auckland.
Phone 09-273 3727 Fax 09-273 3726 Free Phone 0800 806 595
Email: sales@thermakraft.co.nz Website: www.thermakraft.co.nz

E. & O. E.

BUTYNOL & EPDM MEMBRANES

ARDEX

About ARDEX

ARDEX specialises in high-quality construction materials for substrate preparation, levelling floors, waterproofing, the fixing of natural stones & ceramic tiles and other surfacing materials. ARDEX offers innovative products of outstanding quality and optimal environmental friendliness, as well as providing training and support services for their application. The ARDEX Group comprises of 28 subsidiaries and some 1,400 employees active in offices and branches in more than 50 countries.

The history of ARDEX can be traced back over 50 years to Witten, Germany where ARDEX Chemie Gmbh was founded by Herr and Frau Fortmann and Dr. Kraft. Products such as **Ardurit Z8** and **Ardur K15** are firmly established as benchmarks for flooring products worldwide.

In December 2001 ARDEX acquired Norcros Building Products (NBP). The latter has a similar heritage in the Australasian market with **Butynol waterproofing membranes, ABA tile adhesives** – renowned for their quality and technical excellence, a reputation built over 30 years. Innovations such as Abaflex are unique in the market until this day. Other brands offered by NBP include **Superflex** under-tile waterproofing systems, **Shelter (previously Dunlop)** sheet membrane systems and **HydrEpoxy** coatings. In 2002 **Vibro Products Pty Ltd**, manufacturers under licence of ARDEX floor levelling and adhesives, was acquired and integrated into ARDEX.

These brands, leaders in their respective fields, come together under the ARDEX umbrella, offering you expert solutions. In addition, sharing of resources and technology within our extensive network enables us to provide you with a broader range of world benchmarked products and services.

Make ARDEX your single point of contact for all your waterproofing, flooring and tiling needs.

The Ardex Vision

Ardex New Zealand aims to become New Zealand's leading supplier of high quality specialised construction materials.

THIS PRODUCT MANUAL TAKES EFFECT FROM 1ST APRIL 2005 AND REPLACES ALL PREVIOUS PRODUCT MANUALS ISSUED BY ARDEX NEW ZEALAND LTD

® Butynol, Shelterbit, Shelterseal, Sheltercoat, Episeal and Fibrepol are registered tradenames.

ARDEX Butyl

BRANZ Appraised,
E2/AS1 Acceptable Solution

BRANZ APPRAISED

SPECIFY WITH CONFIDENCE

BRANZ Appraisals
Technical Assessments of products for building and construction

BRANZ APPRAISAL CERTIFICATE No. 436 (2005)

BUTYNOL® ROOFING MEMBRANE

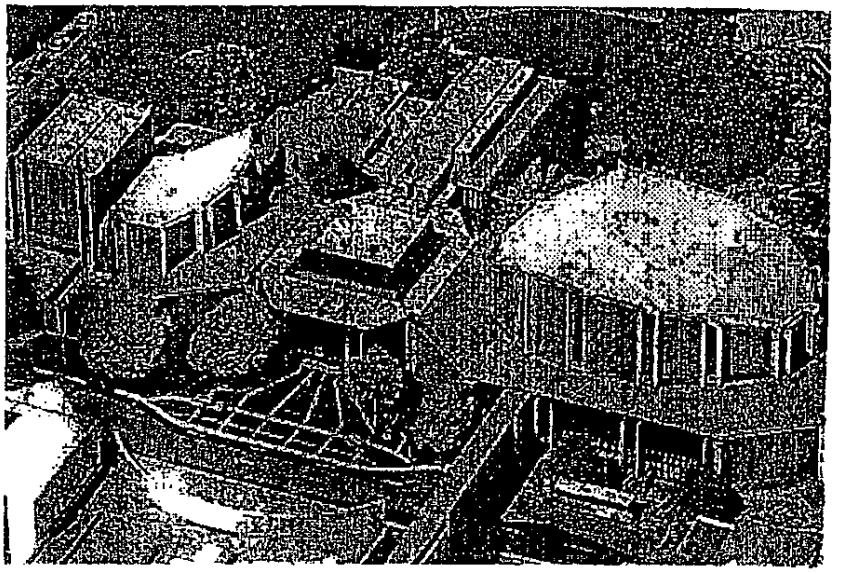
Ardex NZ Ltd
PO Box 11-299
Ellerslie
Auckland
Tel 09 573 1275
Fax 09 573 1276
www.ardex.co.nz

BRANZ

WFTAO

1.1 Butynol® Roofing Membrane is a synthetic rubber waterproofing membrane designed to be used on roofs and decks.

1.2 The product is supplied as single-ply, flexible synthetic rubber sheet in roll form. The product is installed as a single layer system.



Current view of Christchurch Town Hall.
1 mm Butynol® Roof Membrane laid 1972.

2.1 Butynol® Roofing Membrane has been appraised for use as waterproofing membrane for buildings within the following scope:

- scope limitations of NZBC Acceptable Solution E2/AS1, Paragraph 1.1; and
- with timber supporting structures designed and constructed in accordance with the NZBC; and,
- with nominally flat or pitched roofs constructed to drain water to gutters and drain outlets complying with NZBC; and,
- with substrates of plywood sheet; and,
- with decks that have a maximum size of 40m².

2.2 Butynol® Roofing Membrane has also been appraised for use as waterproofing membrane for external reinforced concrete and plywood roofs, pedestrian decks and balconies for buildings within the following scope:

- up to 3 storeys with a maximum height from ground to eaves of 10m and with a floor plan area limited only by seismic and structural control joints; and,
- with the reinforced concrete structure designed and constructed in accordance with the NZBC; and,
- with timber supporting structures designed and constructed in accordance with the NZBC; and,
- with nominally flat, curved or pitched roofs constructed to drain water to gutters and drain outlets complying with NZBC.

2.3 This Appraisal is limited to roofs, decks and balconies within the following scope:

- constructed to suitable falls (Refer Paragraph 13.1 – 13.9); and,
- with no steps within the deck level, no integral roof gardens and no down pipe discharging directly onto the deck.

2.4 The design and construction of the substrate and movement and control joints is specific to each building, and therefore the responsibility of the building designer and building contractor and is outside the scope of this Certificate.

3.1 **In the opinion of BRANZ, Butynol® Roof Membrane, if designed, used, installed and maintained in accordance with the statements and conditions of this Certificate, will meet or contribute to meeting the following provisions of the NZBC:**

Clause B2 DURABILITY: Performance B2.3.1 (b) 15 years. Butynol® Roof Membrane meets this requirement. See Paragraph 9.1.

Clause E2 EXTERNAL MOISTURE: Performance E2.3.1 and E2.3.2. Roofs. Decks and balconies incorporating Butynol® Roof Membrane meets these requirements. See Paragraphs 12.1 – 12.9.

Clause F2 HAZARDOUS BUILDING MATERIALS: Performance F2.3.1. Butynol® Roof Membrane meets this requirement and will not present a health hazard to people.

3.2 This Certificate appraises an Acceptable Solution in terms of New Zealand Building Code compliance and the product complies with NZBC Acceptable Solution E2/AS1 Paragraph 8.5. This product is also appraised as an Alternative Solution as outlined in Paragraph 2.2

4.1 Materials supplied by Ardex NZ Ltd are as follows:

Butynol® Membranes

All membranes are single-ply, [illegible] membranes are supplied in rolls [illegible] wide by [illegible] long. Each roll is packed in a polythene wrapper trademarked "Butynol®" with the [illegible] identified. Gauges available are 1.0, 1.5 and 2.25mm in black and 1.5mm in [illegible].

Adhesive WA98

- A specially formulated solvent-based adhesive for all Butynol® applications. Supplied in 1, 4 and 20 litre containers

Seam Primer

- A water resistant primer adhesive, used with seam tape for general lap bonding.

Seam Tape

- Uncured cold gum tape used for general lap bonding and laps likely to be subject to periodic ponding. Supplied in 50mm x 30.5 metre rolls.

Flashing Tape

- A malleable tape for moulding gussets, pipe flashings and awkward situations. Supplied in widths of 50-100mm x 5 metres long.

Butynol Sealant

- A specially designed and formulated sealant for sealing Butynol® flashings into chases. Supplied in 375mm tubes.

Handling and Storage

5.1 Handling and storage of all materials whether on or off site is under the control of the Ardex NZ Ltd trained installers. Dry storage must be provided for all products and the rolls of membrane must be stored in an upright position.

6.1 Refer to the Appraisals listing on the BRANZ website for details of the current Technical Literature for the Butynol® Roofing Membrane. The Technical Literature must be read in conjunction with this Certificate. All aspects of design, use installation and maintenance contained in the Technical Literature and within the scope of this Certificate must be followed.

General

7.1 Butynol® Roofing Membrane is for use on roofs, decks and balconies where an impervious waterproof membrane is required to prevent damage to building elements and adjoining areas.

7.2 The 1.0mm thickness product is designed for use on roofs and gutters, and will accommodate light traffic; the 1.5mm is for walk out decks and high maintenance areas; and the 2.25mm is a heavy duty product that is custom made on request.

7.3 The effective control of internal moisture must be considered at the design stage due to the impermeability of the membrane. Refer to BRANZ publication "Good Practice Guide to Membrane Roofing".

7.4 [illegible] framing systems must comply with [illegible] where [illegible] the engineering design [illegible] the framing [illegible] of [illegible] equivalent stiffness to the [illegible] Paragraph [illegible] complied with the [illegible] all cases framing must be provided so that the maximum [illegible] the substrate as specified by the substrate manufacturer is met and that all sheet edges are fully supported.

Substrates

Plywood

8.1 Plywood must be treated to H3.2 (CCA treated) LOSP treated plywood must not be used. Plywood must comply with NZBC Acceptable Solution E2/AS1 Paragraph 8.5.3 and 8.5.5. Where specific design is used (i.e. outside the scope of E2/AS1), the plywood thickness and fixing size may increase and centres may decrease to meet specific wind loadings.

Concrete

8.2 Concrete substrates must be to a specific engineering design meeting the requirements of the NZBC, such as concrete construction to NZS 3101.

Durability

Serviceable Life

9.1 Butynol® Roofing Membrane when subjected to normal conditions of environment and with proper maintenance can expect to have a serviceable life of at least 20 years.

Maintenance

10.1 No maintenance of the membrane is normally required provided significant substrate movement does not occur.

10.2 In the event of damage to the membrane, the membrane

combustible materials.

External Moisture

12.1 Roofs, decks and balconies must be designed and constructed to shed precipitated moisture. They must also take account of snowfalls in snow prone areas. A means of meeting code compliance with NZBC Clause E2.3.1 is given by the Technical Literature which matches details in NZBC Acceptable Solution E2/AS1.

12.2 When installed in accordance with this Certificate and the Technical Literature, Butynol® Roofing Membrane will prevent the penetration of water and will therefore meet code compliance with Clause E2.3.2. The membrane is impervious to water and will give a weathertight roof, roof deck or balcony.

12.3 The minimum fall to roofs is 1 in 40 and to decks, balconies and gutters are 1 in 60. All falls must slope to an outlet. Inadequate falls will allow moisture to collect and increase the risk of deterioration of the membrane.

12.4 Butynol® Roofing Membrane is impermeable; therefore a means of dissipating construction moisture must be provided in the building design and construction to meet code compliance with Clause E2.3.6.

12.5 Roof, deck and balcony falls must be built into the substrate and not created with mortar screeds applied over the membrane.

12.6 Allowance for deflection and settlement of the substrate must be made in the design of the deck or balcony to ensure falls are maintained and no ponding of water can occur.

Drainage flanges [illegible] used for any outlet [illegible] covered with a grate [illegible] to reduce potential [illegible] blockages. An overflow [illegible] provided where the deck or balcony does not drain to an external gutter or spouting.

12.8 Penetrations and upstands of the membrane must be raised above the level of any possible flooding caused by blockage of deck and balcony drainage.

12.9 The design of details not covered by the Technical Literature is subject to specific weathertightness design and is outside the scope of this certificate.

Water Supplies

13.1 Butynol® Roofing Membrane is suitable for roofs used for the collection of water supplies in compliance with the provisions of NZBC G12.3.1. Water collection systems are the subject of specific design and are outside the scope of this Certificate.

Installation Skill Level Requirement

14.1 Installation of the membrane must be completed by trained applicators, approved by Ardex NZ Ltd.

14.2 Installation of substrates must be completed by tradespersons with an understanding of roof, deck and balcony construction, in accordance with instructions given within the Ardex NZ Ltd Technical Literature and this Certificate.

formwork release agents. All surface defects must be filled to achieve an even and uniform surface.

15.2 Concrete substrates can be checked for dryness by using a hygrometer, as set out in BRANZ Bulletin No 424. The relative humidity of the concrete must be 75% or less before membrane application.

15.3 The moisture content of a timber substructure must be a maximum of 20% and plywood sheet must be dry at time of membrane application. This will generally require plywood sheets to be covered until just before the membrane is laid, to prevent rain wetting.

15.4 Substrates must be primed with a 50/50 solution of WA98 and adhesive solvent and left to dry before membrane is installed.

Membrane Installation

16.1 The membrane must be installed in accordance with the Technical Literature.

16.2 Plywood joints must be taped with 25mm wide PVC pressure sensitive tape.

16.3 The membrane must be unrolled without tension onto the prepared substrate and allowed to 'relax' for at least 20 minutes prior to installation.

16.4 Adhesive must be applied to both the membrane and the substrate, one half at a time. When the adhesive is tack dry, the sheet is rolled onto the substrate. The process is then repeated for the other half of the sheet. Joints in substrates with a [illegible] all edges of the membrane irrespective of [illegible] and areas subject to [illegible] ponding require [illegible] Ardex seam tape [illegible] on substrates with a [illegible] sealed using WA98 adhesive. This applies to the [illegible] only.

Inspections

17.1 The Technical Literature must be referred to during the inspection of membrane installations by Building Consent Authorities and Territorial Authorities.

17.2 Critical areas of inspection for waterproofing systems are:

- Construction of substrates, including crack control and installation of bond breakers and movement control joints
- Moisture content of the substrate prior to the application of the membrane.
- Acceptance of the substrate by the membrane installer prior to application of the membrane.
- Installation of the membrane to the manufacturer's instructions.

Health and Safety

18.1 Safe use and handling procedures for the membrane system is provided in the Technical Literature.

The products must be used in conjunction with the relevant Materials Safety Data Sheet for each membrane.

carried out.

Tests

19.1 Tests have been carried out on the membrane by Materials and Quality Consultancy Ltd This testing covered specific gravity, shore hardness, tensile strength, modus of elongation, elongation at break, tensile and elongation retention after heat aging, tear strength, ozone resistance and water absorption as detailed in NZBC Acceptable Solution E2/AS1 Paragraph 8.5.4(b). Results and test methods have been reviewed by BRANZ and found to be satisfactory.

19.2 Water vapour permeability tests have been undertaken by BRANZ in accordance with ASTM E96

19.3 Tests have been carried out on the membrane to assess its suitability for use with potable water supplies This testing showed the product was satisfactory.

19.4 The adhesives, primers and seam tapes used with Butynol® Roofing Membrane meet the intended performance requirements of NZBC Acceptable Solution E2/AS1 Paragraph 8.5.4(c). *Note: At the time of this Certificate's issue BRANZ EM5 as oulined on Paragraph 8.5.4(c)(i) was not published.*

Other Investigations

20.1 An assessment was made of the durability of the Butynol® Roofing Membrane by BRANZ technical experts using NZBC B2/VM1 History of Use

20.2 Site visits have been carried out by BRANZ to assess the practicability of installation and the examine completed installations

Quality

21.1 The manufacture of the Butynol® Roofing membrane has been examined by BRANZ, and details regarding the quality and composition of the materials used were obtained by BRANZ and found to be satisfactory. The membrane manufacturer is the subject of AS/NZS ISO 9001 Certificate by Telarc Limited, Registration No. 621.

21.2 The quality of manufacture of the product is the responsibility of Ardex NZ Ltd.

21.4 The quality of supply of the product to the market is the responsibility of Ardex NZ Ltd.

21.5 Quality on site is the responsibility of the Ardex NZ Ltd approved applicators.

21.6 Designers are responsible for the substrate design, and building contractors are responsible for the quality of construction of substrate systems in accordance with the instructions of the substrate manufacturer, Ardex NZ Ltd and this Certificate.

Sources of Information

- AS/NZS 2269:1994 Plywood – Structural
- ASTM E 96-02 Water vapour transmission of materials in sheet form, American Society of Testing Materials, Philadelphia, 1992.
- NZS 3101: 1995 The design of concrete structures.
- NZS 3604: 1999 Timber framed buildings.
- Compliance Document for New Zealand Building Code External Moisture Clause E2, Department of Building and Housing, Third Edition July 2005.
- New Zealand Building Code Handbook and Approved Documents, Building Industry Authority, 1992.
- The Building Regulations 1992, up to, and including October 2004 Amendment.

In the opinion of BRANZ, Butynol® Roofing Membrane is fit for purpose and will comply with the Building Code to the extent specified in this Certificate, provided it is used, designed, installed and maintained as set out in this Certificate.

The Appraisal Certificate is issued only to the Certificate Holder, Ardex NZ Ltd, and is valid until further notice, subject to the Conditions of Certification.

Conditions of Certification

For BRANZ

I P Robertson
Chief Executive

Date of Issue: 11 July 2006

BRANZ Appraised, E2/AS1 Acceptable Solution

BRANZ APPRAISED

BRANZ Appraisal Certificate No 436 (2005) Butynol Roofing Membrane has been issued. Copy available on request.

BRANZ APPRAISED SPECIFY WITH CONFIDENCE

BUTYNOL SYSTEM SPECIFICATION

A synthetic rubber with properties which resist ageing from heat, sunlight and ozone. It has excellent gas impermeability and toughness and remains flexible at low temperatures.

Butynol is manufactured by combining the petroleum gases isobutylene and isoprene at the extremely low temperature of –100°C. (Rubber Technology–Morton)

Butynol is marketed by Ardex as a warranted roofing and tanking product and fixed by their trained and experienced approved Applicators.

BUTYNOL MATERIAL SPECIFICATIONS

Our requirements for long term warranty necessitate that Butynol meets these typical [illegible]

Specific Gravity to ASTM D297	[illegible]
Hardness IRHD to ASTM D1415	[illegible]
Tensile Strength to ASTM D412	[illegible] MPa min
Modulus at 300% elongation to ASTM D412	4.15 MPa min
Elongation at break to ASTM D412	300% min
Heat Ageing (7 days at 115°C)	
Tensile Retention to ASTM D412	70% min
Elongation Retention to ASTM D412	70% min
Tear Strength to ASTM D624	26kN/m
Ozone Resistance to ASTM D1149 (7 days at 40°C in 50pphm ozone)	No visible cracks
Water Absorption to ASTM D471	
1.65% (by mass)	0.72% (by volume)
Water Permeability to ASTM E96-92	
Vapour Flow Resistance (MNs/g)	12414
Vapour Flow Rate (g/m²d)	0.013

Note: Interesting comparable figures for water permeability are –
Polythene 156, Asphalt 1830, P.V.C. 4900.

K Values on 1mm Butynol sheeting

K Value (Thermal Conductivity) 7.4×10^{3} Cal/cm/sec/deg C.

Conductivity Data on 1mm Butynol sheeting

Resistance/m² Ω /m² = 0.6816 on 9.3 volts.

SEAM TAPE PERFORMANCE

Tests on the seam tape bonding method, by an independent testing laboratory, have shown average values equivalent to 90% of unwelded material. It is considered impossible for the test methods used to be duplicated in normal service ie. 400% elongation.

BUTYNOL PROTECTION

Butynol protects against water, moisture vapour, gases, sun, ozone, frost, acids, chemicals and bacteria.

BUTYNOL RESISTANCE

Butynol resists tearing, flex cracking, bubbling and abrasion. It is extremely strong, has a long life and is versatile.

STAINING OF LIGHT COLOURED BUTYNOL

To avoid staining care must be taken during design stage to ensure that water running off unpainted treated timber and some metals (eg copper) do not run over light coloured Butynol.

BUTYNOL GAUGES

Standard 1.0mm–For roofs, gutters and decks with protection.

1.2mm–For roofs

1.5mm–For roofs and walk out decks

2.25mm–Heavy Duty

Factory welded panels to all gauges [illegible] mode

BUTYNOL IS PACKAGED

In rolls of nominal 1.4m width and 17.86m long. Each roll is packed in polythene wrapper trademarked Butynol with thickness identified. Coverage 25m² except 2.25mm gauge which is 12m²

Gauges available are:

1.0mm black.	Weight: nominal 30kg
1.5mm black.	Weight: nominal 45kg
2.25mm black.	Weight: nominal 32kg
1.2mm dove grey.	Weight: nominal 32kg
1.5mm all colours.	Weight: nominal 47kg

ADHESIVES AND SOLVENTS

Specially formulated for all Butynol applications. Supplied in 20L steel/plastic pails (approx. 20kg). 4 and 1 litre cans.

BUTYNOL SEALANT

Available in tubes for caulking guns.

SEAM TAPE

Supplied by Ardex in 50mm x 30.5m rolls (6 to a carton). Roofs with a pitch of less than 5°, all coloured membranes and all guttering and areas subjected to periodic ponding require special lap bonding. All coloured membranes, irrespective of pitch require special lap bonding.

DETAIL TAPE

A malleable exterior tape for flashing exterior corners etc. 150mm x 30.5m rolls.

FLASHING TAPE

A malleable tape for moulding in gussets, pipe flashings and awkward situations. Supplied in 100mm x 5m rolls Flashing tape must not be left exposed. A cover strip of Butynol or detail tape must be applied over flashing tape to finish.

SUBSTRATE VENTILATION

Substrate ventilation should be used to release moisture trapped under the Butynol. Substrate ventilators are used in conjunction with vent tape. Tape should be laid in a grid pattern spaced at 3m centres venting to the roof perimeter. One way substrate ventilators prevent moisture vapour build up and one should be installed every 90 square metres. Not designed to ventilate roof cavities. (Refer Diagram page 17)

PLYWOOD TREATMENT

To be in accordance with Acceptable Solution E2/AS1 plywood substrate must be treated to H3.2 with Waterborne CCA treatment and kiln dried after treatment.

Plywood must not be LOSP treated.

DURABILITY

Butynol when fixed according to Ardex instruction will meet the NZBC requirements of B2.3.1(b) 15 years. Refer BRANZ Appraisal Certificate No 436 (2005).

EXTERNAL MOISTURE

New Zealand Building Code Acceptable Solution E2/AS1 requirements recommend membrane clad roofs have a minimum pitch of 1.5°.

DAMP AND WEATHERPROOFING

The Building Code of Australia Deemed-to-Satisfy Provisions F1.9 and F1.10 are met by Butynol as an acceptable damp-proof course.

Butynol when used as described in ABSAC Technical Opinion 188 August 1994 complies with the Building Code of Australia Deemed-to-Satisfy Provision F1.7(b) and Acceptable Construction Manual Part 3.8.1.0, or AS 3740 for "Water Proofing of Wet Areas in Buildings"

FIRE RATING

The Butynol roofing system must be considered combustible but may be used on buildings for all purpose groups, subject to the requirements of NZBC Acceptable Solution C/AS1 Part 7, Paragraph 7.11.1

When used for roofs in Purpose Groups SC and SD a non-combustible substrate or timber 18mm thick is acceptable. Refer 7.11.1.

Building Code of Australia allows use in all building types under Specification C1.10, Clause 7(e), except in bush fire prone areas.

PRODUCT WARRANTY

When laid by an approved Applicator in accordance with Ardex's specifications, a material warranty for up to years (covering the Membrane, adhesive and tapes) available. Ardex is not responsible for any costs arising from installation of the Membrane and does not provide any warranty other than where a written Ardex material warranty has been issued.

WORKMANSHIP

A warranty for workmanship shall be provided directly by the approved Applicator. The period and terms of the workmanship warranty shall be determined by the conditions of contract or the approved Applicator.

ADHESIVES AND SOLVENTS FOR USE WITH BUTYNOL

WA98	The Standard contact brushing, spray grade and rolling adhesive for fixing to the substrate and for laps not subject to periodic ponding. (Pitch 5° and above)
Seam Primer	A water resistant primer, used with seam tape for general lap bonding.

Roofs with a pitch of less than 5°, all coloured membranes and all guttering and areas subjected to periodic ponding require special lap bonding. All coloured membranes, irrespective of pitch require special lap bonding.

Note: Temperature and Humidity

The evaporation of any solvent adhesive system causes a drop in temperature at the interface. At times of high humidity this can result in a micro molecular water layer at the interface which will result in a failure to bond, falsely attributed to Adhesive failure. Fixing should not proceed under these circumstances.

NOTES

1. In [illegible] extremes absorbency [illegible] 5[illegible] adhesive and solvent fixes as [illegible] water shedding and absorption. However, a follow up of full strength adhesive for full bonding should not be proceeded with under four hours, thus allowing full evaporation of solvents absorbed into the substrate. Primers must be time dried not touch dried.
2. As new substrate materials continually appear on the market, consult Ardex for approval of their use with Butynol
3. Where periodic ponding is likely and on roofs with a slope of less than 5°, Ardex Seam Tape and Seam Primer must be used on all joints.
4. Black Butynol and roofs with pitch of 5° or greater and sufficient fall to prevent periodic ponding may be formed using the sheet bonding adhesive WA98. All laps must be wiped with WA98 solvent prior to bonding.

   Roofs with a pitch of less than 5°, all **coloured membranes** and all guttering and areas subjected to periodic ponding require special lap bonding.

   Refer Acceptable Solution E2/AS1 8.5.5.2a.

   All **coloured membranes**, irrespective of pitch require special lap bonding.
5. *Do not use in temperatures less than 6°C.*

   CAUTION

   All Adhesives and Solvents are

   HIGHLY FLAMMABLE

SUBSTRATE SPECIFICATION (Plywood)

To conform with Acceptable Solution E2/AS1 plywood shall be:

A minimum of 17mm complying with AS/NZS 2269, at least CD Structural Grade plywood with the sanded C face upwards, and H3.2 with Waterborne CCA treatment and kiln dried after treatment.

Substrates must be dry when Butynol is applied. The plywood and the timber substructure shall have a maximum moisture content of 20% when Butynol is adhered.

Plywood panels shall be laid with staggered joints (brick bond), the edge of sheets shall be supported with dwangs or framing, unless a structurally tested tongue-in-groove edge provides equivalent support. The maximum recommended span in E2/AS1 is 400mm in each direction. However specific design may allow 17.5mm plywood or greater to be laid on 400mm purlins with nogs or dwangs at 600mm or even 1200mm centres. Plywood shall be laid with the face grain at right angles to the supports. A 20mm triangular fillet shall be used at the base of any 90° upstand. External edges shall be [illegible] with a minimum gap of 5mm.

Plywood shall be fixed with 8 gauge x 50mm stainless steel countersunk head screws eg Hylton Parker No. 24639, with 3mm gaps between all sheets, at 150mm centres on edges, and 200mm in the body of the sheets.

All joints in the plywood and junctions of plywood with other materials shall have 25mm polyethylene release tape applied before application of Butynol.

Closed-in construction spaces under Butynol roofs and decks shall have adequate ventilation to prevent the accumulation of moisture under Butynol. There should be a minimum gap of 20mm between the underside of the substrate and any insulation.

NOTE: The use of LOSP (Light Organic Solvent Preservative) treated plywood must NOT be used under Butynol in any circumstances or conditions.

SUBSTRATE SPECIFICATION (Concrete)

New concrete

Must be cured for a minimum of 28 days and all curing compounds removed prior to application.

A reduction in cure time can be achieved by utilising the Ardex HydrEpoxy System (consult Ardex Technical Department for details)

Old concrete

Must be clean from any contaminents prior to application.

For further substrate types please consult Ardex Technical Department.

TYPICAL ARCHITECTURAL BUTYNOL RUBBER ROOFING SPECIFICATION

1. Preliminary

Refer to the Preliminary and General Clauses of this specification and to the General Conditions of Contract which are equally binding on all trades. This section of the specification shall be read in conjunction with all other sections.

2. Scope

This section of the contract consists in general of the provision and laying of all the Butynol rubber, for the roofs, decks, gutters and flashings on the buildings. Refer to Clause 12 hereafter for Extent of Work.

3. Workmanship

The whole of the work shall be carried out by skilled tradesmen using adequate and proper equipment and methods in accordance with best trade practice, and following the specifications methods and recommendations as laid down by the manufacturers

4. Sub-contractors

The work included in this section of the contract shall be carried out by a firm of roofing experts conversant with and specialising in the supply and fixing of the material and shall be a firm approved by Ardex.

5. Warranty

When laid by an approved Applicator in accordance with Ardex's specifications, a written material warranty of up to 20 years is available. It is the responsibility of the approved Applicator to confirm proper installation and to request Ardex to issue a material warranty on behalf of the customer following completion of installation. Ardex is not responsible for any costs arising from installation and does not provide any warranty other than where a written Ardex material warranty has been issued.

6. Materials

6.1 Butynol Rubber

(a) Shall be 1.0mm thick standard Black Butynol rubber to all roof surfaces, gutters and fascias and walk out decks where membrane is to be overlaid with tiles.

(b) Shall be 1.5mm thick Butynol to all walk out decks.

6.2 Adhesives

Shall be as recommended by Ardex specially formulated for Butynol rubber and suitable for the particular application and the relevant temperature and conditions applicable.

Generally Ardex WA98 adhesive is used for substrate and lap bonding (5° and above).

Ardex seam primer shall be used in conjunction with Ardex seam tapes.

When conditions are experienced that are outside the temperature and/or moisture ranges recommended by the manufacturers for the above standard adhesives work will cease.

6.3 Seam Tapes

Shall be 50mm wide seam tape provided by Ardex

6.4 Substrate Joint Tape

All Plywood joints shall be taped with a 25mm wide pressure sensitive Ardex approved self adhesive tape.

7. Roof Deckings

Shall be 1.5mm Butynol or 1mm with a protective covering for all deck surfaces.

All decks to which Butynol is to be fixed shall be clean, smooth, dry and free from dirt, grit or sharp objects.

Deck substrates may be primed with 50/50 WA98 adhesive/solvent.

The Butynol roofer shall co-operate with the other trades laying the decking to ensure that the final surface is in first class condition for the laying of the Butynol rubber roofing.

The Butynol roofer shall check the deck before laying any Butynol to ensure that the surface is completely sound, screw fixed to the manufacturer's screw head, the sheets joined to provide a flush surface [illegible]

8. Laying of Butynol Roofing

It is the responsibility of the Applicator to ensure that the substrate surface to be covered by the Butynol is in fit and proper condition, suitable for the laying of the material.

Tape all joins in substrate sheets with 25mm wide pressure sensitive tape approved by Ardex.

All Butynol sheeting shall be laid out on the roof to "relax" the sheeting before fixing. A period of at least 20 minutes is usually required. Do not finally position sheeting with a tension exceeding 2%.

Apply adhesive to the substrate and the underside of the Butynol rubber sheeting by brush, spray or an approved type roller at a spreading rate of generally not less than 2.5 square metres per litre. Leave to tack dry before bonding the two surfaces together.

Lay sheeting by drawing back halfway either longitudinally or transversely. Thoroughly roll or work over the surface of the sheet to exclude all air and to obtain a full bond

All Butynol shall be "lap bonded" as detailed below

Bonding Laps with Ardex Seam Tape and Seam Primer

Following laying of the Butynol the laps must be sealed. Roofs with a pitch of less than 5°, all coloured membranes irrespective of pitch and all guttering and areas subjected to periodic ponding require special lap bonding using Ardex seam primer and Ardex seam tape. Laps with pitch 5° and above (on black Butynol only) can be sealed using WA98 adhesive. (Lap area must be wiped using WA98 solvent prior to applying adhesive.)

1. The top lap is positioned and the bottom sheet marked to indicate the edge of the top sheet.
2. The top sheet is folded back.
3. The Ardex Seam Primer is then applied to the Butynol in the area marked on the bottom sheet and 50mm in from the edge on the top sheet. The Ardex Seam Primer is applied to the mating surfaces using a synthetic scrubbing pad. Scrubbing pads should be replaced as they become dirty. Allow the primer to become 'dry to the touch'.
4. Position and unroll the 50mm Ardex Seam Tape along the seam. The edge of the release paper should be aligned to the mark on the bottom membrane sheet.
5. Roll the length of the seam with the release paper still in place.
6. Remove the release paper from the Ardex Seam Tape by pulling at a 45° angle away from the seam. Keep the release paper low to the roof surface as it is removed.
7. Fold into place the primed edge of the top sheet.
8. Roll the completed seam.

9. Tiling Over Butynol

To direct fix tiles to Butynol, ABA Optima two part adhesive should be used. Ensure the Butynol surface is clean and dry before applying the adhesive. All laps must have seam tape.

(Refer Optima page 41)

10. Protection of Laid Butynol Sheeting

The Butynol roofing contractor shall ensure that his fixers only work on the Butynol roofing with soft sole shoes

The Butynol roofer shall co-ordinate with the main contractor who shall ensure that any other trades who work over the completed roof wear soft sole shoes

Upon completion of each area the roofer shall get the main contractor to inspect the area and the main contractor will sign off that the area was free from any defects or damage. It is then the responsibility of the main contractor to ensure the Butynol roofing is in no way damaged by other trades.

11. Completion

On completion carefully and thoroughly clean off and remove all scrap and other rubbish from finished [illegible]

12. Extent of Work

Observe the foregoing specification and supply and lay Butynol rubber sheeting to all roofs, decks, gutters and flashings as shown and detailed in the Ardex specification

Failure to comply with the above specifications will result in all warranties being null and void.

BRANZ Appraised, E2/AS1 Acceptable Solution

LAYING SPECIFICATION

The Sub contractor for the work called for in this trade will be a Company or Person approved by Ardex.

The approved Applicator (hereafter called the Applicator) shall examine all drawings and provide for the flashing, caulking and sealing of all vents, stacks and pipes penetrating the roofing membrane. Also all flashings at walls, parapets, verges, gutters etc., unless otherwise instructed in the specifications.

The surface to which Butynol is to be fixed shall be clean, smooth, dry and free from sawdust, grit or sharp objects. Membrane laying shall not start until defects have been corrected.

To avoid staining care should be taken to avoid water runoff from copper downpipes or guttering on to light coloured Butynol.

When CCA plywood is used in conjunction with a light coloured membrane it is advisable to prime any plywood that will not be covered the same day.

It is the responsibility of the Applicator to ensure that the surface to be covered by the Butynol is in fit and proper condition suitable in all respects for the laying of the material.

On completion the Applicator will provide the Owner with a Workmanship Warranty and obtain from Ardex a Materials Warranty.

Failure to comply with the above specifications will result in all warranties being null and void

LAYING THE BUTYNOL

Before applying the Butynol, it shall be unrolled for twenty minutes to relieve stresses induced by manufacture and storage. The Butynol sheet shall be set out in the exact position in which it will be finally required and while it is held in place, it shall be folded back lengthwise to expose half the underside. To the now exposed underside and the area of roof also left exposed, apply an even coat of WA98 Adhesive. When the adhesive has become touch dry, work the sheet back into its original position avoiding wrinkles and the inclusion of air bubbles.

Repeat the process with the other half of the sheet and when completed, roll the whole sheet with hand press rollers or the like.

When applying the next sheet, it shall be lapped over the first sheet by 50mm. All turn ups and downs shall be neatly formed and cut to a straight line if required.

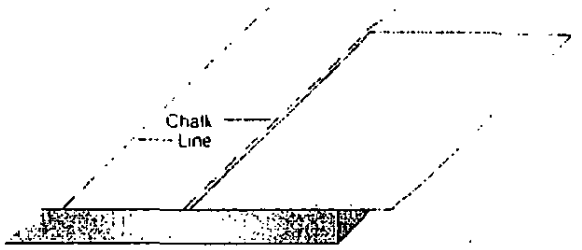
Butynol shall not be laid under tension.

When the whole area has been covered or as work progresses, the applicator has to seal the laps.

BUTYNOL LAYING METHOD

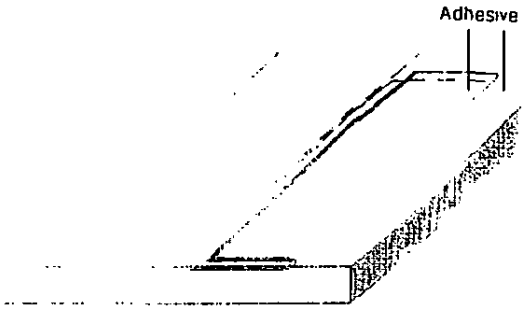
STEP 1

Accurately place sheet. Mark spacing with chalk line



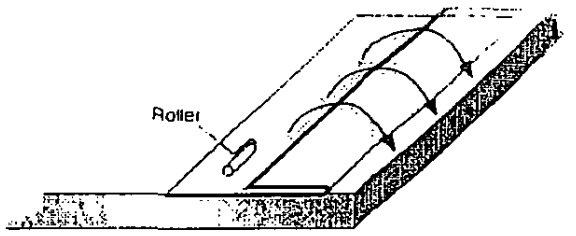
STEP 2

Fold back half sheet. Apply adhesive to both faces.



STEP 3

After flashings fold membrane into place. Roll thoroughly



STEP 4

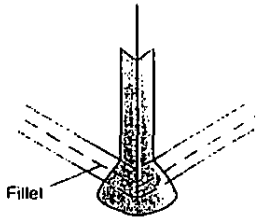
Treat 2nd half of Butynol similarly.

EXTERNAL CORNERS

To comply with Acceptable Solution E2/AS1 Figure 57

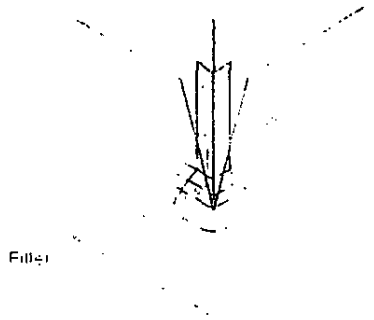
STEP 1

Bond 100mm flashing to corner as shown



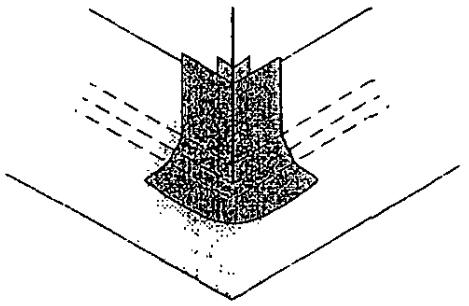
STEP 2

Bond Butynol to deck and up wall 150mm minimum. Cut sheet from corner at 45° as shown.



STEP 3

Cover corner point with layer of detail tape.

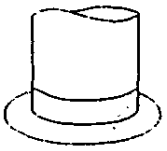


NOTE: Fillets must be used on all internal corners.

FLASHING EXISTING PIPE

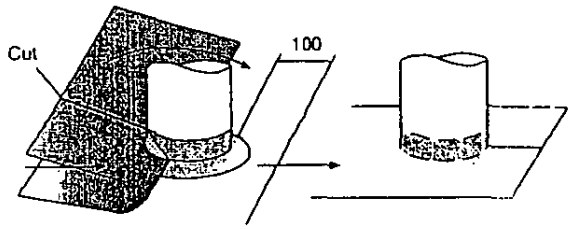
STEP 1

Under flash pipe with 100mm Butynol flashing tape.



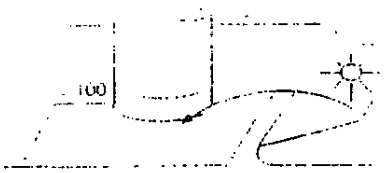
STEP 2

Bond Butynol to 100mm past pipe.
N.B. When flashing black Butynol use Butynol or detail tape.



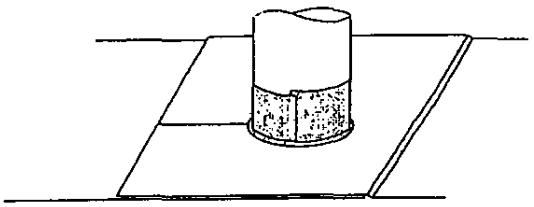
STEP 3

Bond continuation of Butynol to overlap base sheet and beyond pipe 100mm



STEP 4

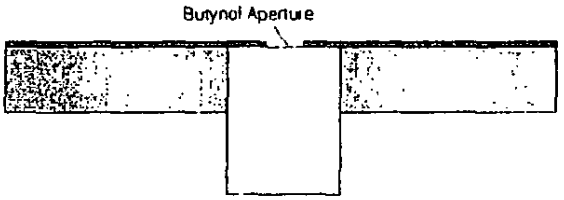
Apply collar of detail tape or Butynol cover strip DO NOT STRETCH STRIP.



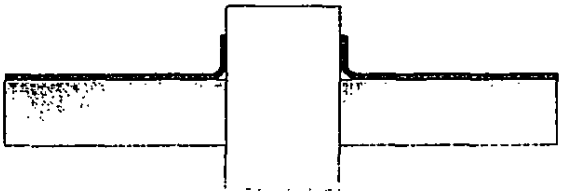
N.B. Flashing tape MUST NOT be left exposed. Cover strip must be Butynol. When detail tape is used a cover strip of Butynol is not required.

BRANZ Appraised, E2/AS1 Acceptable Solution

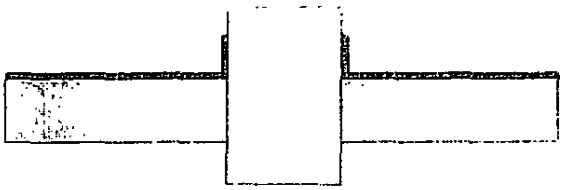
STEP 1
Cut smaller diameter hole than pipe.



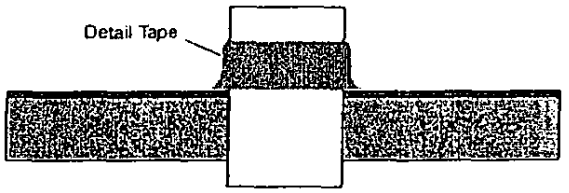
STEP 2
Pipe is raised through smaller diameter hole in Butynol, forcing edge upwards to create upstand.



STEP 3
Pull pipe down approximately 1cm to sharpen corner



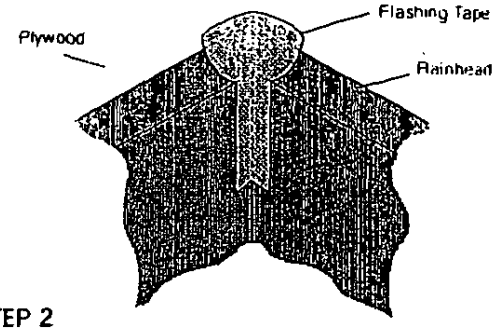
STEP 4
After pulling pipe down approximately 1cm to sharpen corner, tape upstanding Butynol to pipe using WA98 adhesive and detail tape.



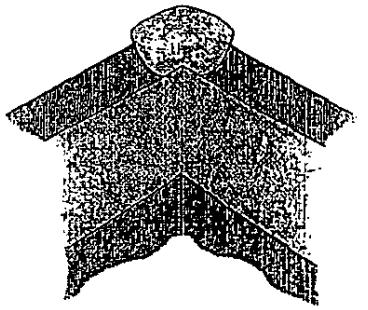
N.B. If flashing tape is used it MUST NOT be left exposed. A cover strip of Butynol must be applied over the flashing tape to finish.

and areas where a pig's ear cannot be used

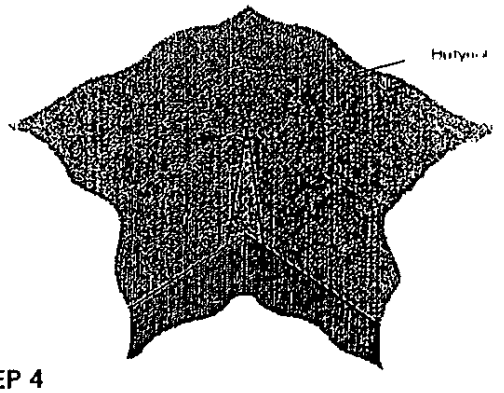
STEP 1
Apply Flashing Tape over Rainhead and Plywood



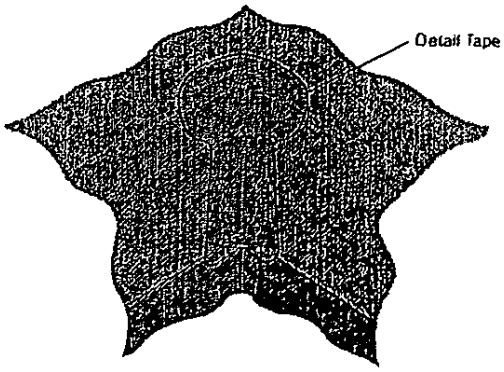
STEP 2
Run Seam Tape along all four vertical sides of Rainhead.



STEP 3
Cut Butynol sheet to fit into corners.



STEP 4
Cover corner point with layer of detail tape.

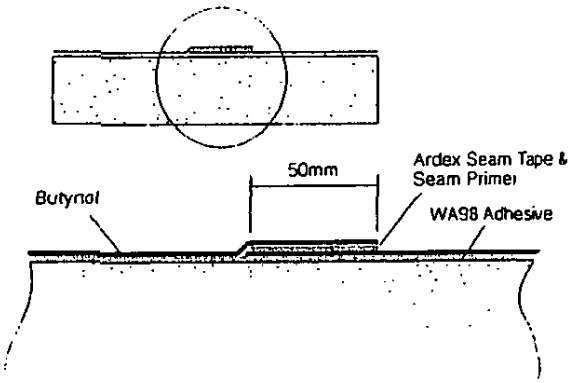


BONDING THE LAPS

Roofs with a pitch of less than 5°, all **coloured membranes** and all guttering and areas subjected to *periodic ponding require special lap bonding.*

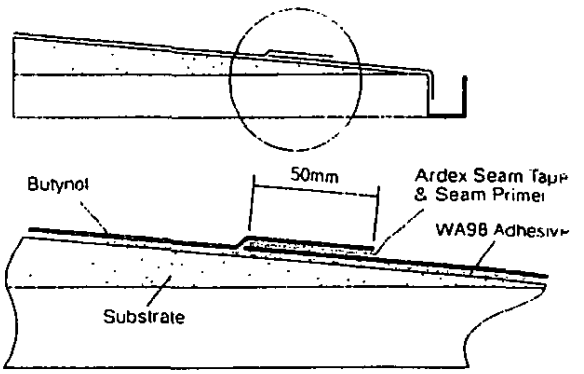
Refer Acceptable Solution E2/AS1 8.5.5.2a.

All **coloured membranes**, irrespective of pitch require special lap bonding.



The top lap is positioned over the bottom sheet marked to indicate the edge of the top sheet.

2. *The top sheet is folded back.*
3. The Ardex Seam Primer is then applied to the Butynol in the area marked on the bottom sheet and 50mm in from the edge on the top sheet. The Ardex Seam Primer is applied to the mating surfaces using a synthetic scrubbing pad. Scrubbing pads should be replaced as they become dirty. Allow the primer to become 'touch dry'.
4. Position and unroll the 50mm Ardex Seam Tape along the seam. The edge of the seam tape should be aligned to the mark on the bottom membrane sheet. The see-through backing film makes this very simple.
5. Roll the length of the seam with backing film still in place.
6. Remove the backing film from the Ardex Seam Tape by pulling at a 45° angle away from the seam. Keep the backing film low to the roof surface as it is removed.
7. Fold into place the primed edge of the top sheet.
8. Roll the completed seam.

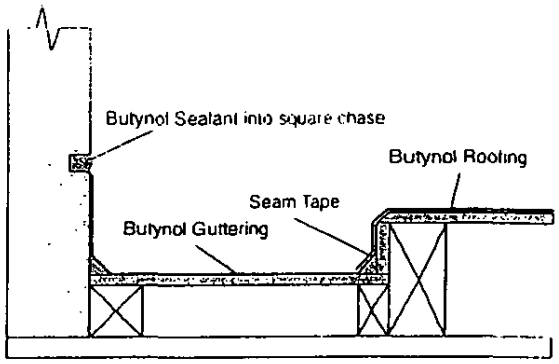


Black Butynol and roofs with minimum pitch of 5° and sufficient fall to prevent periodic ponding may be formed using the sheet bonding adhesive WA98. All laps must be wiped with WA98 solvent prior to bonding.

FORMING LAPS FOR GUTTERS

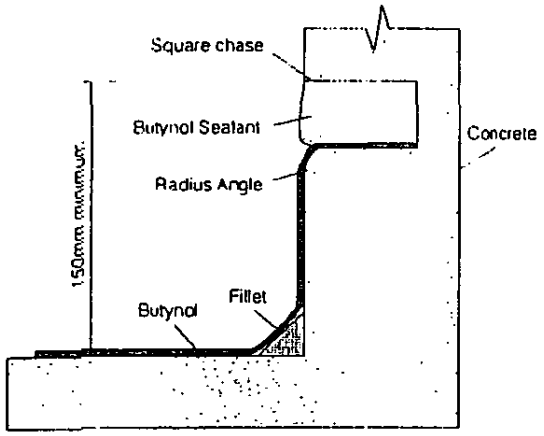
Laps are most important in gutter work and should be formed using Ardex Seam Tape and Primer.

All metal lined gutters, whether of standard or special shape or size using Butynol must be specified at 1.2mm.



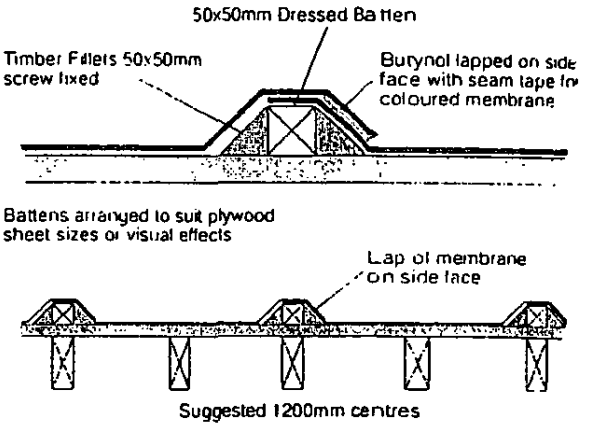
BRANZ Appraised, E2/AS1 Acceptable Solution

FLASHING INTO CONCRETE WALLS



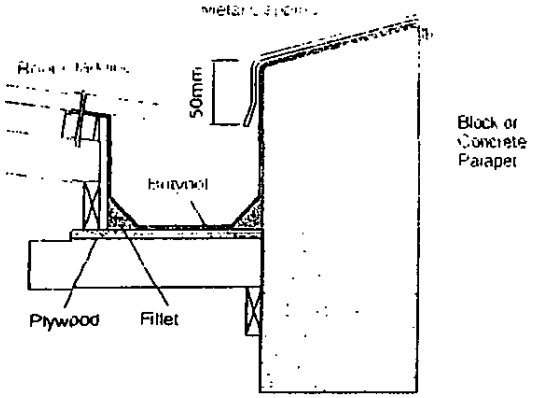
Butynol is glued into square chase and finished with Butynol Sealant

RECOMMENDED BATTEN PROFILE DETAIL

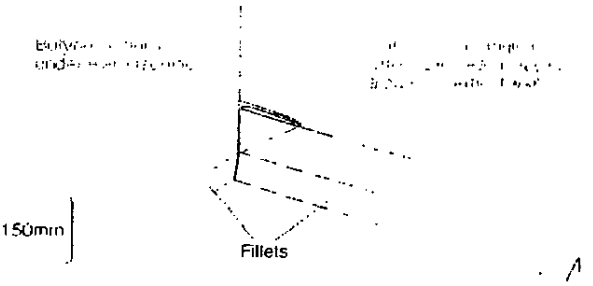


Example of a 1400mm sheet of Ardex Butynol dressed over battens at 1200mm centres

BOXED GUTTER AND PARAPET DOWNTURN



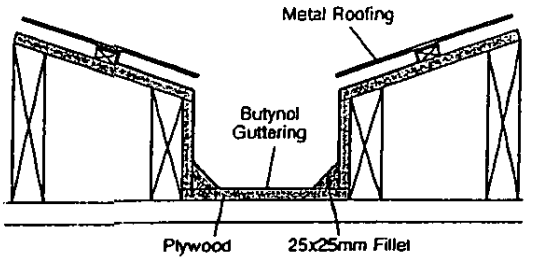
INTERNAL CORNERS



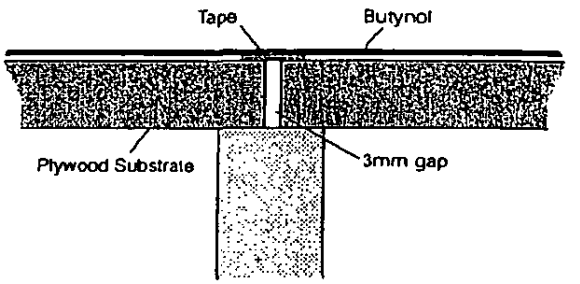
Without cutting Butynol simply fold a 'pig's ear' corner as shown. The angle fold should be behind the main sheet.

NOTE: Fillets must be used on all internal corners

INTERNAL GUTTER



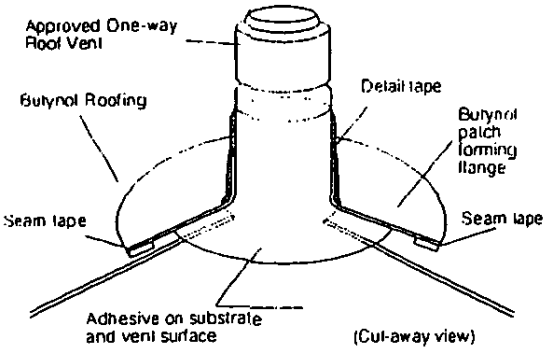
TAPING SUBSTRATE SHEETS



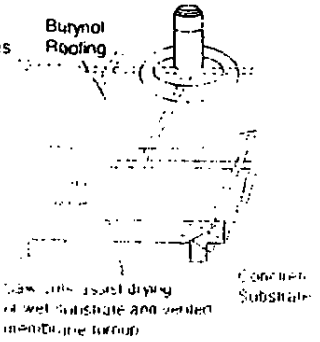
All joints between substrate sheets of Ply should be taped to prevent stressing of the Butynol in case of marked timber movement.

ONE WAY SUBSTRATE VENTILATOR

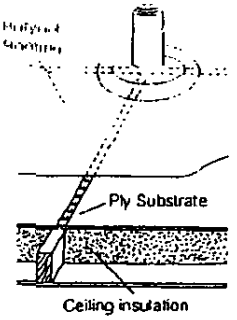
PVC or Aluminium



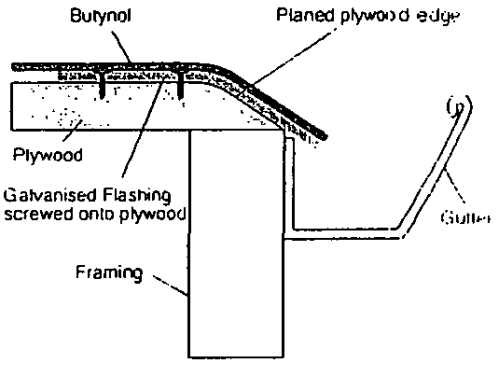
Vent installed over intersection of vent tapes on concrete substrate

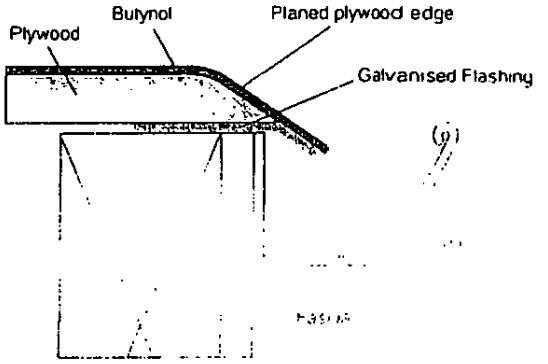


Vent installed over intersection of 3mm gap between Ply substrate sheets

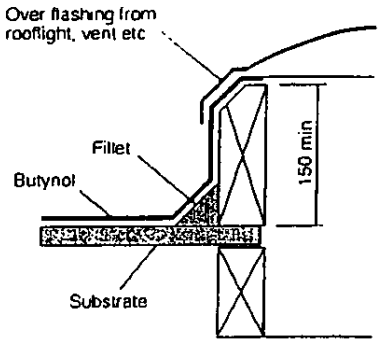


TWO METHODS FOR FINISHING OVER A GUTTER





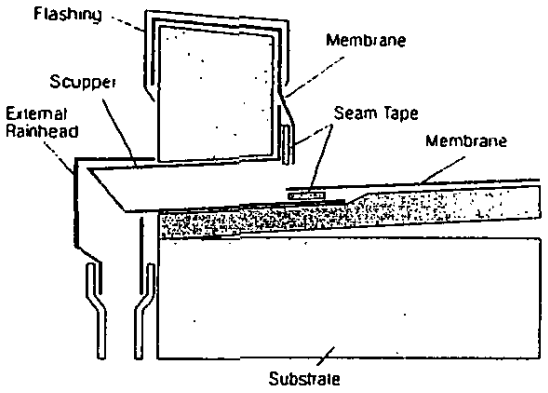
ROOFING PENETRATION IN MEMBRANE



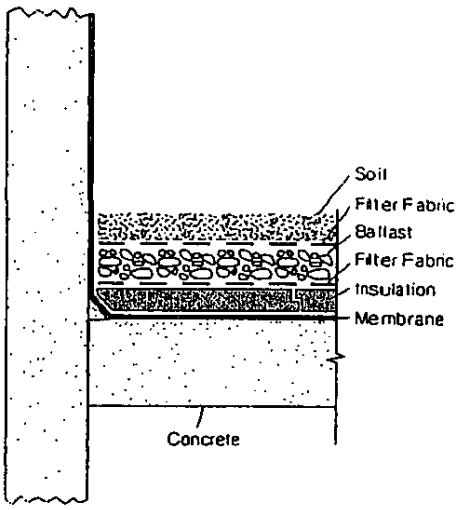
NOTE: 1 For maximum penetration size of 1200x1200mm
2 External corners to be formed as shown

BRANZ Appraised, E2/AS1 Acceptable Solution

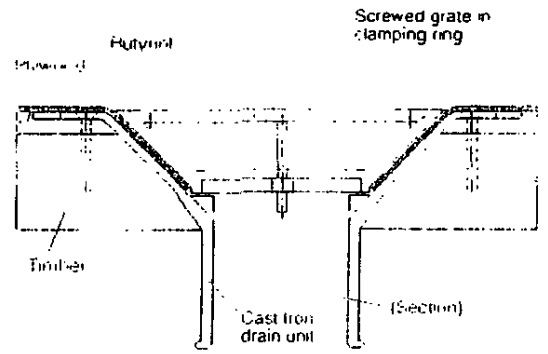
SCUPPER OUTLET

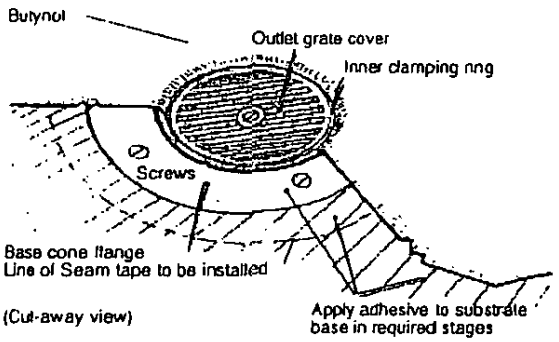


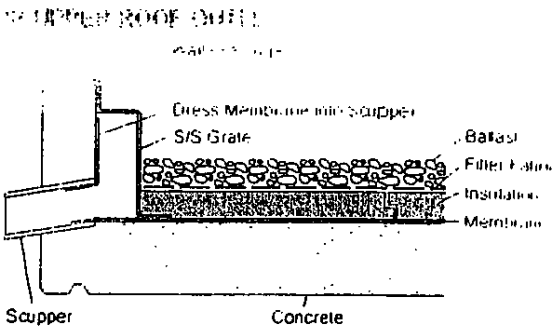
TYPICAL BALLASTED/GARDEN ROOF DETAIL



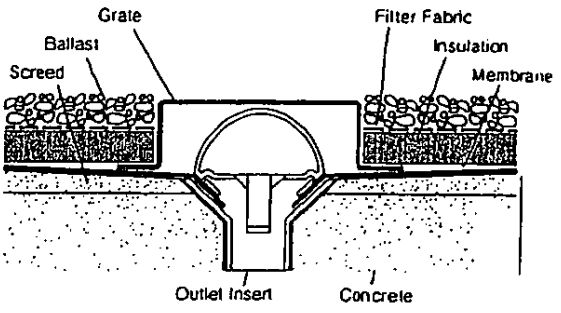
INTERNAL ROOF DRAIN (NZBC E2/AS1 Approved)





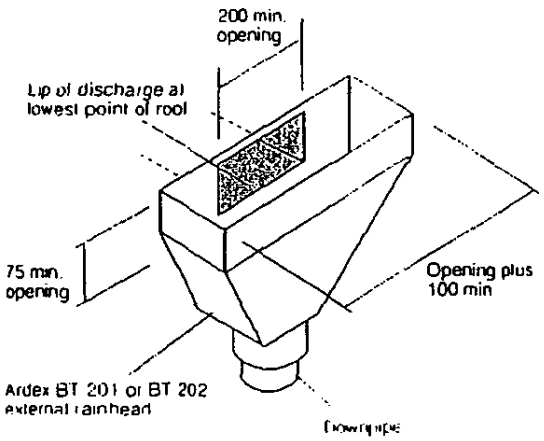


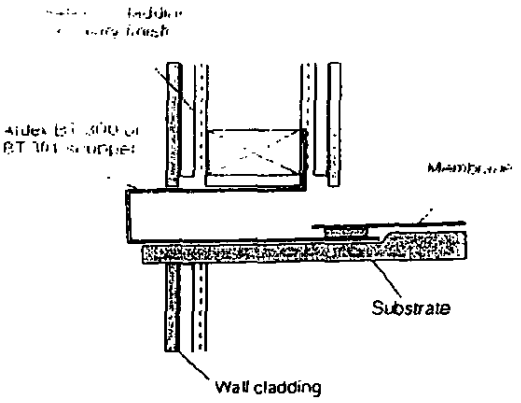
SCUPPER ROOF OUTLET & GRAVEL RETAINER



RAINWATER HEAD AND SCUPPER OPENING IN MEMBRANE USING ARDEX BT 300 OR BT 301 SCUPPER

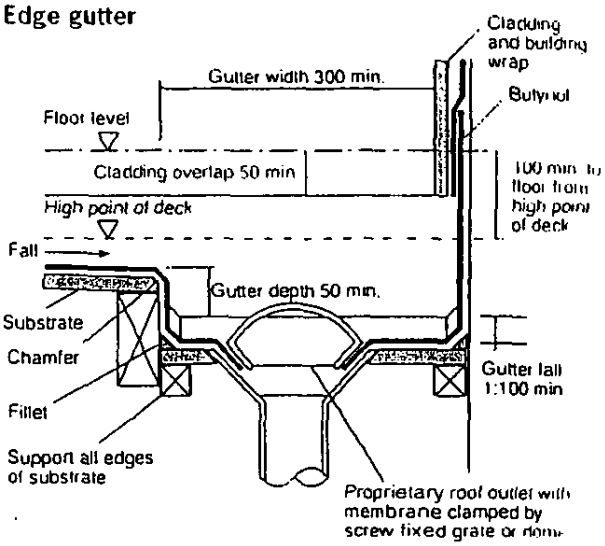
Deck outlet

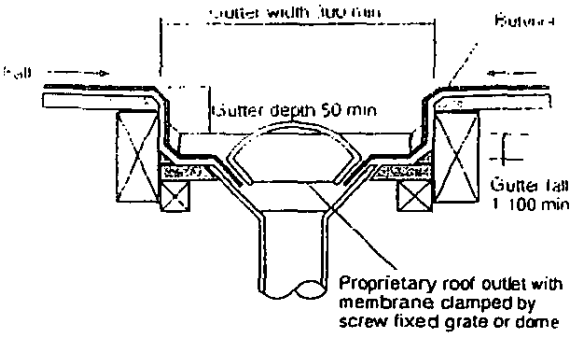




GUTTERS AND OUTLETS IN MEMBRANE

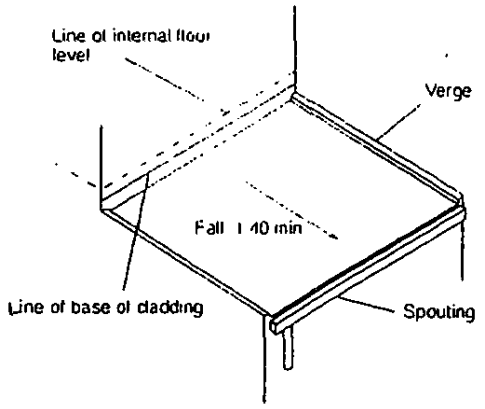
Edge gutter



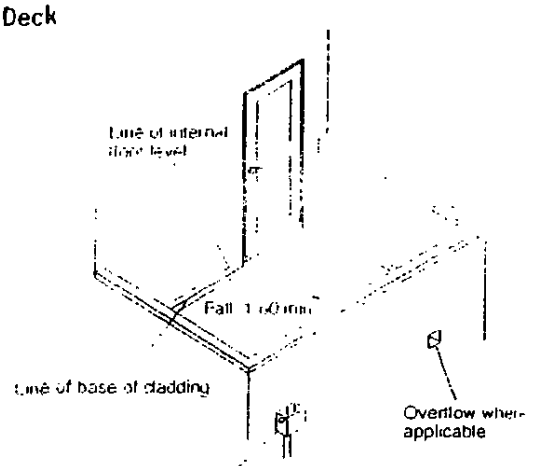


FALLS IN BUTYNOL ROOFS AND DECKS

Roof

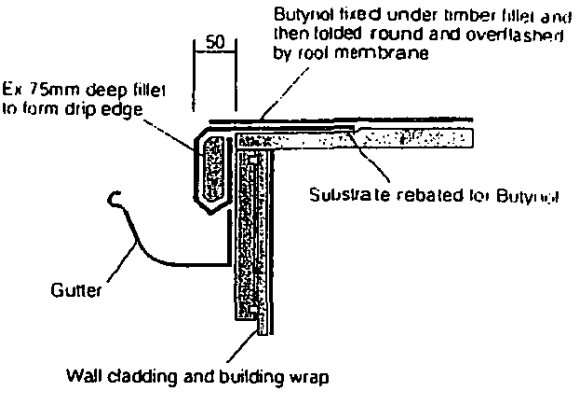


Deck

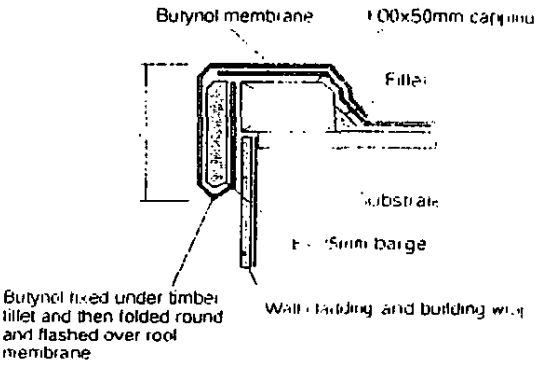


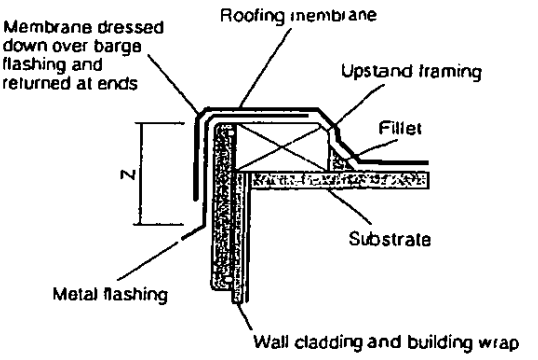
EAVE AND VERGES IN BUTYNOL

Eave



Verges





NOTE: Z = variable according to wind zone

LOOSE LAID APPLICATION OF BUTYNOL ROOFING

Materials used shall be as previously specified. When the surface is suitably prepared a large fully vulcanised Butynol sheet or sheets can be unrolled and spread over the prepared area and allowed to remain in this position for approximately one hour to relieve stresses induced by manufacture and storage. If necessary for ease of handling, these sheets can be supplied in varying sizes and vulcanised on site using an Ardex vulcanising machine or using seam tape with seam primer.

The Butynol sheet shall be set out in the exact position in which it will be finally required and whilst it is held firmly in place it shall be folded back at least one metre from the roof's surrounding parapet or wall to allow the application of adhesive to that area of the exposed substrate.

WA98 adhesive may be applied to the substrate and the corresponding area of Butynol sheeting which may then, when the adhesive is touch dry, be worked back into its required position avoiding wrinkles and the inclusion of air bubbles.

Upon completion of the detail work [illegible] drain and outlet [illegible] a layer of rounded gravel 30-40mm should be spread up to 50mm deep over a layer of Geo Textile Fabric for protection of the Butynol sheet.

Care must be taken at outlets to ensure the ballast cannot enter to cause a blockage that prevents rainwater from leaving the roof area. Maintenance paths should be created to air-conditioning or roof plant with concrete tiles.

Effects on the membrane in areas of high wind can be eliminated by stabilising the ballast with cement. Dry cement should be broadcast over the 30-40mm gravel with a broad mouth shovel and left to hydrate or lightly sprayed with water to set off.

If possible a water test should be carried out prior to the application of ballast.

Note: Minimum pitch 1.5° to comply.

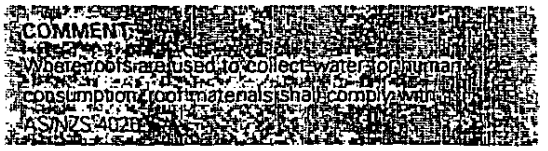
Refer NZBC Clause E@/AS1 External Moisture 8.5.1 (a).

8.0 Roof Claddings

8.1 General

8.1.1 Weathertightness

Roof *claddings* shall meet the requirements of NZBC E2.2, and be specified and *constructed* in accordance with the provisions of Paragraph 8.1.2 to Paragraph 8.5.



8.1.2 Limitations

This Acceptable Solution is limited to roof *cladding systems* listed in Paragraph 3.2.

8.1.3 Maintenance

Maintenance of *claddings* shall be carried out as necessary to achieve the expected *durability* of the material – refer Paragraph 2.5.

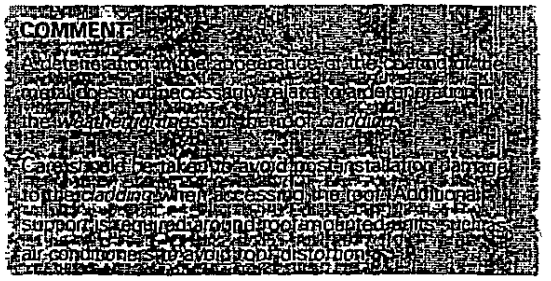
The extent and nature of the necessary maintenance is dependent on the:

a) Type of *cladding* used,

b) Position of the *cladding* on the *building*,

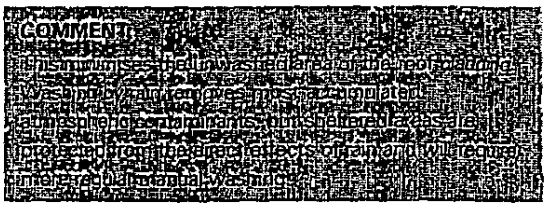
c) Geographical location of the *building*, and

d) Specific site conditions.



8.1.3.1 Projecting eaves

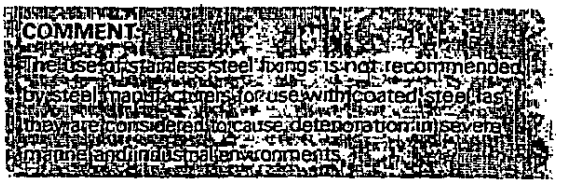
Soffits and verges of all projecting *eaves* shall be closed in.



8.1.4 Fixings

Fixings shall be as specified in Paragraph 8.2 to Paragraph 8.5.

Fixings for roof *claddings* and *flashings*, where necessary, shall be selected from Table 20 to minimise corrosion.



8.1.5 Underlays

All *roof underlays* shall have laps of no less than 150 mm.

Where required, *roof underlays* complying with Table 23 shall be laid either:

a) Vertically, when the roof pitch is not less than 8° (1:7), or

b) Horizontally, with the upper sheets lapped over lower sheets to ensure water is shed to the outer face of the underlay.

8.1.5.1 Underlay support

Roof underlays shall be installed in a manner that prevents ponding of water by:

a) Allowing *roof underlays* classed as extra heavy or heavy in AS/NZS 4200 to span no more than 1200 mm in one direction, or

b) If supported by a corrosion-resistant material:
   i) *roof underlays* classed as medium light or extra light in AS/NZS 4200 shall span no more than 300 mm in one direction, and shall be used only at pitches of 8° or above, or
   ii) *roof underlays* classed as extra heavy or heavy in AS/NZS 4200 shall be used at pitches less than 8°.

Appropriate corrosion-resistant materials are polypropylene tape or a minimum 0.9 mm diameter steel wire mesh galvanized in compliance with AS/NZS 4534.

COMMENT

8.1.6 Gutters

Gutters shall be sized to comply with E1/AS1.

Where gutter depth is reduced to allow entry of a *valley gutter*, the reduced depth shall be used to calculate the capacity of the gutter.

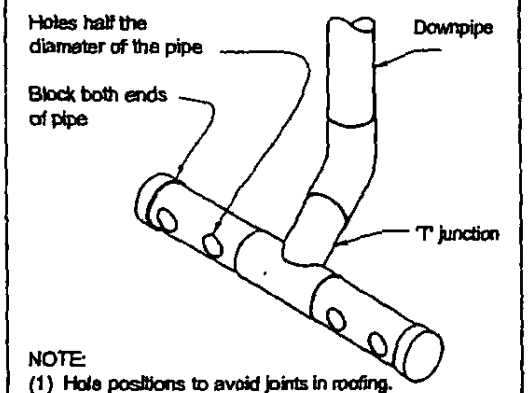
Downpipes discharging to a lower roof shall be fitted with a spreader as detailed in Figure 20, with the discharge limited to a section of roofing with no side laps.

Spreaders shall not be used on *masonry tile* roofs unless a *roof underlay* is installed.

A maximum catchment area of 25 m² shall be permitted to discharge via a spreader on to a lower roof area.

COMMENT

Figure 20: Spreader for roof discharge
Paragraph 8.1.6



NOTE:
(1) Hole positions to avoid joints in roofing.
(2) When downpipe is located in corner, spreader to be L-shaped.

8.1.6.1 Internal, valley and hidden gutters

Internal, *valley* and *hidden gutters* shall:

a) Be continuously supported with gutter boards, treated in accordance with NZS 3602,

b) If metal, be separated from any CCA treatment by *roof underlay*,

c) Have no fixings in gutter bottom or sides,

d) Have all joints lapped and sealed in accordance with Paragraph 4.5.2,

e) Receive no direct discharge from downpipes or spreaders, and

f) Be formed from the same material as the roofing, or:
   i) G5000 series aluminium to AS/NZS 1734, temper O, with a minimum thickness of 1.2 mm, or
   ii) X5CrNiMo 17-12-2 (316) stainless steel in accordance with Table 1 of ISO/TS 15510 with a minimum thickness of 0.45 mm, or
   iii) C1100 or C1220 copper to AS 1566 with a minimum thickness of 0.7 mm, or
   iv) butyl rubber, complying with Paragraph 4.3.9, on timber or plywood.

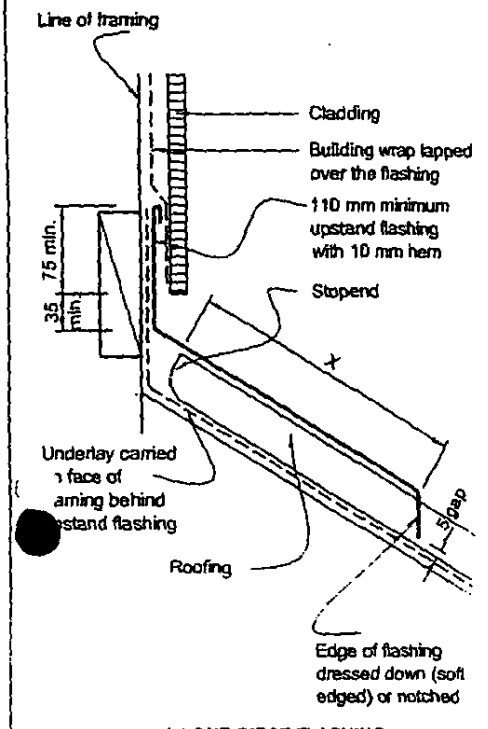
AZ150 or Z275 coated steel with a factory finish shall only be used where gutters can be readily maintained to prevent ponding and may be easily replaced within 15 years.

AZ150 or Z275 coated steel without a factory finish shall not be used.

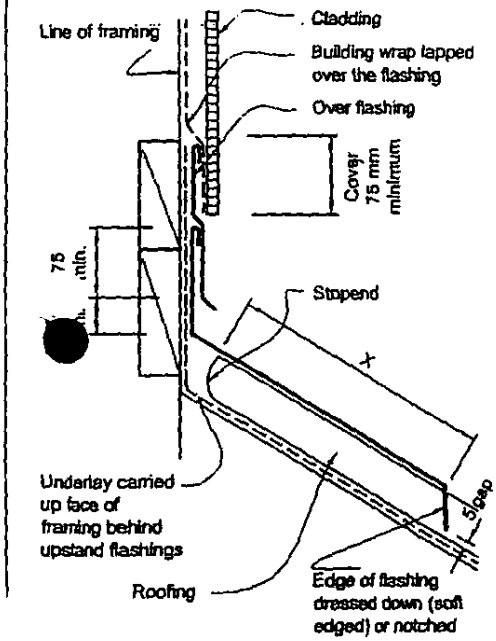
COMMENT

Figure 7: Basic apron flashing
Paragraphs 4.2.1.1, 4.6.1.1 a), 4.6.1.4 b), and 5.1

NOTE: (1) X = variable according to *wind zone* – refer Table 7.
(2) *Stopends* to profiled metal – refer Figure 49.



(a) ONE PIECE FLASHING



(b) TWO PIECE FLASHING

5.0 Roof/Wall Junctions

5.1 Apron flashings

All roof-to-wall junctions shall be made *weathertight* by using an *apron flashing* as outlined in Paragraph 4.6.1.1, and shown in Figure 7, that:

a) Provides a minimum lap under the wall *cladding* of 75 mm in accordance with Table 7, except that:
   i) pressed metal tiles shall have a secondary *flashing* fitted in order to achieve the minimum required overlap of wall *cladding*,

b) For profiled metal, incorporates *stopends* at the upper end of the roof *cladding* as per Paragraph 8.4.13,

c) Provides a minimum clearance from the wall *cladding* to the roofing in accordance with Table 7, and

d) Extends over the roofing by a minimum cover in accordance with Paragraph 4.6.1.1 and Table 7, depending on the:
   i) *wind zone*,
   ii) pitch of the roof, and
   iii) profile of the roof *cladding*.

COMMENT:
49 mm is the minimum achievable with pressed metal tiles requiring a secondary flashing to be used.

Details for specific wall *cladding systems* are given in Paragraph 9.0.

Where the roof finishes within the length of an adjacent wall, a *kick-out* or *stopend* as detailed in Figure 8 shall be provided to direct water out from the wall *cladding* onto the roof *cladding* and gutter.

5.2 Gutters, barges and fascias

Where gutters, barges or fascias terminate against *claddings*, these shall be installed after the wall *cladding*, and after any protective finishes have been applied.

Gutters, barges and fascias shall terminate so as to leave a gap of 10 mm from the finished wall *cladding* as shown in Figure 8.

8.1.6.2 Valley gutters

Valley gutters shall be *constructed* as shown for the applicable roof *cladding*, and shall:

a) Not change direction in plan form,

b) Not be used with roof pitches below 12.5°,

c) Be fixed at the upper end only,

d) Be secured with a purpose-made clip system for the remaining length,

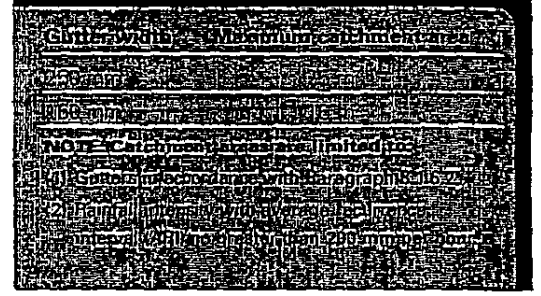
e) Have a minimum clearance of 100 mm between the ends of the roof *cladding*,

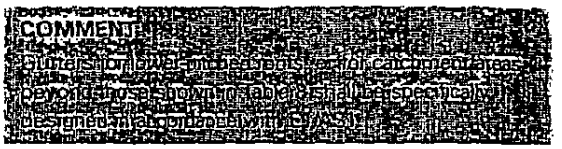
f) Have a minimum depth of 20 mm minimum at the edges of the *valley gutter*,

g) Have a minimum depth of 50 mm at the centre of the *valley gutter*, and

h) Have minimum widths in accordance with the catchment area feeding into the *valley gutter* as shown in Table 8.

Table 8: Maximum catchment areas for valley gutters
Paragraphs 8.1.6.2 and 8.4.16.2, Figures 27, 37 and 51





8.1.6.3 Internal gutters

Internal gutters shall be *constructed* as shown for the applicable roof *cladding*, and shall:

a) Be dimensioned to provide the greater of a:
   i) calculated size as per E1/AS1, or
   ii) minimum depth of 70 mm and minimum width of 300 mm,

b) Be sized to provide an additional freeboard allowance of 20 mm minimum,

c) Be provided with a weir outlet and discharge into a rainhead that has an overflow with the bottom below the sole of the gutter, and

d) Allow for an *expansion joint* at the upper end.

8.1.7 Roof penetrations

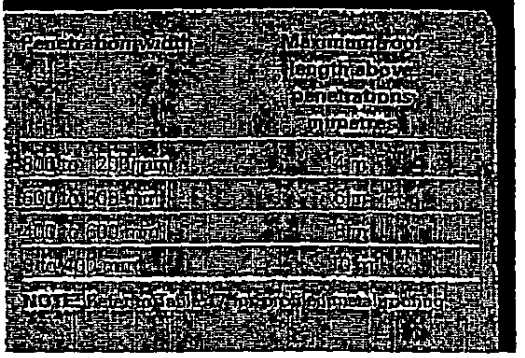
Roof penetrations shall be made *weathertight* in accordance with Paragraph 8.2 to Paragraph 8.5.

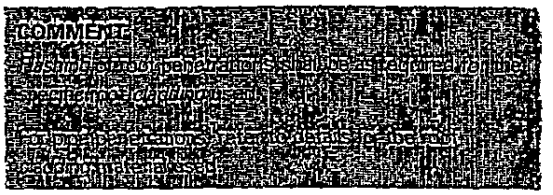
Where roof penetrations are required for large openings such as roof lights and *chimneys*, this Acceptable Solution is limited to the following requirements:

a) The edge of roofing penetrations over 200 mm wide shall be supported in either direction with additional *framing* as shown in Figure 21, and

b) For the catchment area of the roof above the penetration as shown in Figure 22, the roof length shall be limited to:
   i) for profiled metal roofing, Table 17
   ii) for other roof *claddings*, the areas shown in Table 9.

Table 9: Maximum catchment areas above penetrations
Paragraph 8.1.7 b) and Figure 22





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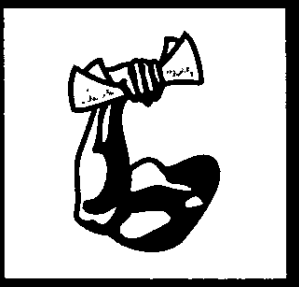
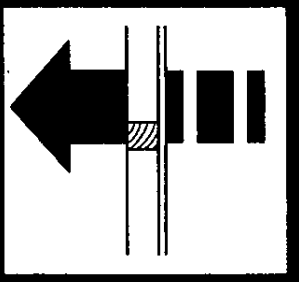
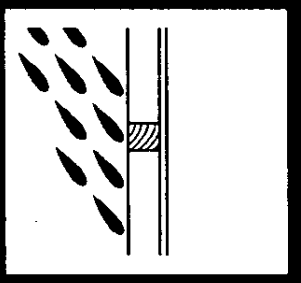
STRENGTH



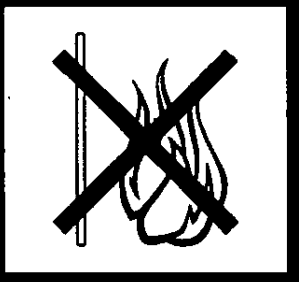
BREATHER SHEET



WATER RESISTANCE



FLAMMABILITY



FLAMMABILITY INDEX OF 1
AS1530 PART 2 1993

®

THE PERFECT
ABSORBENT BREATHABLE

NON WOVEN WALL WRAP

NCM • NEW COMPOSITE MEMBRANE

BRANZ
Appraisal No. 549 [2007]

Thermakraft

FIRE RETARDANT ABSORBENT BREATHABLE NON WOVEN WALL WRAP

PRODUCT DESCRIPTION:

FIRE RETARDANT ABSORBENT BREATHABLE NON WOVEN WALL WRAP is a white soft spun-bonded polypropylene non-woven membrane specifically designed as a wall wrap behind exterior wall claddings. May be used behind direct fixed, non-absorbent PVC and vinyl claddings.

FIRE RETARDANT ABSORBENT BREATHABLE NON WOVEN WALL WRAP is more tear resistant than kraft papers. This factor greatly reduces the danger of damage and installation problems, or because of storm damage saving dollars on repairs and reinstallation costs. Damaged areas are easily repaired.

FIRE RETARDANT ABSORBENT BREATHABLE NON WOVEN WALL WRAP meets the new edge tear high wind zone requirements and increases productivity, allowing work within the structure to proceed by providing temporary weather protection from wind and rain, yet allowing light through. Being translucent it is easy to see nail lines for nogs and studs and provides the ultimate barrier against the elements. For additional wind resistance use **Thermakraft Stud Strap Hand Held.**

IS FIRE RETARDANT FOR THE CONTROL OF INTERNAL FIRE & SMOKE SPREAD

FIRE RETARDANT ABSORBENT BREATHABLE NON WOVEN WALL WRAP has a AS1530 Part 2 Flammability Index of 1 and meets the requirements of NZBC Acceptable Solutions C/AS1 Part 6 Table 6.2 for surface finish requirements for suspended flexible fabrics, and therefore it may be used with no restrictions in all buildings.

FIRE RETARDANT ABSORBENT BREATHABLE NON WOVEN WALL WRAP is available in convenient widths of 2740mm and 1370mm from all good leading Builders Supply and Timber Merchants.

NOTE: FIRE RETARDANT ABSORBENT BREATHABLE NON WOVEN WALL WRAP MUST BE STORED IN CLEAN DRY CONDITIONS AND NOT IN AREAS WITH DIRECT SUNLIGHT.

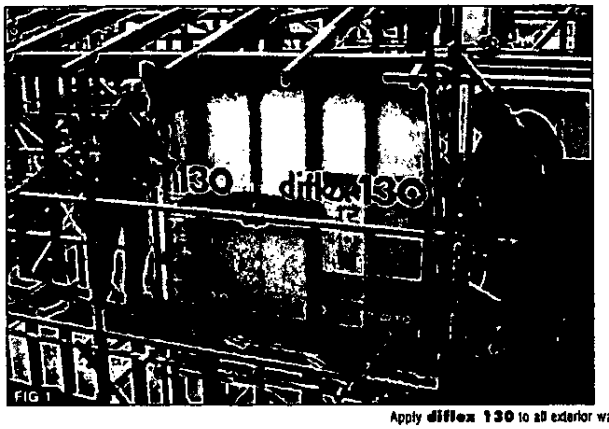


FIG 1

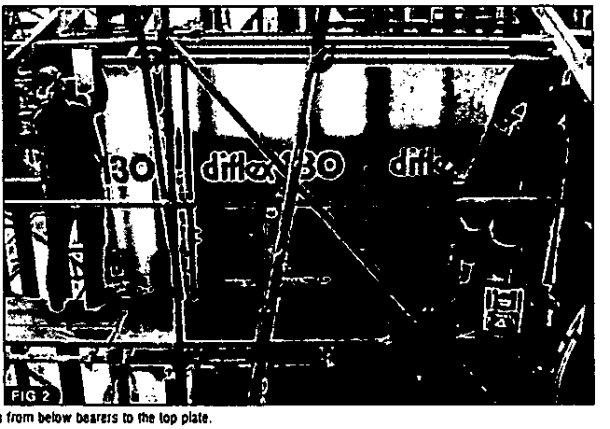


FIG 2

Apply **diflex 130** to all exterior walls from below bearers to the top plate.

FIG 3

Secure to frame with Little Grippers or staples

FIG 4

Use additional fasteners such as Thermakraft Stud Strap Hand Held around each opening to be cut out.

MUST NOT BE LEFT EXPOSED TO THE ELEMENTS FOR MORE THAN 42 DAYS

E. & O. E.

INSTALLATION PROCEDURES:

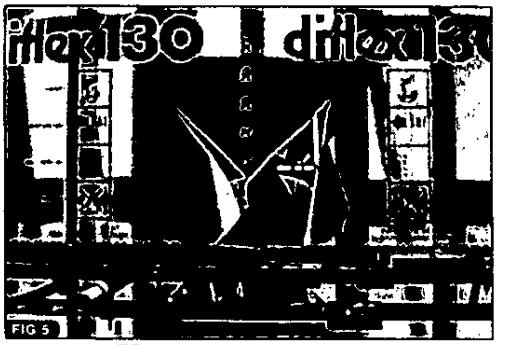
1. **FIRE RETARDANT ABSORBENT BREATHABLE NON WOVEN WALL WRAP** is applied to all exterior walls from below bearers to the top plate (Fig 1 & 2). Fix securely to the frame with fasteners such as galvanised Little Grippers, or 6mm-8mm staples, or 20mm large head galvanised clouts at 300mm centres horizontally and vertically (Fig 3). Additional fasteners should be used around each opening to be cut out and use **Thermakraft** Stud Strap Hand Held (Fig 4).

2. **FIRE RETARDANT ABSORBENT BREATHABLE NON WOVEN WALL WRAP** - when using either 2740mm or 1370mm wide rolls horizontally or vertically, a minimum of 150mm lap is required at joints.
NOTE: FASTENERS BEHIND BRICK VENEER CLADDING MUST HAVE AN EQUIVALENT SERVICEABLE LIFE TO THAT OF THE BRICK VENEER (50 YEARS). REFER TO NZS 3604 TABLES 4.1, 4.2 AND 4.3.
NOTE: ALL VERTICAL LAPS MUST BE MADE OVER STUDS. MAKE GOOD REPAIRS ON ANY FORCED TEARS WITH TAPE.

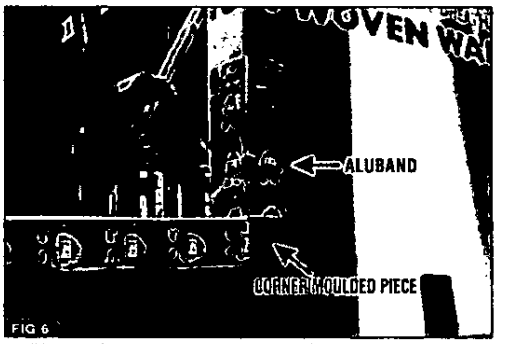
3. **FIRE RETARDANT ABSORBENT BREATHABLE NON WOVEN WALL WRAP** is wide enough to come from below the bottom plate to the top plate, covering all windows and door openings. Use extra fastenings around each opening to be cut out (Fig 3).

NOTE: FIRE RETARDANT ABSORBENT BREATHABLE NON WOVEN WALL WRAP WILL PROVIDE TEMPORARY WEATHER PROTECTION DURING CONSTRUCTION. TRANSLUCENCY OF THE MEMBRANE WILL ENABLE WORK TO PROCEED DURING INCLEMENT WEATHER. ON ARRIVAL OF DOORS AND WINDOWS, CUT THE **FIRE RETARDANT ABSORBENT BREATHABLE NON WOVEN WALL WRAP** AT EACH OPENING ON A 45° ANGLE AWAY FROM EACH CORNER. PULL THE **FIRE RETARDANT ABSORBENT BREATHABLE NON WOVEN WALL WRAP** FLAPS INSIDE AND FASTEN TO FRAME (Fig 5).

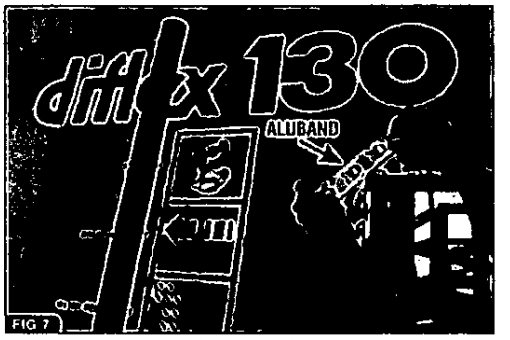
4. **Thermakraft ALUBAND Window Sealing System** (BEAL Appraisal) IS APPLIED PRIOR TO FITTING WINDOWS (Fig 6 & 7) and as drawings below. Free installation pamphlets available - Freephone **0800 806 595**.
NOTE: BRANZ Appraisal No. 549 [2007] relates to **FIRE RETARDANT ABSORBENT BREATHABLE NON WOVEN WALL WRAP** only, NOT to the **Thermakraft ALUBAND Window Sealing System.**



"X" cut **diflex 130** and fold back with stapling, preparing for **ALUBAND WINDOW SEALING SYSTEM.** Simple and efficient.

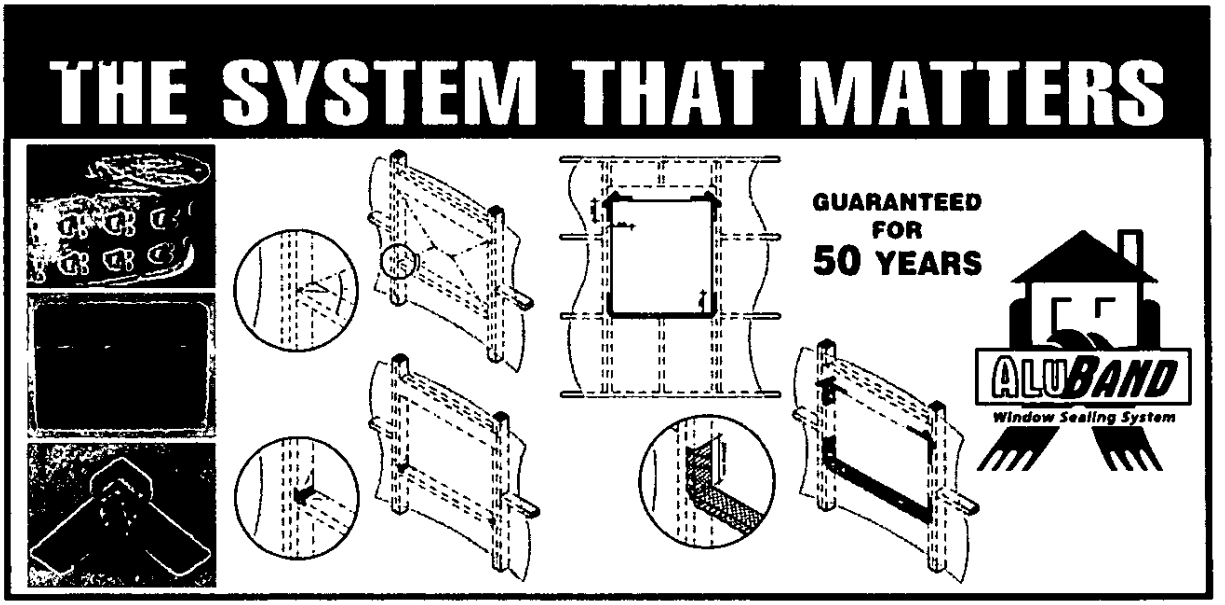


Window opening completed with the Aluband System in place. NOTE: THE ORANGE **CORNER MOULDED PIECE** AS PART OF THE **Thermakraft ALUBAND SEALING SYSTEM.**



Apply butterfly with **Thermakraft ALUBAND Window Sealing Tape** at 45° angle to jamb.

IMPORTANT NOTICE: NZBC ACCEPTABLE SOLUTION E2/AS1 PARAGRAPH 9.1.8.5 WHERE STUD SPACINGS ARE GREATER THAN 450mm CENTRES, AN INTERMEDIATE MEANS OF RESTRAINING THE BUILDING WRAP AND INSULATION FROM BULGING INTO THE DRAINED CAVITY SHALL BE INSTALLED. ACCEPTABLE MEANS OF ACHIEVING THIS IS **Thermakraft Stud Strap Hand Held** FIXED HORIZONTALLY AT 300mm CENTRES. **WARNING: FIRE RETARDANT ABSORBENT BREATHABLE NON WOVEN WALL WRAP** MUST NOT BE USED AS A ROOFING UNDERLAY. **FIRE RETARDANT ABSORBENT BREATHABLE WALL WRAP** IS UNAFFECTED BY LOSP.



E. & O. E

Thermakraft

ENGINEERED FOR NEW ZEALAND CLIMATE

ENQUIRE ABOUT OUR CORPORATE / COMPANY / BUILDER PRINT.

A house should not be completely airtight, there must be some natural air change. Usually there is too much.

FIRE RETARDANT ABSORBENT BREATHABLE NON WOVEN WALL WRAP reduces air infiltration.

FIRE RETARDANT ABSORBENT BREATHABLE NON WOVEN WALL WRAP is effective in high wind areas where it reduces cold air currents within the wall cavity.

FIRE RETARDANT ABSORBENT BREATHABLE NON WOVEN WALL WRAP will help maintain the "R" value of CSR Bradford Gold Thermal and Acoustic Glasswool Insulation by reducing air infiltration and reducing air movement in the insulation between the studs.

FIRE RETARDANT ABSORBENT BREATHABLE NON WOVEN WALL WRAP ***BREATHES*** to prevent build-up of moisture. **FIRE RETARDANT ABSORBENT BREATHABLE WALL WRAP** allows the passage of water vapour from the interior to the exterior through a network of microscopic pores in the membrane, allowing the water vapour to pass through.

FIRE RETARDANT ABSORBENT BREATHABLE NON WOVEN WALL WRAP is able to resist ***ULTRA VIOLET RAYS*** of the sun and damaging effects of the elements, and can be left exposed withstanding UV Light and the elements for 42 days.

FIRE RETARDANT ABSORBENT BREATHABLE NON WOVEN WALL WRAP allows see-through application. Nail lines can be easily seen through the membrane during fixing. This simplifies and speeds up installation.

FIRE RETARDANT ABSORBENT BREATHABLE NON WOVEN WALL WRAP can be used as a Wall Wrap on Timber Framed Buildings within this scope: the scope limitations of NZBC Acceptable Solution E2/AS1, Paragraph 1.1; and with direct fixed absorbent wall claddings; and with direct fixed PVC and vinyl non-absorbent wall claddings; and with absorbent and non-absorbent wall claddings installed over an 18mm minimum drained cavity; and with masonry veneer in accordance with NZS 3604: 1999; and situated in NZS 3604 Building Wind Zones up to, and including ***VERY HIGH***.

FIRE RETARDANT ABSORBENT BREATHABLE NON WOVEN WALL WRAP meets the Performance Requirements of NZBC Clauses B2, Durability (B2.3.1(a) 50 years and B2.3.1(b) 15 years), E2 External Moisture, and F2 Hazardous Building Materials.

ROLL DIMENSIONS

WIDTH (mm)	LENGTH (m)	m^2
2740	36.5	100
2740	18.5	50

WIDTH (mm)	LENGTH (m)	m^2
1370	55	75
1370	30	41

This brochure supersedes all previous brochures. Thermakraft Industries (NZ) Ltd retains the right to change products and specifications without prior notification. Do not use this product in an application other than that detailed in this brochure, relevant Standards, Codes of Practice, Building Legislation and/or Health & Safety Regulations, without obtaining written advice from Thermakraft Industries (NZ) Ltd. All product dimensions and performance claims are subject to any variation caused by normal manufacturing process and tolerances. This information is provided without prejudice by Thermakraft Industries (NZ) Ltd.

MEMBRANES FOR INDUSTRY

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E. & O. E

BRANZ Appraised
Appraisal No.549 [2007]

BRANZ Appraisals

Technical Assessments of products for building and construction

BRANZ APPRAISAL CERTIFICATE No. 549 (2007)

DIFLEX 130 BUILDING WRAP

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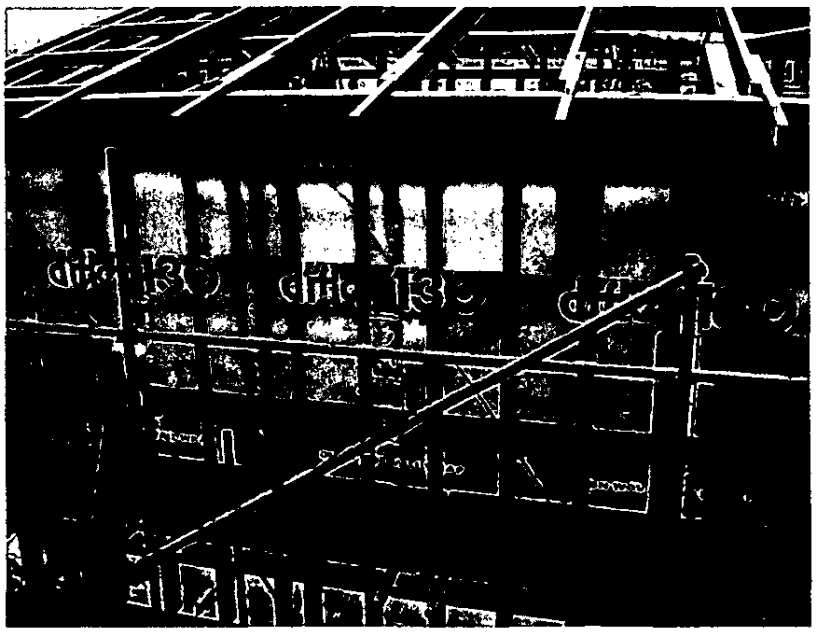
Fax: +61 2 9938 6911
www.branz.com.au

1.1 Diflex 130 is a synthetic building wrap for use as a wall wrap under direct fixed and non-direct fixed wall cladding on timber framed buildings. The product is manufactured from non-woven, spun bonded polypropylene and is coloured white.



2.1 Diflex 130 has been appraised for use as a wall wrap on timber framed buildings within the following scope:

- the scope limitations of NZBC Acceptable Solution E2/AS1, Paragraph 1.1; and,
- with absorbent wall claddings directly fixed to framing; and,
- with non-metallic, non-absorbent wall claddings directly fixed to the frame; and,
- with absorbent and non-absorbent wall claddings installed over an 18 mm minimum drained cavity; and,
- with masonry veneer in accordance with NZS 3604:1999; and,
- situated in NZS 3604 Building Wind Zones up to, and including 'Very High'.

2.2 Diflex 130 has also been appraised for use on buildings subject to specific weathertightness design. Building designers are responsible for the building design and for the incorporation of Diflex 130 into their design in accordance with the declared properties and the instructions of Thermakraft Industries (N.Z.) Ltd.

New Zealand Building Code (NZBC)

3.1 In the opinion of BRANZ, Diflex 130, if used, designed, installed and maintained in accordance with the statements and conditions of this Certificate, will meet, or contribute to meeting the following provisions of the NZBC:

Clause B2 DURABILITY: Performance B2.3.1(a), not less than 50 years and B2.3.1(b), 15 years. Diflex 130 meets these requirements. See Paragraphs 9.1 and 9.2.

Clause E2 EXTERNAL MOISTURE: Performance E2.3.2. When used as part of the cladding system, Diflex 130 will contribute to meeting this requirement. See Paragraphs 12.1 and 12.2.

Clause F2 HAZARDOUS BUILDING MATERIALS: Performance F2.3.1. Diflex 130 meets this requirement and will not present a health hazard to people.

3.2 This Certificate appraises an **Acceptable Solution** in terms of the New Zealand Building Code compliance. Diflex 130 meets the requirements of NZBC Acceptable Solution E2/AS1, Table 23. Diflex 130 has been appraised for use as a wall wrap behind non-metallic, non-absorbent wall cladding directly fixed to the frame, which is an **Alternative Solution** in terms of New Zealand Building Code compliance.

Product Description

4.1 Diflex 130 is a white, 120 g/m² spun-bonded polypropylene, non-woven membrane.

4.2 The product is supplied in rolls 1.370 m wide x 30 and 55 m long and 2.740 m wide x 18.5 and 36.5 m long. The product is printed with the Diflex 130 logo repeated along the length of the roll and is labeled with the marketing or construction company's name. The rolls are wrapped in clear polythene film.

Accessories

4.3 Accessories used with Diflex 130 which are supplied by the installer are:

- Fixings - staples, clouts or proprietary wrap fixings, or other temporary fixings to attach the wall wrap to the framing.
- Building wrap support - polypropylene strap, 75 mm galvanised mesh or galvanised wire, or vertical cavity battens where required to support the wall wrap in accordance with NZBC Acceptable Solution E2/AS1, Paragraph 9.1.8.5.

Handling and Storage

5.1 Handling and storage of the product, whether on or off site, is under the control of the installer. The rolls must be protected from damage and weather. They must be stored on end, under cover, in clean, dry conditions and must not be crushed.

Technical Literature

6.1 Refer to the Appraisals listing on the BRANZ website for details of the current Technical Literature for Diflex 130. The Technical Literature must be read in conjunction with this Certificate. All aspects of design, use, installation and maintenance contained in the Technical Literature and within the scope of this Certificate must be followed.

Design Considerations

Timber Framing

7.1 Studs must be provided at maximum 600 mm centres. Dwangs must be fitted flush between the studs at maximum 1200 mm centres.

General

7.2 Diflex 130 is intended for use as an alternative to conventional building papers which are fixed over timber framed walls in order to limit the entry of wind into building cavities, and to act as a secondary barrier to wind-driven rain.

7.3 The material also provides a degree of temporary weather protection during early construction. However, the product will not make the building weathertight and some wetting of the underlying structure is always possible before the building is closed in. Hence, the building must be closed-in and made weatherproof before moisture sensitive materials such as wall or ceiling linings and insulation materials are installed.

7.4 Diflex 130 is suitable for use under wall claddings as a wall wrap as called up in NZBC Acceptable Solution E2/AS1, Table 23, except that it must not be used with non-absorbent metal based sidings or metal based weatherboards in direct fixed installations. Refer to Table 1.

Table 1: NZBC E2/AS1 Table 23 Requirements

NZBC E2/AS1 Table 23 Wall Wrap Properties	Property Performance Requirement	Actual Property Performance
Absorbency	≥ 100 g/m²	155 g/m²
Vapour Resistance	≤ 7 MN s/g	0.165 MN s/g
Water Resistance	≥ 20 mm	Pass
pH of Extract	≥ 6 and ≤ 9	6.5
Shrinkage	≤ 0.5%	-0.17 %
Mechanical	Edge tear and tensile strength	Edge tear: Machine direction = 146 N Cross direction = 137 N Tensile strength: Machine direction = 3.01 kN/m Cross direction = 3.49 kN/m
Air Barrier	Air resistance: ≥ 0.1 MN s/m³	**Diflex 130 cannot be used as an air barrier.**

7.5 In cavity installations where the cavity battens are installed at greater than 450 mm centres, the building wrap must be supported between the battens to prevent the wrap bulging into the cavity space when bulk insulation is installed in the wall frame cavity in accordance with the requirements of NZBC Acceptable Solution E2/AS1, Paragraph 9.1.8.5.

Stucco Plaster

7.6 Diflex 130 is suitable for use as a non-rigid backing material for stucco plaster in accordance with the requirements of NZBC Acceptable Solution E2/AS1, Paragraph 9.3.5.1. The wrap must be supported with 75 mm galvanised mesh or plastic tape or wire at 150 mm centres run across the cavity battens to limit deflection to a maximum of 5 mm in accordance with the requirements of NZBC Acceptable Solution E2/AS1, Paragraph 9.3.5.2.

7.7 Diflex 130 may also be used as a slip layer over rigid backings for stucco plaster in accordance with the requirements of NZBC Acceptable Solution E2/AS1, Paragraph 9.3.3(b).

Structure

8.1 Diflex 130 is suitable for use in all Building Wind Zones of NZS 3604 up to, and including, 'Very High'.

Durability

9.1 Diflex 130 meets code compliance with NZBC Clause B2.3.1 (a), not less than 50 years for building wraps used where the cladding durability requirement or expected serviceable life is not less than 50 years, e.g. behind masonry veneer, and code compliance with NZBC Clause B2.3.1 (b), 15 years for building wraps used where the cladding durability requirement is 15 years.

Serviceable Life

9.2 Provided it is not exposed to the weather or ultra-violet light for a total of more than 42 days, and provided the exterior cladding is maintained in accordance with the cladding manufacturer's instructions and the cladding remains weather resistant, Diflex 130 is expected to have a serviceable life equal to that of the cladding.

Control of Internal Fire and Smoke Spread

10.1 Diflex 130 has an AS 1530 Part 2 Flammability Index of 1 and meets the requirements of NZBC Acceptable Solution C/AS1 Part 6, Table 6.2 for surface finish requirements for suspended flexible fabrics, and therefore it may be used with no restrictions in all buildings.

Outbreak of Fire

11.1 Diflex 130 must be separated from fireplaces, heating appliances, flues and chimneys in accordance with the requirements of NZBC Acceptable Solution C/AS1 Part 9 for the protection of combustible materials.

External Moisture

12.1 Diflex 130 must be used behind claddings that meet the requirements of the NZBC, such as those covered by NZBC Acceptable Solution E2/AS1, or claddings covered by a valid BRANZ Appraisal Certificate.

12.2 Diflex 130, when installed in accordance with the Technical Literature and this Certificate, will assist in the total cladding systems compliance with NZBC Clause E2.

Installation Information

Installation Skill Level Requirements

13.1 Installation must always be carried out in accordance with the Diflex 130 Technical Literature and this Certificate, by competent tradespersons with an understanding of wall wrap installation.

Wrap Installation

14.1 Diflex 130 must be fixed to all framing members at maximum 300 mm centres with large-head clouts 20 mm long, 6-8 mm staples, or proprietary wrap fixings. The membrane must be pulled taut over the framing before fixing.

14.2 Diflex 130 must be run horizontally and must extend from the upper-side of the top plate to the under-side of the bearers or wall plates supporting ground floor joists, or below bottom plates on concrete slabs. Horizontal laps must be no less than 150 mm wide, with the direction of the lap ensuring that water is shed to the outer face of the membrane. End laps must be made over framing and be no less than 150 mm wide.

14.3 The wall wrap should be run over openings and these left covered until windows and doors are ready to be installed. Openings are formed in the membrane by cutting on a 45 degree diagonal from each corner of the penetration. The flaps of the cut membrane must be folded inside the opening and stapled to the penetration framing. Excess wrap may be cut off flush with the internal face of the wall frame.

14.4 Diflex 130 can be added as a second layer over head flashings in accordance with the requirements of NZBC Acceptable Solution E2/AS1, Paragraph 9.1.7(e).

14.5 When fixing the product in windy conditions, care must be taken due to the large sail area created by wide roll widths.

14.6 Any damaged areas of Diflex 130, such as tears, holes or gaps around service penetrations, must be repaired. Damaged areas can be repaired by covering with new material lapping the damaged area by at least 150 mm and taping, or by taping small tears.

Inspections

14.7 The Technical Literature must be referred to during the inspection of Diflex 130 installations.

Basis of Appraisal

The following is a summary of the technical investigations carried out:

Tests

15.1 The following tests have been carried out on Diflex 130 by Ensis Papro: tensile strength, edge-tear resistance and resistance to water vapour transmission in accordance with AS/NZS 4200.1, resistance to dry delamination in accordance with AS/NZS 4201.1, resistance to wet delamination in accordance with AS/NZS 4201.2, shrinkage in accordance with AS/NZS 4201.3, resistance to water penetration in accordance with AS/NZS 4201.4 and surface water absorbency in accordance with AS/NZS 4201.6. A range of these tests were completed before and after Diflex 130 was exposed to ultra-violet light.

15.2 The following tests have been carried out on Diflex 130 by BRANZ: pH of extract in accordance with AS/NZS 1301.421s.

15.3 The following tests have been carried out on Diflex 130 by CSIRO: flammability in accordance with AS/NZS 1530.2.

Other Investigations

16.1 A durability opinion was given by BRANZ technical experts.

16.2 Site inspections were carried out by BRANZ to assess methods used for the installation of Diflex 130.

16.3 The marketer's Technical Literature, including installation instructions, has been examined by BRANZ and found to be satisfactory.

Quality

17.1 The manufacture of Diflex 130 has not been examined by BRANZ, but details of the methods adopted for quality control and the quality of the materials used, have been obtained.

17.2 The quality of supply to the market is the responsibility of Thermakraft Industries (N.Z.) Ltd.

17.3 Building designers are responsible for the design of the building, and for the incorporation of the wall wrap into their design in accordance with the instructions of Thermakraft Industries (N.Z.) Ltd.

17.4 Quality of installation is the responsibility of the installer in accordance with the instructions of Thermakraft Industries (N.Z.) Ltd.

Sources of Information

- AS 1530.2 - 1993 Test for flammability of materials.
- AS/NZS 1301.421s: 1988 Determination of the pH value of aqueous extracts of paper, board and pulp - cold extraction method.
- AS/NZS 4200.1: 1994 Pliable building membranes and underlays - materials.
- AS/NZS 4201.1: 1994 Pliable building membranes and underlays - Methods of test – Resistance to dry delamination.
- AS/NZS 4201.2: 1994 Pliable building membranes and underlays - Methods of test – Resistance to wet delamination.
- AS/NZS 4201.3: 1994 Pliable building membranes and underlays - Methods of test – Shrinkage.
- AS/NZS 4201.4: 1994 Pliable building membranes and underlays - Methods of test – Resistance to water penetration.
- AS/NZS 4201.6: 1994 Pliable building membranes and underlays - Methods of test – Surface water absorbency.
- NZS 3604: 1999 Timber Framed Buildings.
- Compliance Document for the New Zealand Building Code External Moisture Clause E2, Department of Building and Housing, Third Edition July 2005.
- New Zealand Building Code Handbook and Approved Documents, Building Industry Authority, 1992.
- The Building Regulations 1992, up to, and including October 2004 Amendment.

BRANZ

In the opinion of BRANZ, Diflex 130 Building Wrap is fit for purpose and will comply with the Building Code to the extent specified in this Certificate provided it is used, designed, installed and maintained as set out in this Certificate.

The Appraisal Certificate is issued only to the Certificate Holder, Thermakraft Industries (N.Z.) Ltd, and is valid until further notice, subject to the Conditions of Certification.

Conditions of Certification

1. This Certificate:
   a) relates only to the product as described herein;
   b) must be read, considered and used in full together with the technical literature;
   c) does not address any Legislation, Regulations, Codes or Standards, not specifically named herein;
   d) is copyright of BRANZ.
2. The Certificate Holder:
   a) continues to have the product reviewed by BRANZ;
   b) shall notify BRANZ of any changes in product specification or quality assurance measures prior to the product being marketed;
   c) abides by the BRANZ Appraisals Services Terms and Conditions.
3. The product and the manufacture are maintained at or above the standards, levels and quality assessed and found satisfactory by BRANZ.
4. BRANZ makes no representation as to:
   a) the nature of individual examples of, batches of, or individual installations of the product, including methods and workmanship;
   b) the presence or absence of any patent or similar rights subsisting in the product or any other product;
   c) any guarantee or warranty offered by the Certificate Holder.
5. Any reference in this Certificate to any other publication shall be read as a reference to the version of the publication specified in this Certificate.

For BRANZ

P Robertson
Chief Executive

Date of issue: 17 May 2007

MonierBrick

Brick Maintenance

Bricks are virtually maintenance free which is one of the benefits of choosing to build with brick.

To ensure the best performance, the following routine maintenance should be followed.

Information is also provided to assist with the cleaning of stains that may occur during or subsequent to construction.

Routine Maintenance

Weep holes should be checked annually to ensure they are clear of obstacles such as spider webs, dirt, etc.

For aesthetic purposes only bricks can be washed down with an acid free cleaning agent every two years or as necessary.

For Brick claddings that have been plastered, please refer to Plastering Suppliers maintenance recommendations.

Cleaning of Mortar Stains on Brickwork

The appearance of brickwork can be permanently spoiled by bad cleaning. If cleaning is left too long or if improper cleaning methods have been used, it may be impossible to rectify the situation. Here are some basic steps to follow to achieve best results.

Clean all stains as soon as possible.

If fresh mortar has splashed or spattered onto the brickwork, remove promptly with a clean wet paint-brush. Keep the brush handy in a glass of water containing a small amount of detergent. Do not allow the mortar smears to remain longer than one or two hours before cleaning off. **In particular, where mineral oxides are used as a colouring agent, clean off immediately.**

Use the right tools.

If acid cleaning is called for, remember that the acid attacks mortar and nothing else. This means the mortar in the joints as well as the smudged areas. To begin with remove as much mortar as possible with an old putty knife or wooden paddle, or scrape with a piece of the same colour brick .

Use a plastic bucket, fill with water, and pour the acid **into** the water. Wear rubber gloves and use a long handled fibre-brush (not metal). Scrub the bricks, and not the mortar.

Use the right cleaning agent.

Spirits of Salts (weak hydrochloric acid) is not the answer for anything other than old mortar stains. It will not cure efflorescence, nor will it remove stains caused by oil, timber leachings, iron' ruststains, paint, smoke or soot. Never use spirits of salts on green or yellow stains on a light coloured brick. Acid used on such stains may "fix" them on the brickwork permanently.

Lots of water is the story.

Cleaning with acid involves three steps. The work must be sopping wet before applying the acid; the area should be a smallish one of about 6 to 10 bricks at one time; the residue must be thoroughly hosed down with copious amounts of water.

Don't overdo acid treatment.

One part acid to 10 parts water is powerful enough - even 1:20 will do in some cases. Should the treatment not seem to work at first, do not increase the acid content. Instead, carry on and scrape down with a piece of wood to continue the process.

After the bubbling has stopped, try not to let the acid scum dry on the surface, but clean off immediately. It may prove impossible to shift once it has solidified.

Begin at the top.

Clean brickwork from the top down, and look out below!

On commercial work larger areas can be tackled at one time, say about a metre square. Channel dirty water away from untreated areas if an entire vertical section cannot be cleaned from top to bottom in one day.

Protect Metals

Protect any metal, particularly aluminium window frames, with vaseline or with masking tape.

When in doubt, proceed carefully.

If in doubt about any aspect of treating brickwork, try out small unobtrusive areas, and leave for a week or so to judge the effect before tackling the whole job.

CSR

Vanadium Staining

Light coloured clays often contain naturally occurring vanadium salts which may appear as a yellow, green or reddish-brown discolouration on the bricks.

Vanadium Staining is neither permanent nor harmful, and they do not indicate any defects in the bricks.

It will eventually break down in sunlight. We recommend leaving brickwork with vanadium to break down on its own, however should you want to speed up this process, you can use one of the methods below.

Note

See *General Advice on Removal of Stains* for important information .

The removal of vanadium staining from new brickwork would be the home owners responsibility.

Do not ever use hydrochloric acid on these stains as it may turn the stains black and make them more difficult to remove. Should your vanadium staining already have been affected by hydrochloric acid, the use of caustic soda or one of the proprietary cleaners may help remove these stains although in some cases the stains may be permanent.

It is essential that vanadium salt deposits be removed prior to using hydrochloric acid to remove mortar deposits.

After the initial removal of vanadium salt stains, more water on the masonry - even that used in the cleaning process - may induce further efflorescing of vanadium salt to the surface, depending on the amount within the brick.

These deposits must be removed by the same methods specified for the initial treatment.

Note

Do not apply anti graffiti coatings such as Cleanwall 2000 to bricks which have not been in place for at least 4 weeks or that have vanadium stains on them.

Potassium Hydroxide or Sodium Hydroxide (Caustic Soda)

This alkaline treatment is the preferred treatment.

Mix up 150g potassium or sodium hydroxide per litre of water and apply to the stained bricks. Leave on the wall until the stain disappears, then wash off. Usually several days. A white residue may appear after this treatment and this should also be hosed off.,

Proprietary Cleaners - Noskum

This is a general purpose cleaner used 1 part Noskum, 2 parts water: Neutralize with "Neutril" or bicarbonate of soda solution 1 part, 20 parts water. Apply to dry brick.

Proprietary Cleaners - Vango

A caustic soda based solution. Apply to stains and leave until stain disappears. Could be several days. Wash off. A white residue may appear this should also be washed off. Apply to dry brick. This can also be used on vanadium stains which have been darkened by the use of acid.

Oxalic Acid

This is probably the best known chemical removal of vanadium salt. **However, if used it must be followed by a neutralising wash. This action is commonly omitted and further staining of a serious nature can result**

Correct use of the oxalic treatment is:

1. Mix 20g to 40g of oxalic acid per litre of water (preferably hot water).
2. Apply to the stained bricks without pre-wetting.
3. Then neutralise the oxalic acid by applying a solution of 15g of washing soda per litre of water. Do not wash off.

Proprietary Cleaners - Oxcid

An oxalic acid based cleaner. Apply to stained areas leave until stain disappears. Neutralize with "Neutril" or bicarbonate of soda solution. (See under Noskum). Apply to dry bricks.

Do not use on vanadium stains which have darkened as a result of cleaning with hydrochloric acid (Spirits of Salts).

General Advice on Removal of Stains

Like other wall materials, brickwork can be stained by elements that are due to external causes. Most stains will respond to treatment, but the correct method of treatment will involve *specific remedies for particular* problems.

Here are some basic rules for 'do-it-yourself' treatment of relatively small jobs.

- Determine the efficiency of any cleaning agent by first testing a sample area.
- More than one application may be necessary.
- Do not use Spirits of Salts for anything other than dissolving mortar.
- Chemical compounds are toxic. Wear protective clothing and goggles where necessary.
- Volatile solvents should be used indoors only where good ventilation exists.

Removal of specific stain types

Paint

Fresh paint stains usually respond to a commercial paint remover, or, turps for oil based paints.

A make-it-yourself solution of 1 kg of trisodium phosphate to 5 litres of water may be used. Allow the application to soak in, and remove soft paint with a scraper. Wash with soapy water and rinse with clean water.

Certain paints can be removed successfully by softening with a propane torch and then scraping off, or by burning to a char and brushing away the ash.

All paint removers are toxic, and some fumes are flammable. Extreme care should be exercised and adequate ventilation is essential, particularly indoors i.e. removing paint from an old fireplace. The by-product of paint removal may present a hazard also if treating paints which contain lead.

Rust or Iron

The brown rust stain produced by iron or steel near or embedded in brickwork can usually be removed by applying a solution of oxalic acid in water (strength 1:10 by weight; 100 g/L) to which has been added ammonium bifluoride (50 g/L).

If the stain is heavy, the solution should be applied hot, with a second application if necessary. In extreme cases a poultice, which holds the cleaning material in contact with the brick and draws the stain out, may have to be applied. Such a poultice may be made of sodium citrate, glycerine and water, in proportions 1:7:6, in a thick paste with a filler such as talc and left on the stained area for several days before being brushed away.

Copper and Bronze

The bluish-green stains that betray run-off of water from copper flashings and bronze fixtures can be removed from brickwork by the application of a poultice prepared from one part ammonium chloride (sal ammoniac) to four parts talc or diatomaceous earth to which is added household ammonia. The paste is applied to the bricks and, when dried, brushed off.

Timber (brown or grey)

These stains are due to water spreading tannin and resin from the timber across the bricks and mortar, and can normally be removed by scrubbing with a 1:40 solution of oxalic acid in hot water.

Smoke and soot

Scrub with a household detergent (JIF for example) or a scouring powder that contains bleach, followed by a good rinse. In difficult cases a 6 to 10mm thick poultice may be required, prepared from a filler such as talcum powder and trichloreythlene to form a stiff paste. Cover the poultice with a pan to prevent rapid evaporation. Handle this poultice with care and with adequate ventilation to avoid inhaling the fumes.

Bitumen or tar

Remove as much as possible by scraping off with a putty knife. Apply a poultice as for Smoke and Soot removal. A repeat application may be required. Remember the solvent is toxic, so handle with care. Scrub down with water and detergent after the poultice has been brushed off.

Lichens and mosses

These can be knocked back with an application of copper or ammonium sulphate or a proprietary weed killer. Vegetable growth is generally indicative of damp brickwork and will usually reappear if this basic cause is not cured. Green staining which does not respond to this treatment is possibly due to vanadium salts from within the bricks.

Efflorescence

(white crystals or white furry deposit)

This usually disappears from new brickwork due to the action of wind and rain. The process can be accelerated by repeated washings allowing the wall to dry out at intervals. Brushing down the wall at times of maximum efflorescence will help.

The salts brushed off should not be allowed to accumulate at the base of the wall, otherwise they may be carried back into the brickwork by subsequent rain.

Efflorescence on brickwork indoors:

Ensure that brickwork is as dry as possible. Dab the affected area with a damp (not wet) sponge, rinsing the sponge in clean water.

Allow bricks to dry and repeat as necessary.

The efflorescence should not reoccur if the brickwork remains dry.

Oiling brickwork

Oiled brickwork gives a darker shade to bricks, particularly red bricks, and is suitable as a cosmetic finish to improve the appearance of a job on which there may be light staining - for instance due to mortar droppings which have not been removed carefully.

Merely mix ordinary clean motor oil and kerosene in the proportion of 1:1 and paintbrush over bricks and mortar joints. This is all that is necessary. However, this treatment is for appearance only, and should not be used as a water-proofing technique.

Additional Remarks

Persistent efflorescence, extensive salt staining from within the bricks themselves and vegetable growth on the brickwork are due to excessively wet conditions, and unless the basic problem of water penetration is cured, the staining will repeatedly reappear.

In such cases, it is necessary to overhaul faulty flashings, repair leaking rainwater downpipes, renew copings, etc.

Where chemical treatments are recommended you should note that is is essential for brickwork to be cleaned down afterwards, using copious quantities of water to clear all traces of chemicals from the surface, adjacent areas and drains.

Industrial and manufacturing chemists as listed in the Yellow Pages may be contacted for the chemicals mentioned.

Please note:

We are unable to guarantee the effectiveness of the above treatments for each and every situation, in particular where staining may be due to a variety of causes.

BRANZ Appraised
Appraisal No.472 [2005]

BRANZ Appraisals

Technical Assessments of products for building and construction

BRANZ APPRAISAL CERTIFICATE No. 472 (2005)

SUPERFLEX™ WET AREA MEMBRANES

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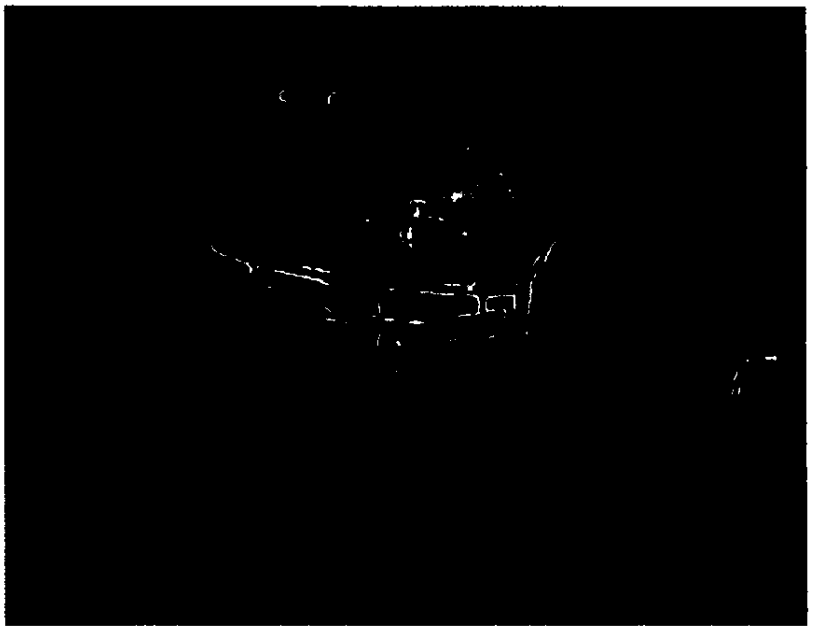
WFTAO

Product

1.1 Superflex™ Wet Area Membranes are premixed and two-part, liquid applied waterproofing membranes for use under ceramic tiles in internal wet areas.



Scope

2.1 Superflex™ Wet Area Membranes have been appraised for use as waterproofing membranes for internal wet areas of buildings, within the following scope:

- on floor substrates of concrete, flooring grade particleboard, plywood, and fibre cement sheet tile underlay, and on wall substrates of wet area fibre cement sheet lining systems and wet area plasterboard lining systems; and,
- when protected from physical damage by ceramic tiles; and,
- where floors are designed and constructed such that deflections do not exceed 1/360th of the span.

2.2 The use of Superflex™ Wet Area Membranes on concrete slabs where hydrostatic or vapour pressure is present is outside the scope of this Certificate.

2.3 Movement and control joints in the substrate must be carried through to the tile finish. The design and construction of the substrate and movement and control joints is specific to each building and therefore the responsibility of the building designer and building contractor and is outside the scope of this Certificate.

2.4 Ceramic tile finishes are outside the scope of this Certificate.

2.5 The products must be installed in accordance with the Ardex New Zealand Ltd Technical Literature referred to in Paragraph 6.1 and by Ardex trained and approved applicators.

New Zealand Building Code (NZBC)

3.1 In the opinion of BRANZ, Superflex™ Wet Area Membranes if designed, used, installed and maintained in accordance with the statements and conditions of this Certificate, will meet or contribute to meeting the following provisions of the NZBC:

Clause B2 DURABILITY: Performance B2.3.1 (b) 15 years. Superflex™ Wet Area Membranes meet this requirement. See Paragraph 9.1.

Clause E3 INTERNAL MOISTURE: Performance E3.3.6. Interior wet area floors and walls incorporating Superflex™ Wet Area Membranes will meet this requirement. Paragraphs 11.1 – 11.7.

Readers are advised to check the validity of this Certificate by referring to the Valid Certificates listing on the BRANZ website, or by contacting BRANZ.

Clause F2 HAZARDOUS BUILDING MATERIALS: Performance F2.3.1. Superflex™ Wet Area Membranes meet this requirement and will not present a health hazard to people.

3.2 This Certificate appraises an **Alternative Solution** in terms of New Zealand Building Code compliance.

[illegible]

4.1 Materials supplied by Ardex New Zealand Ltd are as follows:

Superflex™ 1 Premixed Bathroom and Balcony

- A one part, polymer-based, ready-to-use, liquid-applied membrane containing micro-fibres, supplied as a light blue thixotropic paste in 6.5 kg (approximately 5 litres) and 20 kg (approximately 15 litres) pails.

Superflex™ 3 Two Part Bathroom and Balcony

- A fast drying, two part, flexible, cementitious-based, liquid applied membrane containing micro-fibres. It is supplied as Superflex™ 3 Part A Liquid in 10 and 20 kg pails and Superflex™ 3 Part B Powder in 10 kg multi-wall bags. When dry, the membrane is light grey in colour.

Superflex™ Primer

- A water-based primer used to seal substrates and enhance the adhesion of the membranes. It is supplied as a red coloured liquid in 20 kg plastic containers.

Handling and Storage

5.1 All materials must be stored inside, up off concrete floors, in dry conditions, out of direct sunlight and out of freezing conditions. The membrane products have a shelf life of 12 months from date of manufacture in the original unopened packaging. Once opened, the products must be used within 3 months.

[illegible]

6.1 Refer to the Appraisals listing on the BRANZ website for details of the current Technical Literature for the Superflex™ Wet Area Membranes. The Technical Literature must be read in conjunction with this Certificate. All aspects of design, use, installation and maintenance contained in the Technical Literature and within the scope of this Certificate must be followed.

[illegible]

General

7.1 SuperflexTM Wet Area Membranes are for use in buildings where an impervious waterproof membrane is required to floors and walls to prevent damage to building elements and adjoining areas.

7.2 SuperflexTM 3 Two Part is designed to be used where a quicker curing time is required, such as in cool or humid conditions.

7.3 The membranes must be protected from physical damage by the application of ceramic tile finishes.

7.4 Movement and control joints may be required depending on the shape and size of the building or room, and the tile finish specified. Design guidelines can be found in the BRANZ Tiling Good Practice Guide.

7.5 Timber framing systems must comply with NZS 3604, or where specific engineering design is used, the framing shall be of at least equivalent stiffness to the framing provisions of NZS 3604, or comply with the serviceability criteria of NZS 4203. In all cases framing must be provided so that the maximum span of the substrate as specified by the substrate manufacturer is met and all sheet edges are fully supported. Timber framing systems supporting the substrates must be constructed such that deflections do not exceed 1/360th of the span. Where NZS 3604 is used, the allowable joist spans given in Table 7.1 shall be reduced by 20%.

Substrates

Plywood

8.1 Plywood must be a minimum of 17mm thick complying with AS/NZS 2269, CD Grade Structural with sanded C face upwards and treated to H3 (CCA treated). LOSP treated plywood must not be used. The plywood must be supported with dwangs or framing with a maximum span of 400mm in each direction, fixed with 10g x 50mm stainless steel countersunk head screws at 150mm centres on the edges and 200mm through the body of the sheets.

Fibre Cement Compressed Sheet/ Fibre Cement Sheet Tile Underlay

8.2 Fibre cement compressed sheet must be manufactured to comply with the requirements of AS 2908.2 and must be specified by the manufacturer as being suitable for use as a wet area substrate. Fibre cement sheet tile underlay must be covered by a valid BRANZ Appraisal Certificate for use in internal wet areas. Installation must be in accordance with manufacturer's. instructions.

Particleboard

8.3 Particleboard must be specified for the end use in accordance with NZS 3602.

Concrete and Concrete Masonry

8.4 Concrete and concrete masonry substrates must be to a specific engineering design meeting the requirements of the NZBC, such as concrete construction to NZS 3101 and NZS 3604 Concrete Slab-On-Ground Floors and Concrete masonry to NZS 4229 and NZS 4230.

Wet Area Wall Linings

8.5 Plasterboard wall linings must be manufactured to comply with AS/NZS 2588, and be covered by a valid BRANZ Appraisal Certificate for use in internal wet areas.

8.6 Fibre Cement Sheet must be covered by a valid BRANZ Appraisal Certificate for use in wet areas.

Durability

Serviceable Life

9.1 The Superflex™ Wet Area Membranes, when subjected to normal conditions of environment and use, are expected to have a serviceable life of at least 15 years and be compatible with tile finishes with a design service life of 15-25 years.

Maintenance

10.1 No maintenance of the membranes will be required provided significant substrate movement does not occur and the tile finish remains intact. Regular checks must be made of the tiled areas to ensure they are sound and will not allow moisture to penetrate. Any cracks or damage must be repaired immediately by repairing the tiles, grouts and sealants.

10.2 In the event of damage to the membranes, the tiling must be removed and the membrane repaired by removing the damaged portion and applying a patch as for new work.

10.3 Drainage outlets must be maintained to operate effectively, and tile finishes must be kept clean.

Internal Moisture

11.1 Superflex™ Wet Area Membranes when fully cured are impervious to water and when appropriately designed and installed will avoid the likelihood of water penetrating behind linings or entering concealed spaces.

11.2 Superflex™ Wet Area Membranes are suitable for use to achieve constraint of accidental overflow to meet NZBC Clause E3.3.2. A means of Code Compliance is given in NZBC Acceptable Solution E3/AS1 Paragraph 2.

11.3 Surfaces must be finished with ceramic tiles. A means of Code Compliance to NZBC Clause E3.3.3 is given in Acceptable Solution E3/AS1 Paragraph 3.1.1 (b) and 3.1.2 (b).

11.4 Falls in showers and shower areas must be a minimum of 1 in 50. In unenclosed showers, falls must extend a minimum of 1500 mm out from the shower rose. Floor wastes must be provided and the floor must fall to the outlet.

11.5 The waterproofing membrane must completely cover shower bases, and for unenclosed showers it must extend a minimum of 1500 mm out from the shower rose. Further design guidance on waterproofing wet areas, including waterproofing walls and junctions can be obtained from AS 3740, the BRANZ Tiling Good Practice Guide, and flooring and wallboard manufacturers.

11.6 Where water resistant wall finishes such as prefinished sheet materials are used, they must flash over the membrane a minimum of 30mm.

11.7 BRANZ recommends the entire floor be covered by a waterproof membrane for bath, shower and spa rooms where timber, plywood or particleboard floors are used. This is also a requirement of particleboard manufacturers.

Installation Skill Level Requirement

12.1 Installation of the membranes must be completed by approved applicators who have completed and passed the Ardex New Zealand Ltd training programme

12.2 Installation of substrates must be completed by tradespersons with an understanding of internal wet area construction, in accordance with instructions given within the Ardex New Zealand Ltd Technical Literature and this Certificate.

Preparation of Substrates

13.1 Substrates must be dry and clean before installation commences. Surfaces must be even and free from nibs, sharp edges, dust, dirt or other materials such as oil, grease or concrete formwork release agents.

13.2 Concrete substrates can be checked for dryness by using a hygrometer as set out in BRANZ Bulletin No. 424. The relative humidity of the concrete must be 75% or less before membrane application.

13.3 All voids, cracks, holes, joints and excessively rough areas must be filled to achieve a smooth and uniform surface. Junctions of substrate abutments, such as at wall/floor junctions must have a bond breaker joint system installed as set out in the Technical Literature.

13.4 Substrates must be primed with Superflex™ Primer and allowed to cure before the membrane is installed.

Membrane Installation

14.1 Installation must not be undertaken where the substrate surface temperature is below 10°C or above 35°C.

14.2 Superflex™ 3 Two Part Bathroom and Balcony liquid and dry components must be mixed and left to stand for 5 minutes before re-mixing, then applying. Superflex™ 1 Premixed Bathroom and Balcony must be thoroughly stirred before application.

14.3 The membrane must be applied in a minimum of two coats at the rates set out in the Technical Literature to give a total finished thickness of 1.2 – 1.5 mm. Subsequent coats must be applied at an opposite direction to the previous coat.

14.4 Application can be made by roller (medium/long nap), brush (long bristle), or a flat steel trowel.

14.5 Reinforcement fabric is bedded into the wet layer between coats to provide movement protection at wall/wall and wall/floor junctions, and at any other areas such as joints in the flooring substrate, floor cracks or around penetrations in the membrane.

14.6 Clean up may be undertaken with water.

Tiling

15.1 The membrane must be fully cured before tiling. The cured membrane must be protected at all times to prevent mechanical damage, so may require temporary covers until the finishing is completed.

15.2 Tiling must be undertaken in accordance with AS 3958.1 and the BRANZ Good Tiling Practice Guide. The compatibility of the tile adhesive must be confirmed with the adhesive manufacturer or Ardex New Zealand Ltd.

Inspections

16.1 The Technical Literature must be referred to during the inspection of membrane installations by Building Consent Authorities and Territorial Authorities.

16.2 Critical areas of inspection for waterproofing systems are:

- Construction of substrates, including crack control and installation of bond breakers and movement control joints.
- Moisture content of the substrate prior to the application of the membrane.
- Acceptance of the substrate by the membrane installer prior to application of the membrane.
- Installation of the membrane to the manufacturer's instructions, particularly installation to the correct thickness.
- Membrane curing and integrity prior to the installation of tiles including protection from mechanical damage during curing and prior to tile installation.

Health and Safety

17.1 Safe use and handling procedures for the membrane systems are provided in the Technical Literature. The products must be used in conjunction with the relevant materials safety data sheet for each membrane.

Basis of Appraisal

The following is a summary of the technical investigations carried out:

Tests

18.1 The following testing of Superflex™ 1 Premixed Bathroom and Balcony and Superflex™ Two Part Bathroom and Balcony has been undertaken by Ardex Australia Pty Ltd research and development laboratory: water vapour transmission; water absorption; tensile strength and elongation before and after UV exposure, immersion in bleach, immersion in industrial detergent and immersion in water. Test methods and results were reviewed by BRANZ and found to be satisfactory.

18.2 The following testing of Superflex™ 1 Premixed Bathroom and Balcony was undertaken by the Commonwealth Scientific Industrial Research Organisation (CSIRO) Australia:

- In accordance with ANSI A118.10 for ICBO Evaluation Service - dimensional stability; waterproofness; shear strength to ceramic tile and cement mortar; and fungal and micro-organism resistance.
- In accordance with AS 1145 – behaviour under cyclic strain.

Test methods and results were reviewed by BRANZ and found to be satisfactory.

18.3 Testing of Superflex™ 1 Premixed Bathroom and Balcony and Superflex™ 3 Two Part Bathroom and Balcony has been undertaken by BRANZ for low temperature flexibility and peel adhesion after heat/humidity aging.

18.4 Testing for suitability over particleboard in accordance with AS/NZS 4858-2004, Appendix C has not been undertaken because compliance with the standard has been met by satisfactory water vapour transmission test results.

Other Investigations

19.1 An assessment was made of the durability of the Superflex™ Wet Area Membranes by BRANZ technical experts.

19.2 Site visits have been carried out by BRANZ to assess the practicability of installation, and to examine completed installations.

19.3 The Technical Literature has been examined by BRANZ and found to be satisfactory.

Quality

20.1 The manufacture of the Superflex™ products by Ardex Australia Pty Ltd has been examined by BRANZ, and details regarding the quality and composition of the materials used were obtained by BRANZ and found to be satisfactory.

20.2 The quality management system of Ardex Australia Pty Ltd has been assessed and registered as complying with the requirements of AS/NZS ISO 9001:2000 by SAI Global, Certificate Number QEC1219.

20.3 The quality of manufacture of the Superflex™ products is the responsibility of Ardex Australia Pty Ltd.

20.4 The quality of supply of the Superflex™ products to the market is the responsibility of Ardex New Zealand Ltd.

20.5 Quality on site is the responsibility of the trained and approved applicators.

20.6 Designers are responsible for the substrate design, and building contractors are responsible for the quality of construction of substrate systems in accordance with the instructions of the substrate manufacturer, Ardex New Zealand Ltd and this Certificate.

20.7 Building owners are responsible for the maintenance of the tiling systems in accordance with Ardex New Zealand Ltd's instructions.

Sources of Information

- AS 2908.2: 2000 Cellulose-cement products - flat sheet.
- AS 3740 – 2004 Waterproofing of wet areas within residential buildings.
- AS 3958.1 1991 Guide to the installation of ceramic tiles.
- ASTM D2919-01 Standard test method for determining durability of adhesive joints stressed in shear by tension loading.
- AS/NZS 4858 - 2004 Wet area membranes.
- AS/NZS 2269:1994 Plywood - Structural.
- NZS 3101: 1995 The design of concrete structures.
- NZS 3602: 2003 Timber and wood-based products for use in buildings.
- NZS 3604: 1999 Timber framed buildings.
- NZS 4229:1999 Concrete masonry buildings not requiring specific engineering design.
- NZS 4230:1990 Code of practice for the design of masonry structures.
- New Zealand Building Code Handbook and Approved Documents, Building Industry Authority, 1992.
- The Building Regulations 1992, up to, and including October 2004 Amendment.
- Tiling Good Practice Guide, BRANZ, March 2004.
- Membrane Roofing Good Practice Guide, BRANZ , November 1999

BRANZ

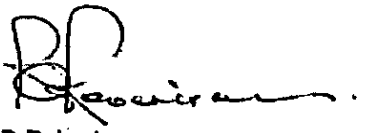
In the opinion of BRANZ, Superflex™ Wet Area Membranes are fit for purpose and will comply with the Building Code to the extent specified in this Certificate provided they are used, designed, installed and maintained as set out in this Certificate.

The Appraisal Certificate is issued only to the Certificate Holder, Ardex New Zealand Ltd, and is valid until further notice, subject to the Conditions of Certification.

Conditions of Certification

1. This Certificate:
   a) relates only to the product as described herein;
   b) must be read, considered and used in full together with the technical literature;
   c) does not address any Legislation, Regulations, Codes or Standards, not specifically named herein;
   d) is copyright of BRANZ.
2. The Certificate Holder:
   a) continues to have the product reviewed by BRANZ;
   b) shall notify BRANZ of any changes in product specification or quality assurance measures prior to the product being marketed;
   c) abides by the BRANZ Appraisals Services Terms and Conditions.
3. The product and the manufacture are maintained at or above the standards, levels and quality assessed and found satisfactory by BRANZ.
4. BRANZ makes no representation as to:
   a) the nature of individual examples of, batches of, or individual installations of the product, including methods and workmanship;
   b) the presence or absence of any patent or similar rights subsisting in the product or any other product;
   c) any guarantee or warranty offered by the Certificate Holder.
5. Any reference in this Certificate to any other publication shall be read as a reference to the version of the publication specified in this Certificate.

For BRANZ



P Robertson
Chief Executive

Date of issue: 20 June 2005

ARDEX WPM 001

Superflex Bathroom & Balcony Premixed - 1 Part

Single Component Undertile Waterproofing Membrane

BRANZ Appraised

Low VOC content – meets Green Building Council of Australia Green Star IEQ-13 requirements

Fast drying one part acrylic membrane

ARDEX WPM 001

Superflex Bathroom & Balcony Premixed - 1 Part Undertile Waterproofing Membrane

Copies available on request.

PRODUCT DESCRIPTION

Ardex WPM 001 (Superflex Bathroom & Balcony Premixed 1 Part) is a tough, ready to use waterproofing membrane specifically designed for use under tiles. Ardex WPM 001 has been uniquely formulated with synthetic microfibres to increase its strength and eliminate the need for a separate reinforcement mat. Ardex WPM 001 is based on the most advanced acrylic polymer technology, and is totally resistant to re-emulsification once cured.

Ardex WPM 001 is flexible, safe to use, low in odour, and is fully compatible with polymer modified tile adhesives. Ardex WPM 001 is one of the fastest drying one part acrylic membranes on the market – normally ready to tile in 48 hours @ 23°C.

WPM 001 meets the Green Building Council of Australia Green Star IEQ-13 requirements for Architectural Sealant when tested in accordance with SCAQMD Method 304-91 Determination of Volatile Organic Compounds (VOC) in Various Materials as referenced by South Coast Air Quality Management Division (SCAQMD) Rule 1168.

FEATURES/BENEFITS

- Fast drying Ardex WPM 001 can be tiled over in 48 hours in non critical areas*
- Liquid reinforced: Excellent strength, eliminates need for reinforcing mat
- Flexible: Accommodates normal building movement class 3 membrane as per AS/NZ 4858: 2004 Wet Area Membranes
- Advanced acrylic: Will not re-emulsify once cured
- Designed for tiling - Fully compatible with Ardex tile adhesive systems
- Water based, safe to use, low odour & easy cleaning
- CSIRO Appraisal #91 for undertile waterproofing in shower recesses
- Conforms to the requirements of AS/NZ 4858: 2004 Wet Area Membranes. (Ref: CSIRO Report 3779)

*Critical areas include areas where the membrane is applied at greater than 0.5mm or over impermeable substances such as over bond breakers or incorporating other reinforcement. Longer drying times are necessary in these areas.

APPLICATION RANGE

Performance Levels
Commercial and residential

Location
Internal wet areas, balconies, decks, and other areas that will be tiled or otherwise protected from regular foot traffic.

Surfaces
Walls & floors

Substrates

Concrete	Cured for min. 28 days or sealed when set with one coat of Ardex WPM 300 (HydrEpoxy 300) at a coverage rate of 3.0 square metres per litre and allowed to cure overnight. External wet concrete should be allowed to dry thoroughly or sealed with one coat of Ardex WPM 300 as above.
Renders and screeds	Cured for min. 7 days or sealed when set with one coat of Ardex WPM 300 at a coverage rate of 3.0 square metres per litre and allowed to cure overnight. Wet render should be allowed to dry thoroughly or sealed with one coat of Ardex WPM 300 as above.
Fibre cement	Suitable for wet area grade fibre cement.
Plasterboard	Wet area grade only.
Plywood	Structural plywood (PAA branded), marine grade or other wet area grade only.
Particleboard	Wet area grade, internal use only (special preparation is required – contact Ardex).
Permanent Immersion	In conditions of permanent immersion, it is recommended that Ardex WPM 002 (Superflex Two Part) is used. Must be covered with tiles for full immersion.

Contact Ardex for use over existing membranes, covering materials, and any other substrates not listed.

SPECIFICATION CLAUSE

ARDEX WPM 001 (Superflex Premixed)
The waterproofing membrane shall be Ardex WPM 001: a one part acrylic modified fibre reinforced membrane formulated to provide a tough, long lasting water barrier under tiling systems.

PACKAGING

Single component: 20kg (approx 15 litres) or 6.5kg (approx 5 litres).

TABLE 1

	Thickness per Coat		Total Dry Film Thickness (2 coats)	Theoretical Coverage		Per Unit
	Dry Film	Wet Film		Per coat	For 2 coats	
FLOORS	0.5mm	1.0mm	1.0mm	15m²	7.5m²	20kg(15L) unit
WALLS	0.25mm	0.5mm	0.5mm	30m²	15m²	20kg(15L) unit

SHELF LIFE

12 months when stored in the original unopened packaging, in a dry place at 23°C. Do not store in direct sunlight. Replace lid tightly after use. Use remaining contents from part used containers within 3 months.

COVERAGE

Two coats are recommended for an effective waterproof membrane.

Coverage will vary depending on the porosity of the surface.

One 20kg (15 litre) unit will cover approximately 7.5-15m² (based on two coats) depending on area requirements between wall and floor surfaces to be treated. Refer Table I.

DRYING TIMES

Recoat time

1-2 hours at (23°C/50% RH) between first and second coats. Alternatively, if a polyester mat is used between coats then the second coat can be applied whilst the first coat is still wet.

Dry through

The slowest drying areas are those where the membrane has been applied over a silicone bond breaker, eg. wall and floor junctions. The membrane cannot be tiled over until these critical areas are completely dry. Ardex WPM 001 is totally dry in 48 hours at 23°C/50% RH, but can take up to 72 hours at 10°C/50% RH in corners or for thick films.

Fully cured

The shower should not be used until the membrane has reached its full strength. Ardex WPM 001 membrane is fully cured after 3 days at 23°C, or after 5 days at 10°C.

Drying times will vary depending on humidity, surface temperature and surface porosity.

Do not apply on substrates where the surface temperature is below 10°C or above 35°C.

CLEANING

Wash hands, brushes, rollers, etc, with water while the membrane is still fresh. Remove cured material with mineral turpentine.

SAFETY PRECAUTIONS

Do not use the product in the following situations:

- Areas subject to negative hydrostatic pressure or rising damp, unless treated with Ardex WPM 300.
- Where the substrate is wet – wet surfaces can be sealed with one coat of Ardex WPM 300 at a coverage rate of 3.0 square metres per litre and allowed to cure overnight.
- Where rain is imminent.
- Where the membrane will be left exposed and subjected to regular foot traffic.
- On glazed, glass or other totally impervious surfaces (eg. areas pre-treated with water repellants).
- Where the surface temperature is below 10°C or greater than 35°C.
- All floor areas must have adequate falls either built into the substrate or achieved with a sand/cement screed prior to application of the Ardex WPM 001.

For substrates or situations other than those listed contact Ardex.

SAFETY DATA

Ardex WPM 001 is non-hazardous and non dangerous. It may produce discomfort of the eyes, respiratory tract and skin. Do not breathe gas/fumes/vapour/spray. Avoid contact with skin. Wear eye/face protection. In case of contact with eyes, rinse with plenty of water and seek medical advice.

ADDITIONAL INFORMATION IS LISTED IN THE MATERIAL SAFETY DATA SHEET.

QUALITY PRODUCT

Ardex WPM 001 is manufactured and tested to Ardex procedures which are maintained in accordance with Quality System Standard ISO 9001.

ARDEX WPM 001

Superflex Bathroom & Balcony Premixed - 1 Part Undertile Waterproofing Membrane

USER NOTES

The technical details and recommendations contained in this data sheet are given in good faith and represent the best of our knowledge and experience at the time of printing. It is the responsibility of the user to ensure that the product is used in accordance with Ardex instructions and in applications for which they are intended.

APPLICATION

Apply Ardex WPM 001 by brush or roller. A medium nap (12-15mm pile) paint roller is recommended. New rollers should be dampened with water before being used for the first time.

For best results with a paint brush use a good quality, 50mm long bristle variety.

To achieve the required dry film thickness per coat, application must consist of laying the product onto the surface and light finish the surface. Do not try to apply in the same manner as a building paint. A conventional building paint is normally applied at 25-40 micrometers wet film thickness while Ardex WPM 001 needs to be applied at between 0.5 and 1.0 mm per coat depending on product and application (Refer Table 1).

Critical Areas:
INTERNAL WET AREAS

1. Construction should be in accordance with Australian 3740 - 2004 Waterproofing of wet areas within residential buildings.
2. All render and tile bed requirements should be completed before application of the membrane and tiles or other floor coverings should be direct bonded to the membrane.
3. Ensure wall & floor sheets are installed as per sheet manufacturer's recommendations.
4. Ensure suitable brick/concrete hobs are used (do not use timber).
5. Ensure that falls to the waste are min 1:60 (ie. approx. 30mm in 2mtr)) before waterproofing. Ensure
outlet pipes are fixed securely and that the waste or drainage flanges are recessed into the floor.
6. Avoid sheet joints in shower recess floor. Ensure that sheets are securely fixed to the wall at the bottom edge, and sheet joints are sealed with a neutral cure silicone sealant spread approximately 6mm on either side of the joint.
7. Treat nail and screw holes with neutral cure silicone sealant.
8. Seal the perimeters of taps, shower outlets and waste outlets with neutral cure silicone sealant.
9. Apply a bead of neutral cure silicone sealant to all horizontal and vertical corners.
10. Apply a bead of neutral cure silicone sealant to the junction of the hob or angle and walls. Spreading the sealant to 6mm on either side of the joint.
11. Waste outlets shall incorporate a puddle flange or similar in accordance with AS3740 & the top surface shall be set flush with the surface to which the membrane is to be applied. A bead of neutral cure silicone shall be applied across the intersection of the puddle flange and the screed/ floor.
12. Apply the membrane to the entire shower recess floor and down into waste or drainage flange. Apply the membrane over the hob and at least 150mm beyond the outside edge of the hob (ideally to entire wet area floor).
13. Apply the membrane 1800mm up the walls or to the height of the shower rose within the shower recess.
14. Install the shower screen to inside edge of the hob.

Fig.1 – Shower Recess – Critical Areas

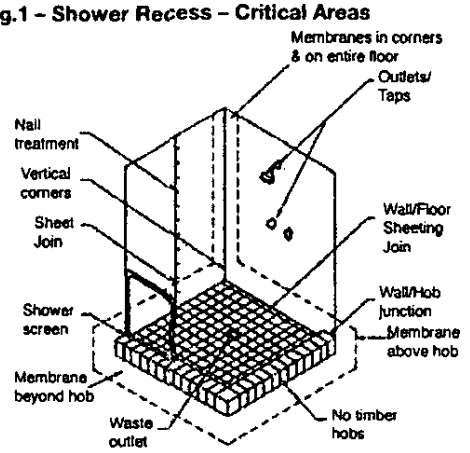
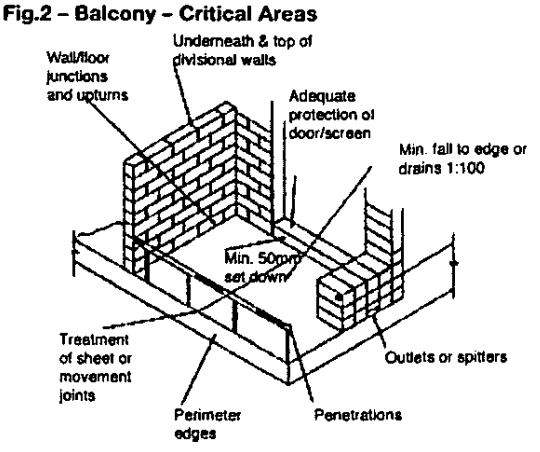


Fig.2 – Balcony – Critical Areas



BALCONIES AND DECKS

1. Ensure that the deck is constructed with falls to edge/drains of min 1:100 (ie. 20mm in 2m) or else achieve the fall with a sand/cement screed.
2. Ensure a min set down (step down) of 50mm to the finished floor level (ie. top of tiles).
3. Ensure suitable flashing is installed, ideally prior to the installation of the balcony screen/ sliding door.
4. Treat any sheet joints with a neutral cure silicone prior to waterproofing.
5. Prepare and seal all wall/floor junctions with a bead of neutral cure silicone.
6. Apply the membrane up the step down and as far up underneath the screen door flashing as possible (ideally waterproof prior to installing door).
7. Where possible, apply the membrane prior to building divisional walls, or other items such as planter boxes.
8. Apply the membrane to the entire balcony floor and at least 50mm up the wall above the top surface of the finished tiles and finished below the wall drainage vents.
9. Apply the membrane to the top of the parapets and divisional walls, or else install suitable metal capping.
10. Apply the membrane down over the front edge of the balcony onto the drip rail.
11. Carefully seal any gaps around balcony penetrations prior to applying the membrane.
12. Apply the membrane down into outlets and drains, ensuring excess material is removed.
13. Ensure all weep holes are above the membrane application area.

APPLICATION NOTES

Surface preparation

- Ensure all surfaces are structurally sound and totally dry. The pores of concrete surfaces should be open (absorbent surface). All sheet substrates must be securely fixed in accordance with the manufacturers instructions.
- Falls to outlets of at least 1:60 or approx. 30mm in 2mtr (wet areas) or 1:100 externally, must be achieved prior to tiling.
- The surface to be coated should be free from dust, oil, paint, curing compounds and any other contaminating materials.
- Damaged concrete should be repaired (leveled) and surface defects including all cracks and sharp protrusions should be treated prior to the application of the membrane.
- Remove laitance on concrete or screeds by mechanical means.
- Highly dense (>40MPa) or steel trowelled concrete should be roughened by suitable mechanical means (shot blasting, grinding, etc).

Priming

The primer is a critical part of the waterproofing system. Apply one coat of Ardex WPM 265 (Sheltercoat/ Superflex Water Based Primer) by brush or roller to all areas to be waterproofed including the floor waste. Allow the primer to completely dry prior to the application of the Ardex WPM 001 membrane. This will take around 20-30 minutes depending upon weather conditions and porosity of the substrate. Coverage is approximately 6m² per litre. Plastic (eg. PVC) pipes should be primed with a solvent based plumbers pink primer. Prime metal surfaces with a suitable metal primer such as epoxy polyamide primer.

GENERAL APPLICATION

Crack preparation

Cracks <2mm:

Clean and remove any loose particles in the crack. Prime the crack and adjacent area carefully with Ardex WPM 265 and allow to dry before applying two coats of Ardex WPM 001 membrane in a band at least 200mm wide equidistantly across the crack, along the length of the crack.

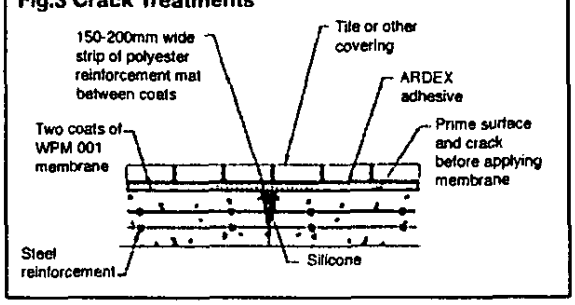
Cracks 2-6mm:

(Refer Fig. 3) Prepare and prime the crack as above. Apply a bead of neutral cure silicone into the crack and extend it 6mm either side. Apply a 300mm wide band of Ardex WPM 001 equidistantly across the crack along the entire length of the crack. Place a 190mm wide band of Ardex "Deckweb" polyester woven cloth reinforcement over the applied membrane. Thoroughly wet out the cloth preferably using a fluted roller, and remove all creases in, or air pockets under the mat. Immediately apply a second coat to completely fill the mat.

Cracks >6mm:

Contact your local Ardex representative.

Fig.3 Crack Treatments



ARDEX WPM 001

Superflex Bathroom & Balcony Premixed - 1 Part Undertile Waterproofing Membrane

Movement/construction joints

Movement joints (<6mm)

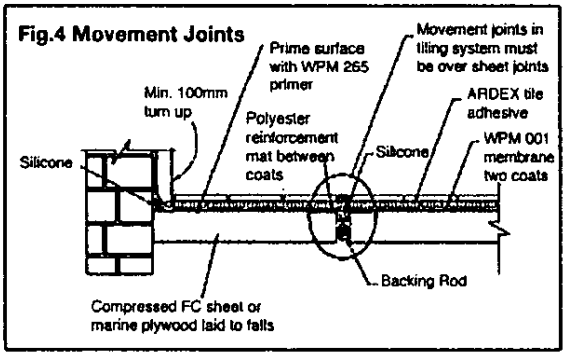
Use same procedure as in crack preparation.

Clean and prime the joint before filling it with a bead of neutral cure silicone and extending it 6mm each side of joint. Apply a 300mm wide band of Ardex WPM 001 equidistantly across the crack along the entire length of the crack. Place a 190mm wide band of Ardex "Deckweb" polyester woven cloth reinforcement over the applied membrane. Thoroughly wet out the mat and remove all creases in, or air pockets under the mat. Immediately apply a second coat to completely fill the mat.

Construction joints (>6mm)

Use the same procedure as above, but replace the reinforcing mat with 120mm of Ardex Coving Bandage. Note: if tiling, movement joints should be taken to the surface of the tiles. Fill the joints between the tiles immediately above the movement joints with an appropriate joint sealant. (Refer Fig.4)

Fig.4 Movement Joints



Corners & coving areas

After priming with Ardex WPM 265 and allowing to dry, apply a generous bead (12mm) of neutral cure silicone sealant to seal all junctions between two substrates in coving areas and corners.Smooth over the silicone so that it extends 6mm up the wall and 6mm over the floor and allow to touch dry.

Apply a first coat of Ardex WPM 001 to the area and allow the membrane to dry.

Apply a second coat ensuring that excess product is removed from the junction (the final dry film thickness should be minimum of 1.0mm). Alternatively, if a polyester reinforcement mat is used between coats then the second coat can be applied as soon as the mat is fully bedded into the first coat.

WALL/FLOOR JUNCTION

After priming with Ardex WPM 265 and allowing to dry, apply a generous bead (12mm) of neutral cure silicone sealant to seal all junctions between two substrates. Smooth over the silicone so that it extends 6mm up the wall and 6mm over the floor and allow to touch dry. Place a 190mm wide band of Ardex "Deckweb" polyester woven mat reinforcement over the applied membrane. Thoroughly wet out the cloth and remove all creases in, or air pockets under the mat. Immediately apply a second coat to completely fill the mat. The Ardex WPM 001 should be applied to at least 100 mm up the wall surfaces as per the recommendations for the application of Ardex WPM 001 to floors.

Walls

Two coats of Ardex WPM 001 are required to achieve a minimum total dry film thickness of 0.5mm.

After priming with Ardex WPM 265 and allowing to dry, apply two coats of Ardex WPM 001 (to achieve a minimum dry film thickness of 0.5mm) in two opposite directions. Wall sheet joints should be treated with a neutral cure silicone, PVC duct tape or base jointing compound. In balcony situations take the membrane up underneath any existing cover flashing or install appropriate flashing. Allow the first coat to dry before applying the second coat.

Floors

Two coats of Ardex WPM 001 are required to achieve a minimum total dry film thickness of 1.0mm. The flooring recommendations should be extended at least 150 mm up all perimeter walls.

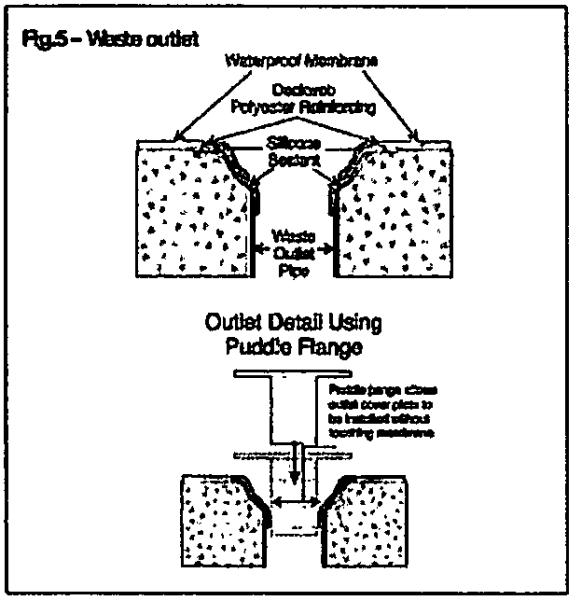
Prime the surface with Ardex WPM 265 and allow to dry.

Apply the first coat over the primed surface and allow it to dry (1-2 hours at 23°C, 50%RH) before applying a second coat in an opposite direction. In shower recesses a drainage flange must be installed on all timber/sheeted floors, and are strongly recommended on all other substrates. Where possible rebate the flange into the floor. Seal the perimeter of the flange with neutral cure silicone treatment. If a flange is not installed the membrane must be applied down into the pipe. (Refer Fig.5) Allow the membrane to dry completely before tiling. Refer drying times above.

Waste Outlet

Prime the surface with Ardex WPM 265 and allow to dry. Surfaces of the outlet flange must be primed with an appropriate primer.

Apply Ardex WPM 001 over the adjacent floor surface extending down into the waste outlet flange overlapping the edge of flange by at least 30mm. Place Ardex "Deckweb" polyester woven mat reinforcement over the applied membrane. Thoroughly wet out the cloth and remove all creases in, or air pockets under the mat. Immediately apply a second coat to completely fill the mat. (Refer Fig. 5)

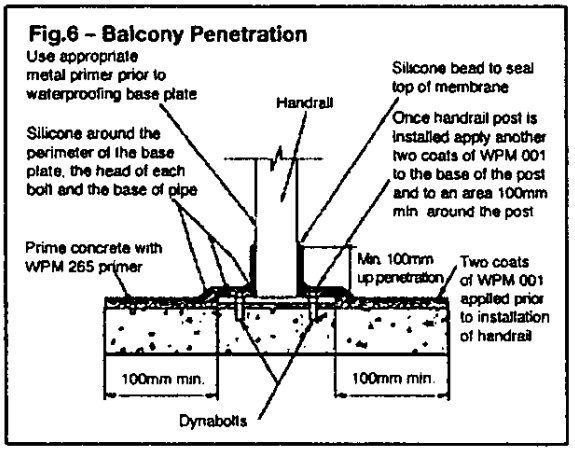


Balcony penetrations (Refer Fig.6)

All upstands are to be mechanically fixed through the membrane, which must be fabricated with a base plate flange.

Prime the metal with an appropriate metal primer such as an epoxy polyamide primer and allow to dry. Apply a 10mm bead of neutral cure silicone around the perimeter of the penetration. Apply the first coat of Ardex WPM 001 on the substrate and the flanged metal.

Allow first coat to dry before applying a second coat ensuring a finished dry film thickness of no less than 1.0mm is achieved. Place a suitable flashing collar around the penetration sealing it with a suitable sealant.



Tiling systems

It is advisable to conduct a flood test of the shower once the membrane has cured (normally after 72 hours), and before the tiling commences. A broad range of Ardex tile adhesives can be used over Ardex membranes. Contact Ardex or your nearest Ardex stockist for advice on the most suitable system.

TECHNICAL DATA

Ardex WPM 001 (Superflex Premixed)
Characteristics of liquid

Form & Colour	Blue viscous paste
Type	Single part
Specific Gravity	Approx. 1.34kg/litre
pH of Liquid	8.5
Viscosity of Liquid (RVT Brookfield, spindle 7 speed 10)	52,000cps
Non Volatile Matter (volume) AS1321.10	50.3%±1
Tensile Strength 7 days dry AS1145	1.04 MPa
Full Cure	1.92 MPa
Elongation at Break 7 days dry AS1145	780%

Conforms to requirements of class 3 membrane of AS/NZ 4858: 2004 Wet Area Membranes.

NOTE: Most of the tests have been carried out in the Ardex laboratory under standard conditions (23±2°C, 50±5% R.H)

ARDEX WPM 002

Superflex Bathroom & Balcony - 2 Part

2 Part Undertile Waterproofing Membrane

BRANZ Appraised

Rapid Drying Time

Two Component Undertile Waterproofing Membrane

Advanced acrylic – will not re-emulsify

Liquid reinforced – eliminates the need for reinforcing mat

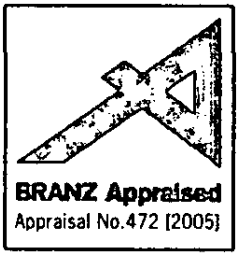
Water based – safe to use, low odour and easy cleaning

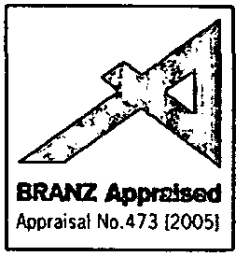
Meets class III category for AS/NZ 4858 Wet Area Membranes

Low VOC content – meets Green Building Council of Australia Green Star IEQ-13 requirements

ARDEX WPM 002

Superflex Bathroom & Balcony - 2 Part
2 Part Undertile Waterproofing Membrane





Copies available on request.

PRODUCT DESCRIPTION

Ardex WPM 002 (Superflex Bathroom & Balcony 2 Part) is a tough, fast drying two component waterproofing membrane specifically designed for use under tiles. The product has been uniquely formulated with synthetic microfibres to increase its strength and eliminate the need for a separate reinforcement mat. Ardex WPM 002 is based on the most advanced acrylic polymer technology, and is totally resistant to re-emulsification.

Ardex WPM 002 is flexible, safe to use, low in odour, and is fully compatible with polymer modified tile adhesives. Ardex WPM 002 is one of the fastest drying acrylic membranes on the market – normally ready to tile in 16-24 hours @ 23°C.

WPM 002 meets the Green Building Council of Australia Green Star IEQ-13 requirements for Architectural Sealant when tested in accordance with SCAQMD Method 304-91 Determination of Volatile Organic Compounds (VOC) in Various Materials as referenced by South Coast Air Quality Management Division (SCAQMD) Rule 1168.

FEATURES/BENEFITS

Fast drying Ardex WPM 002 can be tiled over in 16-24 hours, or 4 hours @ 23°C/50% RH in non critical areas*.

Features benefits

- Liquid reinforced: Excellent strength, eliminates need for reinforcing mat.
- Flexible: Accommodates normal building movement.
- Advanced acrylic: Will not re-emulsify.
- Designed for tiling: Fully compatible with ABA/Ardex tile systems adhesives.
- Water based, safe to use, low odour and easy cleaning for undertile waterproofing in shower recesses by independent testing authority.
- Excellent exterior.
- Conforms to the requirements of AS/NZ 4858: 2004 Wet Area Membranes (Ref: CSIRO Report 3879)

*Critical areas include areas where the membrane is applied at greater than 0.5mm or over impermeable substances such as over bond breakers or incorporating other reinforcement. Longer drying times are necessary in these areas.

APPLICATION RANGE

Performance levels
Commercial and residential.

Location
Internal and external wet areas, balconies, decks, and other areas that will be tiled or otherwise protected from regular foot traffic.

Surfaces
Walls and floors.

Substrates

Concrete	Cured for min. 28 days or sealed when set with one coat Ardex WPM 300 (HydrEpoxy 300) at a coverage rate of 3.0 square metres per litre and allowed to cure overnight. Wet concrete should be allowed to dry thoroughly or sealed with one coat of Ardex WPM 300 as above.
Renders and screeds	Cured for min. 7 days or sealed when set with one coat Ardex WPM 300 at a coverage rate of 3.0 square metres per litre and allowed to cure overnight. Wet render should be allowed to dry thoroughly or sealed with one coat of Ardex WPM 300 as above.
Fibre cement	Wet area grade only.
Plasterboard	Wet area grade only.
Plywood	Structural plywood (PAA branded) or marine grade or other wet area grade only. Not recommended for external use (refer Ardex).
Particleboard	Wet area grade, internal use only (special preparation is required – contact Ardex). Not recommended for external use (refer Ardex).
Permanent Immersion	In conditions of permanent immersion, it is recommended that WPM 002 must be covered with tiles for full immersion applications.

Contact Ardex for use over existing membranes, covering materials, and any other substrates not listed.

SPECIFICATION CLAUSE

Ardex WPM 002 (Superflex Two Part)
The waterproofing membrane shall be Ardex WPM 002, a two component cementitious acrylic modified fibre reinforced membrane formulated to provide a tough, long lasting water barrier under tiling systems.

PACKAGING

Two component: 20kg (approx 20 litres) liquid pail/ 2 x 10kg bags powder.

TABLE 1

	Thickness per coat		Total dry film thickness (2 coats)	Theoretical coverage		Per unit
	Dry film	Wet film		Per coat	For 2 coats	
FLOORS	0.6mm	0.9mm	1.2mm	32m²	16m²	40kg kit
WALLS	0.4mm	0.6mm	0.8mm	48m²	24m²	40kg kit

SHELF LIFE

12 months when stored in the original unopened packaging, in a dry place at 23°C. Do not store in direct sunlight. Replace lid tightly after use. Use remaining contents from part used containers within 3 months.

COVERAGE

Two coats are recommended for an effective waterproof membrane. Coverage will vary depending on the porosity of the surface.

One 40kg kit will cover approximately 16-24m (based on two coats) depending on area requirements between wall and floor surfaces to be treated.

DRYING TIMES

Curing time will vary depending on temperature and humidity.

Recoat time

1-2 hours (23°C/50% RH) between first and second coats. Alternatively, if a polyester mat is used between coats then the second coat can be applied whilst the first coat is still wet.

Dry through

The slowest drying areas are those where the membrane has been applied over a silicone bond breaker, eg. wall and floor junctions. The membrane cannot be tiled over until these critical areas are completely dry.

Ardex WPM 002 membrane is totally dry in 16 hours at 23°C/50% RH but can take up to 24 hours at 10°C / 50% RH in corners or for thick films.

In areas where bond breakers or additional reinforcement are not used, Ardex WPM 002 can be tiled over after 4 hours at 23°C / 50% RH.

Fully cured

The shower should not be used until the membrane has reached its full strength. Normally Ardex WPM 002 membranes are fully cured after 3 days at 23°C, or after 5 days at 10°C.

Drying times will vary depending on humidity, surface temperature and surface porosity.

Do not apply on substrates where the surface temperature is below 10°C or above 35°C.

CLEANING

Wash hands, brushes, rollers, etc, with water while the membrane is still fresh. Remove cured material with mineral turpentine.

SAFETY PRECAUTIONS

Do not use the product in the following situations:

- Areas subject to negative hydrostatic pressure or rising damp, unless treated with Ardex WPM 300.
- Where the substrate is wet – wet surfaces can be sealed with one coat of Ardex WPM 300 at a coverage rate of 3.0 square metres per litre and allowed to cure overnight.
- Where rain is imminent.
- Where the membrane will be left exposed and subjected to regular foot traffic.
- On glazed, glass or other totally impervious surfaces (eg. areas pre-treated with water repellants).
- Where the surface temperature is below 10°C or greater than 35°C.
- All floor areas must have adequate falls either built into the substrate or achieved with a sand/cement screed prior to application of the Ardex WPM 002.

For substrates or situations other than those listed contact Ardex.

SAFETY DATA

Ardex WPM 002 Part A is non-hazardous. It may produce discomfort of the eyes, respiratory tract and skin. It should not be swallowed or inhaled. Avoid contact with skin and wear eye/face protection. In case of contact with eyes, rinse with plenty of water and contact a doctor or Poisons Information Centre.

Ardex WPM 002 Part B contains cement and is therefore hazardous. It may cause burns and serious damage to eyes. Do not breathe dust and avoid contact with eyes. Wear dust masks, goggles and gloves when handling. Keep container locked up and in a well ventilated place.

ADDITIONAL INFORMATION IS LISTED IN THE MATERIAL SAFETY DATA SHEET.

ARDEX WPM 002

Superflex Bathroom & Balcony - 2 Part
2 Part Undertile Waterproofing Membrane

APPLICATION

Apply Ardex WPM 002 by brush or roller. A medium nap (12–15mm pile) paint roller is recommended. New rollers should be dampened with water before being used for the first time.

For best results with a paint brush use a good quality, 50mm long bristle variety.

To achieve the required dry film thickness per coat application must consist of laying the product onto the surface and light finish the surface. Do not try to apply in the same manner as a building paint. A conventional building paint is normally applied at 25–40 micrometers wet film thickness while Ardex WPM 002 needs to be applied at between 0.6 and 0.9 mm per coat depending on product and application (Refer Table 1).

Critical areas:

INTERNAL WET AREAS

1. Construction should be in accordance with Australian 3740 - 2004 Waterproofing of wet areas within residential buildings.
2. All render and tile bed requirements should be completed before application of the membrane and tiles or other floor coverings should be direct bonded to the membrane.
3. Ensure wall and floor sheets are installed as per sheet manufacturer's recommendations.
4. Ensure suitable brick/concrete hobs are used (do not use timber), and that the top of the hob does not slope outwards.
5. Ensure that falls to the waste are min 1:60 (ie. approx. 30mm in 2m) before waterproofing. Ensure outlet pipes are fixed securely and that the waste or drainage flanges are recessed into the floor.
6. Avoid sheet joints in shower recess floor. Ensure that sheets are securely fixed to the wall at the bottom edge, and sheet joints are sealed with a neutral cured silicone sealant spread approximately 6mm on either side of the joint.
7. Treat nail and screw holes with neutral cure silicone sealant.
8. Seal the perimeters of taps, shower outlets and waste outlets with neutral cure silicone sealant.
9. Apply a bead of neutral cure silicone sealant to all horizontal and vertical corners, and spread to 6mm on either side of joint.
10. Apply a bead of neutral cure silicone sealant to the junction of the hob or angle and walls, and spread to 6mm on either side of joint.
11. Waste outlets shall incorporate a puddle flange or similar in accordance with AS3740 and the top surface shall be set flush with the surface to which the membrane is to be applied. A bead of neutral cure silicone shall be applied across the intersection of the puddle flange and the screed/ floor.
12. Apply the membrane to the entire shower recess floor and down into waste or drainage flange. Apply the membrane over the hob and at least 150mm beyond the outside edge of the hob (ideally to entire wet area floor).
13. Apply the membrane 1800mm up the walls or to the height of the shower rose within the shower recess.
14. Install the shower screen to inside edge of the hob.

BALCONIES AND DECKS

1. Ensure that the deck is constructed with falls to edge/drains of min 1:100 (ie. 20mm in 2m) or else achieve the fall with a sand/cement screed.
2. Ensure a min set down (step down) of 50mm to the finished floor level (ie. top of tiles).
3. Ensure suitable flashing is installed, ideally prior to the installation of the balcony screen/sliding door.
4. Treat any sheet joints with a neutral cure silicone

Fig.1 – Shower recess – critical areas

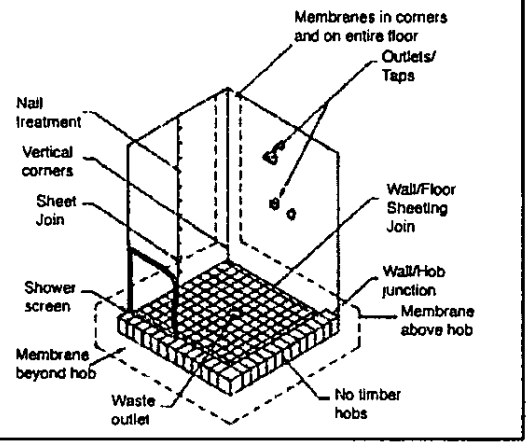
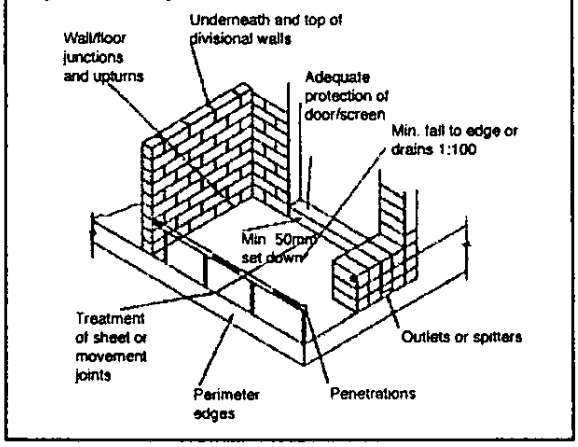


Fig.2 – Balcony – critical areas



prior to waterproofing.

5. Prepare and seal all wall/floor junctions with a bead of neutral cure silicone.
6. Apply the membrane up the step down and as far up underneath the screen door flashing as possible (ideally waterproof prior to installing door).
7. Where possible, apply the membrane prior to building divisional walls.
8. Apply the membrane to the entire balcony floor and at least 50mm up the wall above the top surface of the finished tiles and finished below the wall drainage vents.
9. Apply the membrane to the top of the parapets and divisional walls, or else install suitable metal capping.
10. Apply the membrane down over the front edge of the balcony onto the drip rail.
11. Carefully seal any gaps around balcony penetrations prior to applying the membrane.
12. Apply the membrane down into outlets and drains, ensuring excess material is removed.
13. Ensure all weep holes are above the membrane application area.

APPLICATION NOTES

Surface preparation

- Ensure all surfaces are structurally sound and totally dry. The pores of concrete surfaces should be open (absorbent surface). All sheet substrates must be securely fixed in accordance with the manufacturers instructions.
- Falls to outlets of at least 1:60 or approx. 30mm in 2m (wet areas) or 1:100 externally, must be achieved prior to tiling.
- The surface to be coated should be free from dust, oil, paint, curing compounds and any other contaminating materials.
- Damaged concrete should be repaired (leveled) and surface defects including all cracks and sharp protrusions should be treated prior to the application of the membrane.
- Remove laitance on concrete or screeds by mechanical means.
- Highly dense (>40MPa) or steel trowelled concrete should be roughened by suitable mechanical means (shot blasting, grinding, etc).

Priming

The primer is a critical part of the waterproofing system. Apply one coat of Ardex WPM 265 (Sheltercoat/Superflex Water Based Primer) by brush or roller to all areas to be waterproofed including the floor waste. Allow the primer to be completely dry prior to the application of the Ardex WPM 002 membrane. This will take around 20-30 minutes depending upon weather conditions and porosity of the substrate. Coverage is approximately 6m² per litre. Plastic (eg. PVC) pipes should be primed with a solvent based plumbers pink primer. Prime metal surfaces with a suitable metal primer such as epoxy polyamide primer.

GENERAL APPLICATION

Crack preparation

Cracks <2mm:

Clean and remove any loose particles in the crack. Prime the crack and adjacent area carefully with Ardex WPM 265 and allow to dry before applying two coats of Ardex WPM 002 membrane, in a band at least 200mm wide equidistantly across the crack, along the length of the crack.

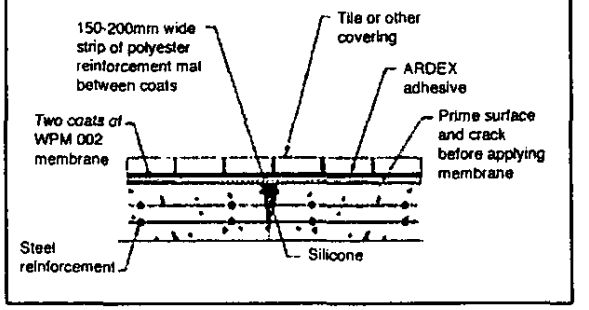
Cracks 2-6mm:

(Refer Fig. 3) prepare and prime the crack as above. Apply a bead of neutral cure silicone into the crack and extend it 6mm either side. Apply a 300mm wide band of Ardex WPM 002 equidistantly across the crack along the entire length of the crack. Place a 190mm wide band of Ardex "Deckweb" polyester woven cloth reinforcement over the applied membrane. Thoroughly wet out the cloth and remove all creases in, or air pockets under the mat. Immediately apply a second coat to completely fill the mat.

Cracks >6mm:

Contact your local Ardex representative.

Fig.3 Crack Treatments



ARDEX WPM 002

Superflex Bathroom & Balcony - 2 Part
2 Part Undertile Waterproofing Membrane

Movement/construction joints

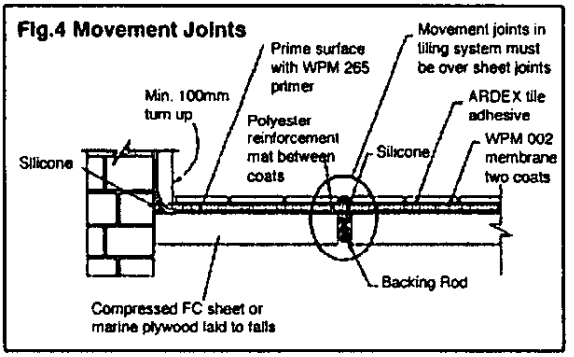
Movement joints (<6mm)

Clean and prime the joint before filling it with a bead of neutral cure silicone and extending it 6mm each side of joint. Apply a 300mm wide band of Ardex WPM 002 equidistantly across the crack along the entire length of the crack. Place a 190mm wide band of Ardex "Deckweb" polyester woven cloth reinforcement over the applied membrane. Thoroughly wet out the cloth and remove all creases in, or air pockets under the mat. Immediately apply a second coat to completely fill the mat.

Construction joints (>6mm)

Use the same procedure as above, but replace the reinforcing mat with 120mm of Ardex Coving Bandage. Note: if tiling, movement joints should be taken to the surface of the tiles. Fill the joints between the tiles immediately above the movement joints with an appropriate joint sealant. (Refer Fig.4)

Fig.4 Movement Joints



Corners and coving areas

After priming with Ardex WPM 265 and allowing to dry, apply a generous bead (16mm) of neutral cure silicone sealant in coving areas and corners. (Refer Fig.5) Smooth over the silicone so that it extends 8mm up the wall and 8mm over the floor and allow to touch dry.

Apply a first coat of Ardex WPM 002 to the area and allow the membrane to dry.

Apply a second coat ensuring that excess product is removed from the junction (the final dry film thickness should be around 1.2mm) Alternatively, if a polyester reinforcement mat is used between coats then the second coat can be applied as soon as the mat is fully bedded into the first coat.

WALL/FLOOR JUNCTION

After priming with Ardex Superflex WPM 265 and allowing to dry, apply a generous bead (16mm) of neutral cure silicone sealant to seal all junctions between two substrates. Smooth over the silicone so that it extends 8mm up the wall and 8mm over the floor and allow to touch dry. Place a 190mm wide band of Ardex "Deckweb" polyester woven cloth reinforcement over the applied membrane. Thoroughly wet out the cloth and remove all creases in, or air pockets under the mat. Immediately apply a second coat to completely fill the mat. The Ardex WPM 002 should be applied to at least 150mm up the wall surfaces as per the recommendations for the application of Ardex WPM 002 to floors.

Walls

Two coats of Ardex WPM 002 are required to achieve a minimum total dry film thickness of 0.8mm.

After priming with Ardex Superflex WPM 265 and allowing to dry, apply two coats of Ardex WPM 002 (to achieve a minimum dry film thickness of 0.8mm) in two opposite directions. Wall sheets joints should be treated with a neutral cure silicone, PVC duct tape or base jointing compound. In balcony situations take the membrane up underneath any existing cover flashing or install appropriate flashing. Allow the first coat to dry before applying the second coat.

Floors

Two coats of Ardex WPM 002 are required to achieve a minimum total dry film thickness of 1.2mm. The flooring recommendations should be extended at least 150mm up all perimeter walls.

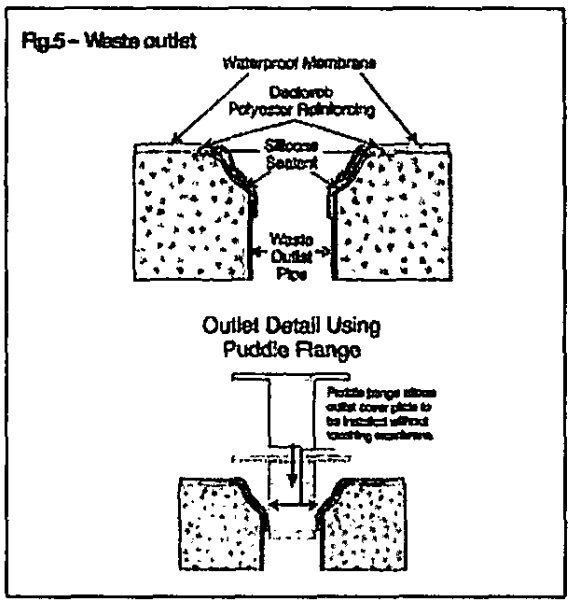
Prime the surface with Ardex WPM 265 water based primer and allow to dry.

Apply the first coat over the primed surface and allow it to dry (1-2 hours at 23°C, 50% RH) before applying a second coat in an opposite direction. In shower recesses a drainage flange must be installed on all timber/sheeted floors, and are strongly recommended on all other substrates. Where possible rebate the flange into the floor. Seal the perimeter of the flange with neutral cure silicone treatment. If a flange is not installed the membrane must be applied down into the pipe. (Refer Fig.5) Allow the membrane to dry completely before tiling. Refer drying times above.

Waste outlet

Prime the surface with Ardex WPM 265 and allow to dry. Surfaces of outlet flange must be primed with an appropriate primer.

Apply Ardex WPM 002 over the adjacent floor surface extending down into the waste outlet pipe overlapping the pipe surfaces by at least 30mm. Place Ardex "Deckweb" polyester woven cloth reinforcement over the applied membrane. Thoroughly wet out the cloth and remove all creases in, or air pockets under the mat. Immediately apply a second coat to completely fill the mat. (Refer Fig. 5).

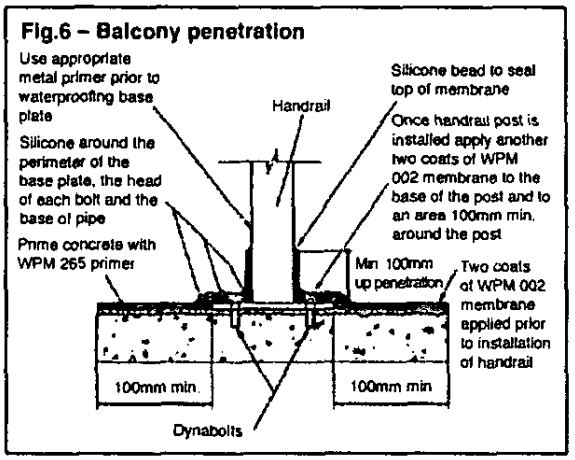


Balcony penetrations (Refer Fig.6)

All upstands are to be mechanically fixed through the membrane, which must be fabricated with a base plate flange.

Prime the metal with an appropriate metal primer such as an epoxy polyamide primer and allow to dry. Apply a 10mm bead of neutral cure silicone around the perimeter of the penetration. Apply the first coat of Ardex WPM 002 on the substrate and the flanged metal.

Allow first coat to dry before applying a second coat ensuring a finished dry film thickness of no less than 1.2mm is achieved. Place a suitable flashing collar around the penetration sealing it with a suitable sealant.



Tiling systems

It is advisable to conduct a flood test of the shower once the membrane has cured (normally after 48 hours), and before the tiling commences. A broad range of Ardex tile adhesives can be used over Ardex Superflex membranes. Contact Ardex or your nearest Ardex stockist for advice on the most suitable system.

QUALITY PRODUCT

Ardex WPM 002 is manufactured and tested to Ardex procedures which are maintained in accordance with Quality System Standard ISO 9001.

USER NOTES

The technical details and recommendations contained in this data sheet are given in good faith and represent the best of our knowledge and experience at the time of printing. It is the responsibility of the user to ensure that the product is used in accordance with Ardex instructions and in applications for which they are intended.

TECHNICAL DATA

Ardex WPM 002
Characteristics of components

Form & Colour	Liquid: white, medium viscosity Powder: off white
Characteristics of mixed product	
Mixing Ratio	1:1 by weight
SG of mixed product	1.44kg/litre
Non Volatile Matter	77±1%
Colour	light grey/green
Characteristics of cured membrane	
Shore A hardness ASTM D2240	
– dry film	85 – 90
– wet film	75 – 80
Tensile Strength	
7 days dry AS1145	1.7 MPa
Full Cure 28 days:	2.9 MPa
Elongation at Break	
7 days dry AS1145	332%

NOTE: Most of the tests have been carried out in the Ardex laboratory under standard conditions (23±2°C, 50±5% RH)

Rob Bennett

From: <Kevin.Jackson@ArdexNZ.com>
To: <rhbennett@xtra.co.nz>
Cc: <Brad.Wilkins@ArdexNZ.com>
Sent: Tuesday, 4 August 2009 10:19 a.m.
Attach: TB178.003_Application_ArdexFlooringSystems_WallFloorVinyl_WetAreas.pdf
Subject: Ardex Tech Bulletin on Superflex (WPM002) under sheet vinyl

Hi Rob,

Please find attached the Ardex Tech Bulletin we discussed this morning, please let me know if this will do for your consent application with Waitakare City Council.

(See attached file: TB178.003_Application_ArdexFlooringSystems_WallFloorVinyl_WetAreas.pdf)

Regards,

Kevin Jackson
Product Manager - Flooring
Ardex New Zealand Limited
Telephone: +64 92967690
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TECHNICAL BULLETIN – TB178

PREPARATION OF WALLS & FLOORS IN WET AREAS OF HEALTH CARE FACILITIES AND INSTITUTIONS TO RECEIVE SHEET VINYL COVERINGS USING ARDEX FLC WATERPROOF MEMBRANES AND ADHESIVES

Date, Friday, 22 August 2008

INTRODUCTION & SCOPE

The elimination of trip hazards when entering wet areas and also the shower whilst maintaining falls to floor wastes is imperative. With previous ceramic tiling systems, the minimum screed height (25mm typically) often resulted in trip hazards and steep ramps at entranceways with the obvious safety hazards of "wet sloping hard surfaces".

Standard concrete screeds requires a minimum 15-25mm thickness, dries at 1mm per day, and often requires additional smoothing before fixing resilient flooring. An Ardex cementitious topping typically is installed from 20-30mm to a featheredge at the floor waste, and dry rapidly to allow sheet vinyl flooring to be fixed typically within 16-18 hours.

The turnaround time factor can be critical and systems are available with a range of cure times to suit project needs. For the fast tracks systems, resilient flooring can be laid as early as 1 - 1½ hours over ARDEX A45 or A55, from 16-24 hours for ARDEX K15 and ARDEX K10, or up to 48-72hrs for slower products such as ARDEX K005 where cost is more important than time.

The critical requirements of any floor preparation material are:-

- Must be able to dramatically reduce the need for thick sand/cement screeds to create falls to floor waste with the resultant ramps at adjoining entranceways. Note: In new construction the need for structurally formed set downs (wet areas) is no longer required.
- To maintain a waterproof system in wet areas that conforms to the Australian Building Code for Class 3 and 9 buildings to AS3740 and that is compatible with sheet vinyl coverings.
- All products for preparing wet areas surfaces are to be readily available, reliable, easy to use and safe, offering long term guarantees, available from the one manufacturer, have rapid hardening and drying properties to allow for the most cost effective construction with quick installation times.

In this bulletin methods will be described that allow a complete system to be installed including levelling, ramps or fall forming and membranes.

CREATING FALLS TO WASTE

Selected ARDEX Floor levelling, repair and re-modelling cements allow the installation of rapid hardening, rapid drying cement screeds for falls to floor waste. These products can be used from a minimum thickness of a featheredge to 20mm providing the minimum required thickness to achieve falls for a typical 900 x 900mm shower floor area.

Areas adjacent to the shower can also be ramped (back to floor waste) allowing only a moderate height build up to adjoining dry areas. Trip hazards can be easily

removed by ramping with the same cement into dry areas with the shallow gradient allowing easy and safe passage by users of health care facilities.

Alternately, in new construction only the falls to floor waste (shower areas) need to be created at time of construction. Roughly created falls can be quickly, easily, and cost effectively smoothed prior to installation of sheet vinyl flooring.

Specification of this system can allow flexibility of design with the location and installation of wet areas able to be altered at any time.

Advantage: No need for set downs or falls to waste in the structural concrete subfloor.

WATERPROOF MEMBRANES

The waterproofing standard AS3740 describes sheet vinyl flooring as water resistant rather than waterproof. This is because of the joining process of the sheets with welded joints. The difference between the two is defined in the standard as:

Waterproof – The property of a material that **does not allow** moisture to penetrate through it when tested in accordance with AS/NZS 4858.

Water resistant – The property of a system or material that **restricts** moisture movement and will not degrade under conditions of moisture.

The significance of this distinction arises in the General Requirements of the standard where shower areas (enclosed and unenclosed) and bathrooms and laundries with floor wastes require the floor to be waterproofed, rather than be water resistant. This means that whilst vinyl flooring is water resistant, it is not waterproof and so a separate membrane system is required.

SURFACE PREPARATION

1. Concrete floors must be structurally sound with all previous coatings removed, clean and free of oil, grease, wax, latex compounds, curing compounds, efflorescence, laitance, dust and all foreign matter, back to an open porous matrix of the concrete. Professional cleaning by mechanical means in line with sound building industry practices is advised. Suggested processes include diamond grinding or if large areas scarifying or shotblasting to provide a surface profile of between CSP3 to CSP7. Refer to Technical Bulletin TB041 for more details.
2. Vacuum the surface to thoroughly remove all dust, dirt and debris from surface preparation etc.

Note: Ardex considers that sand-cement screeds are NOT suitable substrates for vinyl flooring. The basic reasons are related to slow drying, difficulty in obtaining a smooth surface. Also unless carefully mixed and compacted, screeds have poor strength and indentation properties in the longer term which can lead to subsequent problems with the floor. Screeds shall be removed and the systems applied to the concrete base. For more detail refer to Ardex Technical Bulletin TB159.

PRIMING BEFORE RAPID CURE CEMENT BASE

1. Primer for standard absorbent concrete to be ARDEX P51
2. Mix ARDEX P51 1:2 with water and apply evenly with a soft pushbroom. Do not leave any bare spots and remove all puddles and excess primer. Allow to dry to a clear, thin film (min., 3 hours, Max., 24 hours). Underlayment shall not be applied until primer is dry.

SYSTEMS TO CREATE BASE AND FALLS TO WASTE

The following systems are suitable for creating falls and smoothing the surface prior to installation of the membrane. The Ultra-rapid and Rapid cure systems are intended for 'fast track' installation.

Table 1) Ultra-rapid Cure Systems

Product	Ardex E25	Thickness	Cure times	Advantages	Limitations
System 1 ARDEX A55	Nil	① Added equal volume aggregate 2-5mm to minimise flow. Any thickness	60-90 minutes	·Very fast cure allows rapid turn around times · High strength	·Very high flow without aggregate restricts ability to create falls
System 2 ARDEX A45	Gauge solution is 1 volume of E25 to 2.5 volumes of water. 1 volume of gauge solution to 3 volumes of A45 powder	**a)** 1-5mm neat A45 **b)** Thickness 5mm to 30mm A45 mortar can be bulked out ① 1/3 volume 0.3-0.5mm sand 1 volume 2-5mm aggregate **c)** Between 30-50mm 1 volume 10mm aggregate.	90 minutes	·Very fast cure allows rapid turn around times ·High strength ·Good formability	·When bulk filled is stiff to mix. ·Mixing large volumes creates a short working time

Table 2) Rapid cure systems

Product	Ardex E25	Thickness	Cure times	Advantages	Limitations
System 3 ARDEX K15	1.6 litres of E25 to 4 litres of water per 20kg bag	① Recommended to have added equal volume aggregate 2-5mm to minimise flow. Any thickness	16-18 hours	·Fast cure allows rapid turn around times. ·No thickness restrictions ·High compressive strength	·High flow without aggregate restricts ability to create falls
System 4 ARDEX K10	1.5 litres of E25 to 3.5 litres of water per 20kg bag	**a)** ARDEX K10 is suitable for ramping to drains in the one operation without filler. **b)** ① For thickness 10-35mm recommended to have added equal volume aggregate 2-5mm	16-18 hours	·Stiff trowellable consistency allows good creation of falls without aggregate ·High compressive strength	·Maximum recommended thickness 35mm

Table 3) Moderate cure time systems

Product	Ardex E25	Thickness	Cure times	Advantages	Limitations
System 5 ARDEX K005	a) 1 litre of E25 to 2 litres of water per 20kg bag or b) 2.5 litres of Abalastic to 2.5 litres of water per 20kg bag.	① Any thickness from 10-120mm	48 hours	·Cure much faster than screeds ·High thickness possible ·Reduced costs ·Water resistant ·Good bulk fill base for other topcoats	·Slower cure dependent on thickness ·Does not feather out
System 6 ARDEX ARDITEX-NA	Not required	a) ARDITEX NA is suitable for ramping to drains in the one operation without filler. b) ① For thickness 10-30mm recommended to have added equal volume aggregate 2-5mm	24 hours	·Water resistant ·Flexible so good for CFC floors ·Easier to form without aggregate	·Softer than other smoothing cements ·Maximum recommended thickness 30mm
System 7 ARDEX A46	NA	0-30mm	24 hrs	·Good formability ·Water resistant – External product	Maximum recommended thickness 30mm
System 8 ARDEX K301	NA	a) 2-20mm b) ① For thickness 10-30mm recommended to have added equal volume aggregate 2-5mm	48 hours	·Water resistant-External product ·Hard surface	·Maximum thickness 20mm ·Rough surface texture ·Main application is wear surface

1. Where a smoothing cement has been bulk filled with aggregate a coat of smoothing cement is required to remove the rough and lumpy surface that bulk filled layers have. After the base coat has cured a coat of ARDEX P51 primer diluted 1:2 with water is applied to the surface and allowed to dry for approximately 3 hours.

2. It may be necessary to install pins in the concrete (adjusted by a string line) to act as a guide when installing floor-levelling cements. The gauge water/ E25 mix quantity can be adjusted down slightly to adjust workability as a screed.

PLACEMENT WITH FALLS TO FLOOR WASTE

The bulk filled smoothing cements can be screeded or trowelled to the required fall or gradient (between 1 in 60 and 1 in 80), with an approximate minimum thicknesses of typically 8mm-10mm.

Where using neat ARDEX A45 and ARDEX A46 these are trowellable mortars and so can be formed easily with a hand trowel.

Where using the neat smoothing cements ARDEX K10, ARDITEX or ARDEX K301 the amount of fall that be created is restricted by the maximum build height that can be achieved.

Allow the mortar to harden to "FINGER TIGHT" then proceed to shape the mortar to the required fall to provide a flat finish by shaving or grinding the surface with a trowel blade or similar tool.

WATERPROOF PROTECTION COATING FOR LEVELLING CEMENT

The application of the ARDEX WPM002 membrane when installed in showers shall be continued as per AS 3740:

- up the internal corners to a height of 1.8 metres and 40mm either side of the junctions, assumed that walls are water resistant construction (this does not preclude full water proofing of walls if desired)
- up wall surfaces for a minimum height of 150mm
- above the bath level for 150mm
- for floors of un-enclosed showers out to a minimum distance of 1500mm from the shower head
- and floors with wastes over the whole floor.

1. Allow the base coat of topping to harden and dry, see recommended cure times in tables, before applying the waterproof protective coating
2. The smoothing cement surface should be primed with ARDEX WPM265 Water Based Primer (preferred primer for WPM002), but other suitable options based on product availability include ARDEX P51 diluted to 1:2 with water, or with ARDEX MULTIPRIME.
3. A bead of elastomeric sealant (e.g. neutral cure silicone) or bond breaking tape is applied as a bond breaker to the following areas:
   - floor wall junction
   - expansion joints, floor/wall junction within shower trays
   - joins in flooring and other places where movement is expected
4. Build enhancing elastic fabric scrim on all joints and penetrations to be ARDEX Deck Web 190mm wide.
5. The waterproof membrane shall be ARDEX WPM002 installed as per the product Technical Data sheet to all finished surfaces.
6. Allow the ARDEX WPM002, to cure for at **least** 4 hours at 23°C/50% RH, prior to the installation of the ARDEX FEATHER FINISH.
7. Where the vinyl is turned up the walls, details such as coves are required and the fairing coat must be continued up the height of the membrane and then overlapped onto the wall construction to produce a smooth transition.

Note: ARDEX WPM155 can be substituted where specified, but is not as resistant as the cement containing WPM002 where solvent based contact adhesives are used (can result in transient softening of the membrane).

Ardex cannot offer guarantees for installations over non-Ardex membranes unless tested by Ardex for compatibility.

FINISHING COAT FOR DIRECT FIXING OF VINYL – FEATHER FINISH

The flexible smooth cement shall be ARDEX FEATHER FINISH.

The purpose of the finishing coat is to improve performance of tack off type water based adhesives, to provide some protection for the membrane surface, and to hide the rough texture of the membrane to prevent show through.

1. FEATHER FINISH to be mixed 2 parts powder to one part water with an Ardex mixing paddle and electric drill.
2. Apply FEATHER FINISH mortar using a 1.6 to 2.4mm notched trowel, then smooth using a flat trowel to provide a flat/smooth porous surface. This can be done as a single coat which is trowelled smooth, but application of a second coat after the first has dried is more effective.

   The required minimum thickness for floors to be 1.5mm

   The recommended minimum thickness for walls is 1.0mm
3. The fairing coat can be used to cover the edge of the membrane and provide a wedge shaped transition on the walls where the vinyl is turned up.
4. Allow the FEATHER FINISH smoothing coat to dry thoroughly before proceeding with installation of resilient vinyl sheeting (minimum 3 -6 hours at 20 C).

FINISHING COAT FOR DIRECT FIXING OF VINYL – ARDITEX NA

In some situations a thicker build is required and in this case ARDITEX NA can be installed over the membrane. ARDITEX is also more resistant to solvents than a thinner layer of FEATHER FINISH provides, so can give extra protection where contact solvent adhesives are in use.

1. The self smoothing latex based underlayment shall be ARDITEX-NA.
2. Install ARDITEX-NA at a minimum thickness of 3mm to the dry waterproof membrane and allow to dry thoroughly (minimum 24 hours) prior to the installation of vinyl finishes.

Note that Arditex-NA cannot be run up walls and in this case a coat of FEATHER FINISH is required to smooth the wall areas.

FLOORING ADHESIVES

The resilient flooring can be installed with a number of products, however the adhesives used must comply with the floor covering manufacturer's recommendations for appropriate types.

The most moisture resistant adhesive used is typically a two part epoxy, however they have poor initial grab which can lead to problems at the gattic floor waste. Water based acrylic adhesives are subject to moisture damage when the vinyl joints leak, and also require correct tack off time. Solvent based contact adhesives provide fast grab, but can be long term moisture sensitive, depending on the solvent type may affect the membrane, and may not be recommended by floor covering manufacturer.

Approaches to vinyl installation would include:

1. Bonding the vinyl to the floor and walls with ARDEX AF142 fast grab adhesive with 1.6mm notch trowel, making sure the product has correctly tacked off before laying the vinyl to prevent moisture being trapped.
2. The area around the welded vinyl joints on the floor bonded with ARDEX AF545 epoxy adhesive. This adhesive can also be used to bond the whole area of the floor.
3. The plastic gattic waste turndown and the area within ~100mm can be have the coverings bonded with the contact adhesive ARDEX AF675. To prevent solvent damage to the membrane the contact adhesive must correctly tack off before the covering is placed.
4. Where mouldings and fittings are to be bonded to the walls (typically where the vinyl finishes on the turn up) or the corner covings, ARDEX AF675 can be used, again allowing the correct tack off time.
5. Mouldings or skirting trim can also be bonded with ARDEX CA-20P silane adhesive and sealant. The adhesive can be activated faster by misting with water before placing the piece to be bonded. This adhesive is not designed as fast grab, and heavier items may require support, but is solvent free.

DAMP SLABS

Where the concrete subfloor has a moisture content that exceeds the requirements of AS1884-1985, the floor shall be treated with ARDEX WPM300 as per Ardex Technical Bulletin TB006. The smoothing cements systems used in this case are restricted to systems 1, 2, 3 or 5.

TIMBER FLOORS

These systems are not considered suitable for use over timber based floors. Whilst it is possible to waterproof floors made of particle board and plywood, strip timber floors are classified as not suitable under the standard.

REFERENCES

AS3740-2004 Waterproofing of wet areas within residential buildings.
AS/NZS4858-2004 Wet area membranes
Ardex Technical Bulletin TB012C Systems for Preparation of Walls & Floors in Wet Areas of Health Care Facilities to Receive Sheet Vinyl Coverings. Ardex FLC and Membranes.

IMPORTANT
This Technical Bulletin provides guideline information only and is not intended to be interpreted as a general specification for the application/installation of the products described. Since each project potentially differs in exposure/condition specific recommendations may vary from the information contained herein. For recommendations for specific applications/installations contact your nearest Ardex Australia Office.

DISCLAIMER
The information presented in this Technical Bulletin is to the best of our knowledge true and accurate. No warranty is implied or given as to its completeness or accuracy in describing the performance or suitability of a product for a particular application. Users are asked to check that the literature in their possession is the latest issue.

REASON FOR REVISION
New bulletin to replace TB163 to cover detail changes in the system, and also inclusion of Ardex adhesives.

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BRANZ Appraised
Appraisal No. 427 (2007)

BRANZ Appraisals

Technical Assessments of products for building and construction

BRANZ APPRAISAL CERTIFICATE No. 427 (2007)

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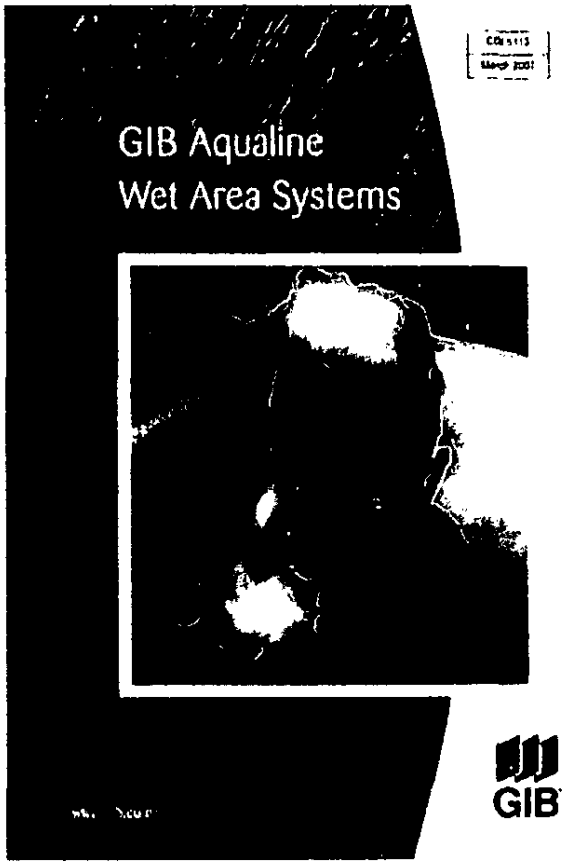
WFTAO

1.1 GIB Aqualine® Wet Area Systems are for the interior lining of timber and steel frame walls and ceilings in wet areas such as bathrooms, laundries, kitchens and toilets where a water resistant lining material is desirable.
1.2 GIB Aqualine® Wet Area Systems are based on 10 mm and 13 mm thick GIB Aqualine® water resistant plasterboard.



2.1 GIB Aqualine® Wet Area Systems have been appraised for use as a wet area wall and ceiling lining in buildings within the following scope:
- on framed walls and ceilings within the scope limitations on NZS 3604; and,
- on timber and light gauge steel framed walls and ceiling subject to specific design; and,

2.2 GIB Aqualine® may also be used to substitute for some other GIB® Plasterboards in fire-rated, sound-rated and bracing-rated wall and floor/ceiling constructions.

New Zealand Building Code (NZBC)

3.1 In the opinion of BRANZ, the GIB Aqualine® Wet Area Systems, if designed, used, installed and maintained in accordance with the statements and conditions of this Certificate, will meet or contribute to meeting the following provisions of the NZBC:
Clause B1 STRUCTURE: Performance B1.3.1, B1.3.2 and B1.3.4. GIB Aqualine® Wet Area Systems meet the requirements for loads arising from self-weight, earthquake, wind and impact [i.e. B1.3.3 (a), (f), (h) and (j)]. See Paragraphs 8.1 - 8.3.
Clause B2 DURABILITY: Performance B2.3.1 (a) not less than 50 years, B2.3.1 (b) 15 years and B2.3.1 (c) 5 years. GIB Aqualine® Wet Area Systems meet these requirements. See Paragraphs 9.1 - 9.5.

Readers are advised to check the validity of this Certificate by referring to the Valid Certificates listing on the BRANZ website, or by contacting BRANZ.

Clause C3 SPREAD OF FIRE: Performance C3.3.1, C3.3.2, and C3.3.5. GIB Aqualine® Wet Area Systems meet these requirements by providing passive fire and smoke protection.
Clause E3 INTERNAL MOISTURE: Performance E3.3.4, E3.3.5 and E3.3.6. GIB Aqualine® Wet Area Systems meet these requirements. See Paragraphs 13.1 - 13.3.
Clause F2 HAZARDOUS BUILDING MATERIALS: Performance F2.3.1. GIB Aqualine® Wet Area Systems meet this requirement and will not present a health hazard to people.
Clause G6 AIRBORNE AND IMPACT SOUND: Performance G6.3.1 and G6.3.2. GIB Aqualine® Wet Area Systems meet the requirements. See Paragraph.

3.2 This Certificate appraises an Alternative Solution in terms of New Zealand Building Code compliance.

4.1 The GIB® plasterboards and accessories used in the GIB Aqualine® Wet Area System and supplied or specified by Winstone Wallboards Limited are as follows:

GIB Aqualine®

4.2 GIB Aqualine® is a paper-bound, modified water-resistant gypsum-plaster core sheet lining material. The sheets have a taper on the two long sheet edges. GIB Aqualine® is available in 10 mm and 13 mm sheet thicknesses, a sheet width of 1200 mm and in lengths of 2400 mm, 2700 mm, 3000 mm and 3600 mm. The maximum weights are 7.8 kg/m² and 10.2 kg/m² for 10 mm and 13 mm thick sheets respectively. GIB Aqualine® face paper is green in colour.

Fastenings

- GIB® Grabber® High Thread Drywall screws for fixing to timber:
  6g x 25 mm and 32 mm.
- GIB® Grabber® Self Tapping Drywall screws for fixing to light gauge steel:
  6g x 25 mm and 32 mm.
- GIB® Nails
  30 mm and 40 mm x 2.8 mm

Adhesive and Sealants

- GIBFix® Wood Bond (Acrylic)
- GIBFix® All-Bond (Solvent)

GIB® Accessories and GIB® Jointing Compounds

- As specified in the GIB Aqualine® Wet Area Systems and GIB® Site Guide Technical Literature.

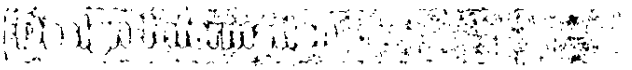
Finishes

4.3 Finishes such as tiling, flexible sheet vinyl, paints and wallpapers have not been assessed and are outside the scope of this Certificate.

Handling and Storage

5.1 The best results are achieved when GIB Aqualine® is treated as a finishing material and protected from damage. Sheets must be stacked flat and kept dry at all times. For limits on stack heights see the GIB® Site Guide. Sheets must be carried on edge and not dragged.
5.2 All accessories must be kept dry.

6.1 Refer to the Appraisals listing on the BRANZ website for details of the current Technical Literature for the GIB Aqualine® Wet Area System. The Technical Literature must be read in conjunction with this Certificate. All aspects of design, use, installation and maintenance contained in the Technical Literature and within the scope of this Certificate must be followed.



General

7.1 GIB Aqualine® provides a water-resistant lining as a base for finishing systems in wet areas such as bathrooms, toilets, laundries and kitchens. The typical finishes are ceramic tiles and flexible sheet vinyl to walls and paint, and wallpaper to walls and ceilings.
7.2 GIB Aqualine® must not be used in the following situations:

- For bracing applications in shower areas or adjacent baths (See Paragraphs 7.4 and 8.2).
- In areas of high humidity (above 90% RH) or continually wet such as group showers, steam rooms, or swimming pools.
- Installed over a vapour barrier.
- Applied directly to masonry, concrete or solid plaster.
- Applied over other sheet lining materials.
- Used externally of the building envelope.
- Exposed to temperatures of 52°C or greater for prolonged periods. (Refer to appliance and fitting manufacturer's for installation details.)

7.3 GIB Aqualine® may be substituted for some other GIB® Plasterboard products in specific GIB® Bracing Systems, GIB® Fire Rated Systems, GIB® Noise Control Systems and GIB Ultraline® PLUS Lining System.

Wet Areas

7.4 Wet areas are spaces where sanitary fixture and sanitary appliances are located such as bathrooms, toilets, laundries and kitchens. There are two general categories of wet areas as follows:

1. Water Splash – These are areas subject to intermittent splashing of water such as around baths, vanities, tubs and sinks.
2. Shower Areas – These are areas subject to frequent and heavy water splash such as enclosed showers, unenclosed shower zones and showers over baths.

7.5 Both the above wet area categories must be finished with surfaces and joints that are impervious and easily cleaned. Shower areas must additionally be waterproof. This can be achieved using proprietary rigid shower lining systems, flexible vinyl shower wall finish, or tiling. Tiled shower areas must include a wet area waterproofing membrane system under the tiles.

Intertenancy Walls – Wet Areas

7.6 Intertenancy drywall constructions that incorporate fire resistance and noise control must be protected from water splash. In shower areas GIB Aqualine® must not be substituted for other GIB® Plasterboards but must be an extra lining layer. Refer to the GIB Aqualine® Wet Area Systems Technical Literature.

Tiling

7.7 GIB Aqualine® is suitable as a substrate for tiling up to the following weights:

- 10 mm GIB Aqualine® up to 20kg/m²
- 13 mm GIB Aqualine® up to 32kg/m².

Note: Most cermic and porcelain wall tiles weigh less than 20kg/m². For further information on tiling consult the BRANZ Good Practice Guide – Tiling.

Framing

7.8 Supporting framing must comprise one of the following subject to the minimum sizes, dwang centres and all other frame requirements of GIB Aqualine® Wet Area Systems Technical

Literature:

- Timber framing must be designed and constructed in accordance with NZS 3604, or to a specific design using NZS 3603 and NZS 4203 (AS/NZS 1170).
- Steel framing must be designed to withstand loads in accordance with NZS 4203 (AS/NZS 1170).

Structure

Bracing

8.1 GIB Aqualine® can be used in place of GIB® Standard plasterboard in GIB® bracing elements. GIB Aqualine® can be used in place of GIB Braceline® in GIB® bracing elements 900 mm or longer, provided the perimeter of the element is fixed with GIB Braceline® Nails or GIB Braceline® screws at 100 mm centres, using the GIB Braceline® corner fixing pattern.

8.2 GIB Aqualine® must not be used for bracing in shower areas or behind baths.

Impact Resistance

8.3 GIB® plasterboards provide adequate resistance to soft body impact, based upon experience of use in domestic and light commercial applications.

Durability

Serviceable Life

9.1 GIB Aqualine® has a serviceable life of at least 15 years as a fully protected shower or water splash lining. As a general wall and ceiling lining GIB Aqualine® will have a serviceable life in excess of 50 years. The ability of GIB Aqualine® to remain durable is dependent on being protected and remaining dry in service, and being maintained in accordance with this Certificate.

Maintenance

9.2 The building must be maintained weathertight and all lining systems protected from internal and external moisture.

9.3 Finishes to water splash and shower areas, including tiles, grout, waterproof membranes, sealants and flexible sheet vinyl must be checked to ensure the integrity of the system is maintained. They must be repaired or replaced if necessary. When repairing or replacing finishes, the GIB Aqualine® substrate must be checked for defects and repaired or replaced, as required.

9.4 For flexible sheet vinyl, particular attention must be paid to joints especially at corners. Checks should be made to ensure the vinyl has not been punctured. Where damage has occurred, repairs must be made immediately.

9.5 Impact damage to GIB Aqualine® plasterboard, resulting in small holes and cracks, may be patched, stopped and finished. For larger areas of damage, expert advice on repair must be sought from Winstone Wallboards Ltd.

Outbreak of Fire

10.1 Separation or protection must be provided to GIB Aqualine® Wet Area Systems from heat sources such as stoves, heaters, flues and chimneys.

10.2 NZBC Acceptable Solution C/AS1, Part 9 and Verification Method C/VM1 provide methods for separation and protection of combustible materials from heat sources.

Spread of Fire

11.1 When 10 mm GIB Aqualine® is substituted into fire rated systems in place of 10 mm GIB Fyreline®, the FRR of that system will be maintained. Similarly, the FRR is maintained when 13 mm GIB Aqualine® is substituted for 13 mm GIB Fyreline®.

Flame Barrier

12.1 Where flame barriers are required by Acceptable Solution C/AS1 Table 6.3, GIB Aqualine® is a suitable material to provide a 10 minute flame barrier, provided all sheet joints are formed over framing, or backblocked with GIB® plasterboard.

Internal Moisture

13.1 When installed in accordance with this Certificate, GIB Aqualine® Wet Area Systems will provide wall surfaces adjacent to sanitary fixtures and sanitary appliances that are impervious and easily cleaned.

13.2 The construction methods meet with the internal moisture requirements of the NZBC Acceptable Solution E3/AS1.

13.3 To minimise internal condensation, adequate levels of ventilation and thermal resistance must be provided to all spaces where moisture may be generated.

Airborne and Impact Sound

14.1 When GIB Aqualine® is substituted into GIB® Noise Control systems in place of the equivalent thickness GIB® Standard plasterboard or GIB Fyreline®, the STC and IIC rating of that system will be maintained. When GIB Aqualine® is substituted in place of the equivalent thickness GIB Noiseline®, a small performance loss may occur.

Installation Skill Level Requirement

15.1 Installation of GIB Aqualine® Wet Area Systems can be carried out by any competent building contractor.

General

16.1 GIB Aqualine® Wet Area Systems must be installed in accordance with the Technical Literature. For inspection, reference must be made to the Technical Literature.

Cutting

16.2 GIB Aqualine® is easily cut by scoring the face paper with a sharp short-bladed trimming knife, and then snapping the plasterboard away from the cut face and cutting the back paper or by sawing. Use of a metal straightedge facilitates clean straight cuts. Cut edges can be tidied up by using a knife. Paper dags should be removed.

Health and Safety

16.3 Dust resulting from the sanding of stopping and finishing compounds may be a respiratory irritant, and the use of a suitable facemask is recommended.

Framing

16.4 To achieve an acceptable decorative finish, GIB Aqualine® Wet Area Systems and the GIB® Site Guide specifies that walls must not be lined unless the moisture content of timber framing is less than 18%. Winstone Wallbaords Limited recommend a moisture content of 8–12% where buildings are to be air conditioned or centrally heated.

Fixing Sheets

Non-Tiled Areas

17.1 GIB Aqualine® sheets may be installed vertically or horizontally. Sheets are fixed with GIB® Grabber® screws or GIB® Nails at 300 mm centres around the perimeter of the

sheet, and with GIBFix® adhesive on all intermediate studs and dwangs. Adhesive must not be used under fasteners. A 5-10 mm gap must be left between the floor and the bottom of the sheet.

Tiled Areas

17.2 Control joints must be provided at maximum 4 m centres.

Internal corners in shower areas must be reinforced with a minimum 32 x 32 x 0.55 mm galvanised metal angle prior to lining the walls.

17.3 GIB Aqualine® sheets may be installed vertically or horizontally. Sheets are fixed with GIB® Grabber® screws at 100 mm centres to perimeter of wall and to all intermediate studs. Adhesive must not be used in place of screws.

Ceilings

17.4 Supports of timber or steel battens or ceiling joists must be 450 centres for 10 mm GIB Aqualine®, or 600 mm centres for 13 mm GIB Aqualine®.

17.5 GIB Aqualine® sheets must be fixed with GIB® Grabber® screws at 600 mm centres around perimeter and at 200 mm centre along supports. Alternatively, sheets are screw fixed at 600 mm centres along the supports and GIBFix® adhesive fixed at 200 mm centre between.

Penetrations and Sealants

18.1 All cut-outs for pipe penetrations must be made neatly using a hole saw. Cut-outs should be made approximately 12 mm diameter greater than the pipe.

18.2 A bead of silicone sealant must be placed to the full thickness of the GIB Aqualine® sheet around all pipe penetrations, at bath rims and preformed shower bases and where an impervious junction is required at the floor/wall line.

18.3 In tiled areas, a bead of silicone sealant 6 mm wide must also be placed to the full thickness of the tiles where the above situation occurs. The sealant manufacturer's technical literature must be followed for installation.

Jointing and Finishing

19.1 Jointing must be carried out in accordance with GIB® Site Guide Technical Literature.

19.2 Tiled shower areas must incorporate a waterproofing membrane over GIB Aqualine®. Waterproofing membranes are outside the scope of this Certificate and must otherwise be specified and approved.

Investigations

20.1 The GIB Aqualine® Wet Area Systems and GIB® Site Guide Technical Literature have been examined by BRANZ and found to be satisfactory.

20.2 Site visits were carried out by BRANZ to assess the practicability of the installation of the systems, and to view completed installations.

20.3 An assessment was made of the durability of the systems by BRANZ technical experts and found to be satisfactory.

20.4 Winstone Wallboards Limited GIB® plasterboards have been assessed for the following properties: MOR, MOE, paper tensile strength, paper shear strength, nail pull resistance, Hunter hardness, inspection for fungal spores, hard and soft body impact tests.

Quality

21.1 Winstone Wallboards Limited's manufacturing process and details of the quality and composition of the materials, have been examined by BRANZ and found to be satisfactory.

The quality management systems of Winstone Wallboards Limited have been assessed and registered by TELARC as meeting the requirements of ISO 9001, Registration No. 581.

Winstone Wallboards Limited is responsible for the quality of the product supplied.

21.2 The quality of the application and finish on site is the responsibility of the installation, stopping and finishing contractors.

21.3 Designers are responsible for the design of buildings.

21.4 Building owners are responsible for the maintenance in accordance with the instructions of Winstone Wallboards Limited.

Sources of Information

- AS/NZS 1170: 2002 Structural design actions.
- AS/NZS 2588: 1998 Gypsum Plasterboard.
- NZS 3602: 2003 Timber and wood-based products for use in building.
- NZS 3603: 1993 Timber structures standard.
- NZS 3604: 1999 Timber and framed buildings.
- NZS 4203: 1992 Code of practice for general structural design and design loadings of buildings.
- BRANZ Good Practice Guide - Tiling, March 2004.
- New Zealand Building Code Handbook and Approved Documents, Building Industry Authority, 1992.
- The Building Regulations 1992, up to, and including October 2004 Amendment.

BRANZ

In the opinion of BRANZ, GIB Aqualine® Wet Area Systems are fit for purpose and will comply with the Building Code, to the extent specified in this Certificate provided they are used, designed, installed and maintained as set out in this Certificate.

The Appraisal Certificate is issued only to the Certificate Holder, Winstone Wallboards Limited, and is valid until further notice, subject to the Conditions of Certification.

Conditions of Certification

1. This Certificate:
   a) relates only to the product as described herein;
   b) must be read, considered and used in full together with the technical literature;
   c) does not address any Legislation, Regulations, Codes or Standards, not specifically named herein;
   d) is copyright of BRANZ.
2. The Certificate Holder:
   a) continues to have the product reviewed by BRANZ;
   b) shall notify BRANZ of any changes in product specification or quality assurance measures prior to the product being marketed;
   c) abides by the BRANZ Appraisals Services Terms and Conditions.
3. The product and the manufacture are maintained at or above the standards, levels and quality assessed and found satisfactory by BRANZ.
4. BRANZ makes no representation as to:
   a) the nature of individual examples of batches of, or individual installations of the product, including methods and workmanship;
   b) the presence or absence of any patent or similar rights subsisting in the product or any other product;
   c) any guarantee or warranty offered by the Certificate Holder.
5. Any reference in this Certificate to any other publication shall be read as a reference to the version of the publication specified in this Certificate.

For BRANZ

P. Robertson
Chief Executive

Date of issue: 4 April 2007

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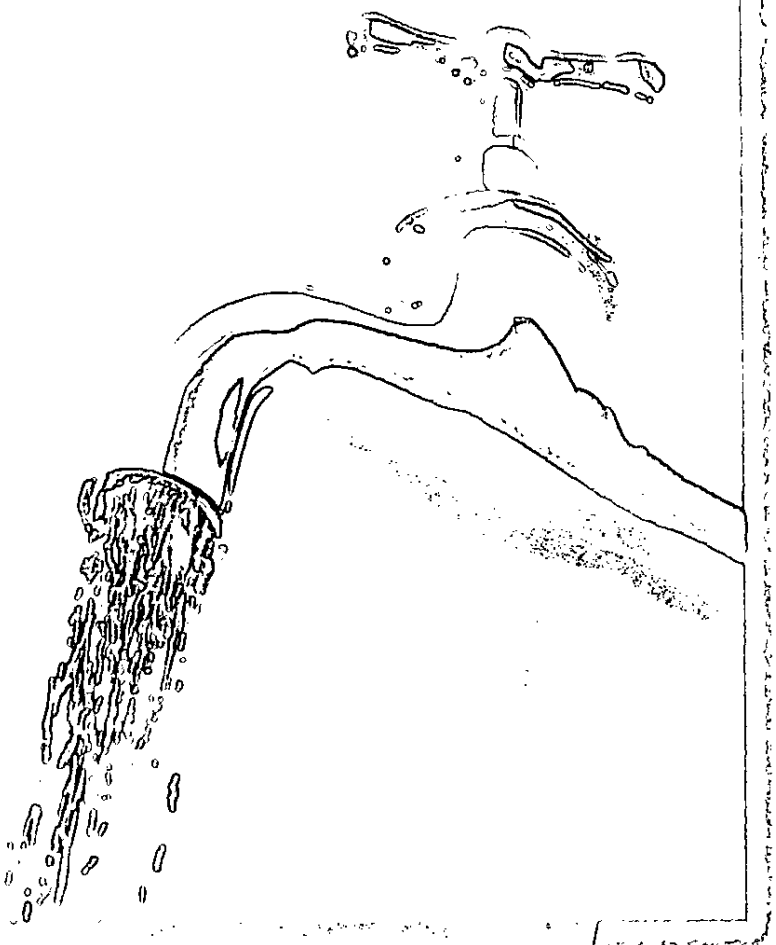
CBI 5113

October 2002

GIB Aqualine® Wet Area Systems



GIB
Living Solutions®

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Note: GIB Aqualine® Wet Area Systems, October 2002 supersedes the publication entitled GIB Aqualine® Wet Area Systems, September 1996, May 2001 and February 2002.

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GIB Aqualine® Wet Area Systems, October 2002

Winstone Wallboards Ltd accepts no liability if the GIB Aqualine® Wet Area system is not designed and installed in strict accordance with instructions contained in this publication.

Use only the current specification

This publication may be superseded by a new publication. Winstone Wallboards accepts no liability for reliance upon publications that have been superseded. You should check the current index of publications contained in your GIB® Technical Manual before using this publication. If you are unsure whether this is the current publication, simply call the GIB® Helpline on 0800 100 442

Substitution

GIB Aqualine® Wet Area Systems are not generic. Where specified, GIB® branded components must be used when specifying and installing GIB Aqualine® Wet Area Systems. Substitution is not in accordance with the instructions contained in this publication.

GIB® products

Manufactured by Winstone Wallboards Ltd. Distributed nationwide by authorised distributors.

The names GIB®, GIB Board®, Gibraltar Board®, GIB Fyreline®, GIB Ultraline®, GIB Toughline®, GIB Braceline®, GIB Aqualine®, GIB® Grabber™, GIB® Nail, GIB Noiseline®, GIB Soundseal®, GIB-Cove®, GIBSealer®, GIBFix®, GIB Tradeset®, GIB Plus 4®, GIB® Top Coat, GIB® All Purpose, GIB-Tone®, GIB® Vinyl, GIB Rail®, GIB® Ceiling Batten and GIB Clip® are trademarks of Winstone Wallboards Ltd.

GIB® Help Line - Call Free

0800 100 442

Free Facsimile

0800 229 222

E-mail

info@gib.co.nz

Internet Website

http://www.gib.co.nz

Auckland

P.O. Box 12 256 Penrose. Telephone 0-9-633 0100.
Facsimile 0-9-633 0101.

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Facsimile 0-4-568 7844

Christchurch

P.O. Box 1983 Christchurch. Telephone 0-3-332 3159.
Facsimile 0-3-337 1014

BRANZ Appraisal Certificate 427 (2002)

GIB Aqualine® Wet Area Systems, February 2002

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GIB

Introduction

GIB Aqualine® is an internal lining material designed for use in wet areas such as bathrooms, kitchens, laundries and toilets.

When installed in wet areas, directly exposed to liquid water, that is a shower cubicle or shower over bath situation, the GIB Aqualine® must be faced with ceramic tiles complete with a waterproof membrane.

Alternatively, GIB Aqualine® may be clad with a suitable flexible sheet vinyl, fully bonded and with all seams heat welded.

Outside of areas directly exposed to liquid water, GIB Aqualine® is ideal for the application of paint and wallpaper finishes.

Product Description

GIB Aqualine® features a wax modified water resistant core. The board resists both water vapour penetrating to the cavity of the wall and moisture travelling up the core.

The board is manufactured with tapered edges allowing conventional jointing techniques.

Compliance with the New Zealand Building Code (NZBC)

Structure - Clause B1

The design and material specification for steel and timber framing used in GIB Aqualine® systems must be in accordance with the performance requirements of NZBC Clause B1 (Structure).

NZBC Clauses B1 (Structure) and B2 (Durability) require that bracing elements have a durability of 50 years. GIB® Bracing Systems must not be specified in areas where a 15 year durability applies and where linings are subject to direct water pressure. Examples are a shower cubicle or shower over bath situations. Otherwise GIB Aqualine® may be used as a substitute for the equivalent thickness GIB® Standard plasterboard in bracing systems GIB1, 2, 3, 10 and 11.

Durability - Clause B2

When installed and maintained in accordance with this literature, GIB Aqualine® tiled or vinyl covered systems have a serviceable life of at least 15 years. They comply with the requirements of NZBC Clause B2 (Durability), for use in wet areas directly exposed to liquid water, e.g. showers, showers over baths and splash backs.

When used as a general wet area lining, and maintained under normal dry internal conditions, GIB Aqualine® systems have a serviceable life of at least 50 years and comply with NZBC Clause B2 (Durability) for use within toilets, kitchens, bathrooms and laundries not directly exposed to liquid water.

Spread of Fire - Clause C3

GIB® Fire Rated Systems provide passive fire protection in accordance with the requirements of NZBC Clause C3 (Spread of Fire). When GIB Aqualine® is substituted into fire rated systems in place of the equivalent thickness GIB Fyreline®, the Fire Resistance Rating (FRR) of that system will be maintained.

Internal Moisture - Clause E3

When installed in accordance with this literature, tiled or vinyl covered GIB Aqualine® systems may be used in areas directly exposed to liquid water such as showers to provide an impervious and easily cleaned wall surface. These systems comply with the requirements of NZBC Clause E3 (Internal Moisture).

Hazardous Building Materials - Clause F2

At no stage during handling, installation, or serviceable life does GIB Aqualine® constitute a health hazard. It therefore meets the provisions of NZBC Clause F2 (Hazardous Building Materials). Dust resulting from the sanding of stopping compounds may be a respiratory irritant and the use of a suitable facemask is recommended.

Ventilation - Clause G4

NZBC Clause G4 (Ventilation) requires buildings to have a means of collecting or otherwise removing steam generated from laundering, utensil washing, bathing or showering. To prolong the life of interior linings and surface finishes, and to minimise the risk of moisture related problems such as condensation and mould growth, GIB® recommends that adequate heating and mechanical ventilation is provided in kitchens, bathrooms and laundries.

Airborne and Impact sound - Clause G6

GIB Noise Control® Systems can be used to provide ratings for Sound Transmission Class (STC) and Impact Insulation Class (IIC) in accordance with the requirements of NZBC Clause G6 (Airborne and Impact Sound). When GIB Aqualine® is substituted into GIB Noise Control® systems in place of the equivalent thickness GIB® Standard or GIB Fyreline®, the STC and IIC rating of that system will be maintained. When GIB Aqualine® is substituted in place of the equivalent thickness GIB Noiseline®, a small performance loss may occur. For further information contact the GIB® Helpline 0800 100 442.

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Introduction

Appraisal

The document entitled "GIB Aqualine® Wet Area Systems" 2002 has been appraised by the Building Research Association of New Zealand (BRANZ) Appraisal Certificate No. 427 (2002).

Sheet Dimensions and Weights

Sheet Dimensions (all sheets 1200mm wide)		Maximum Weight
Thickness (mm)	Length (mm)	
10	2400, 2700, 3000, 3600,	7.8kg
13	2400, 2700, 3000, 3600,	10.2kg

Benefits

- Durable
- Protects structural frame from water ingress, rot and corrosion
- Suitable for both domestic and commercial applications
- Dimensionally stable, will not buckle or warp
- Conventional jointing methods
- Suitable for painting and wall papering
- Economical substrate for ceramic tiles and sheet vinyl
- Easy to cut and form openings
- May be used in GIB® Bracing, Fire Rated and Noise Control Systems (see Compliance with the NZBC, page 3 clauses B1, C3 and G6)

Handling and Storage

- GIB Aqualine® must be stored under cover, stacked flat and clear of the floor with sufficient support to avoid sagging.
- GIB Aqualine® must be handled as a finishing material.

Limitations

- GIB Aqualine® must be faced with ceramic tiles or alternatively, heat welded flexible sheet vinyl when installed in shower cubicles or shower over bath situations.
- GIB Aqualine® must be screw fastened when used as a substrate to ceramic tiles. **Adhesive fixing of the sheets is not permitted.**
- GIB Aqualine® must **not** be used for bracing purposes in the shower cubicle or shower over bath situations.
- Do not use GIB Aqualine® where it may be exposed for extended periods to humidities of 90% RH and above. Such areas include group shower or steam rooms, also moisture and chlorine rich environments such as indoor heated swimming pools.
- GIB Aqualine® must be applied only to timber or steel framing or to a substrate of GIB® Plasterboard. It must **not** be directly applied to solid plaster (gypsum or cement) wood based sheet linings or similar materials, masonry or concrete.
  GIB Aqualine® may only be applied to these materials where timber strapping or steel furring channels are installed.
- GIB Aqualine® must not be installed over a vapour barrier or a wall acting as a vapour barrier.
- Never form penetrations with a hammer or by any impact method, this will severely impair the performance of the board.
- Cracked or damaged sheets must never be used.
- GIB Aqualine® must not be used in external situations.

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Framing and Lining Installation - Paint and Wallpaper Finishes

Walls - Paint and Wallpaper Finishes Outside of Shower Areas (Refer to associated GIB® Publications for Fire Rated or Noise Control Construction)

Framing

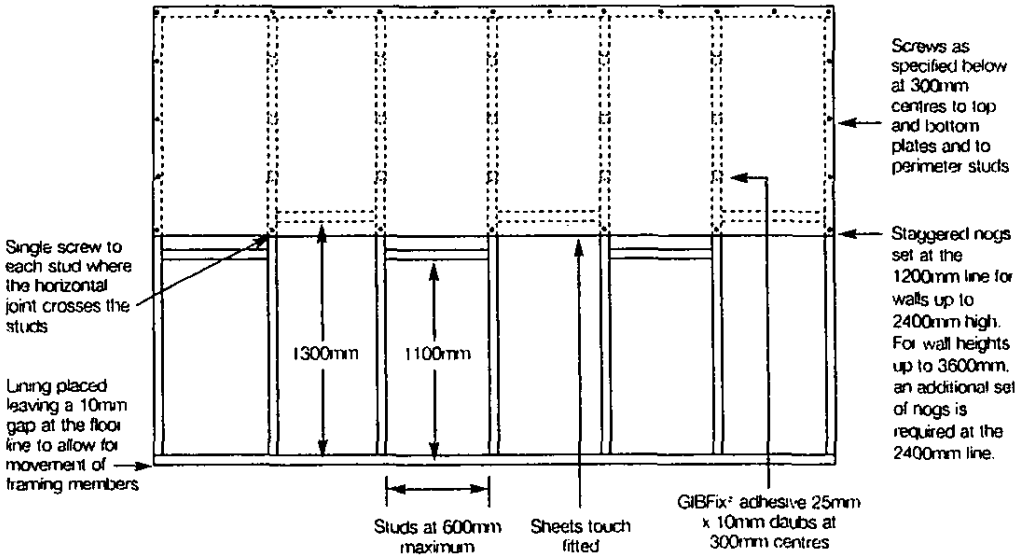
The moisture content of timber framing shall be between 12-16% at the time of lining.

- Studs shall be spaced at 600mm centres maximum.
- Nogs
  - For wall heights up to 2400mm, staggered nogs are to be set alternately 100mm above and below the 1200mm line.
  - For wall heights up to 3600mm an additional set of nogs is required at the 2400mm line.
- Steel stud systems do not generally incorporate nogs except as required below.

Note: Additional nogs are required as follows:-

- Adjacent to each pipe penetration
- Between all studs above bath flanges and preformed shower bases
- Behind sink and tub flashings
- To support towel rails, grab rails and wall basin brackets

Fastening and Jointing the Linings - Horizontal Fixing



Fasteners	- 10mm GIB Aqualine® – 25mm x 6g GIB® Grabber™ High Thread Drywall screws - 13mm GIB Aqualine® – 32mm x 6g screws as above
Fastener Centres	- 300mm centres to top and bottom plates and to perimeter studs - Single screws to each stud where the horizontal joint crosses the studs - 25mm x 10mm daubs of GIBFix® adhesive at 300mm centres to intermediate studs
Lining	- Lay the sheets horizontally leaving a 10mm gap at the floor line to allow for movement of framing members. Sheets to be touch fitted.
Jointing	- Jointing shall be carried out in accordance with instructions contained in the publication "GIB Living Solutions® Site Guide"

Note: The above specification also applies to flexible sheet vinyl finishes, except that the lining gap at the floor should be reduced to 5mm when a pencil cove detail is used. **See "Flexible Sheet Vinyl", Page 8.**

Framing and Lining Installation - Tiled Walls

Tiled Walls - Showers and Other Wet Areas
(Refer to associated GIB® Publications for Fire Rated or Noise Control construction)

Framing

- The moisture content of timber framing shall be between 12-16% at the time of lining.
- **10mm GIB Aqualine® faced with ceramic tiles (tile weight up to 12.5kg/m²)** studs shall be spaced at 400mm centres with nogs set at 600mm centres.
  Note: Where double layer linings occur, the studs may be set at 600mm centres.
- **13mm GIB Aqualine® faced with ceramic tiles (tile weight up to 32kg/m²)** studs shall be spaced at 600mm centres maximum.
  Nogs
  - For wall heights up to 2400mm, staggered nogs are to be set alternately 100mm above and below the 1200mm line
  - For wall heights up to 3600mm an additional set of nogs is required at 2400mm line
- Prior to lining in tiled areas (shower cubicles and shower over bath only) the internal corners shall be reinforced with a minimum 32 x 32 x 0.55mm galvanised metal angle. Each side of the angle shall be fastened to the framing with 30mm galvanised clouts at 300mm centres (see illustrations, page 11, 13)
- Steel stud systems do not generally incorporate nogs except as required below.
- Additional nogs are required as follows:-
  - Adjacent to each pipe penetration
  - Between all studs above bath flanges and preformed shower bases
  - Behind sink and tub flashings
  - To support towel rails, grab rails and wall basin brackets.

Fasteners - **10mm GIB Aqualine®, tile weight up to 12.5kg/m²**
25mm x 6g GIB® Grabber™ High Thread Drywall screws at 150mm centres to studs, top and bottom plates and single screws to the centre of each nog
- **13mm GIB Aqualine®, tile weight up to 32kg/m²**
32mm x 6g screws as above at 100mm centres to studs, nogs and top and bottom plates
Note: Adhesive fixing is not permitted in tiled areas

Lining - Lay the sheets horizontally leaving a 10mm gap at the floor line to allow for movement of framing members.
Provide a 5-10mm gap between the bottom edge of the lining and the bath rim, any upstand or the preformed shower base (allows placement of sealant)
Sheets shall be touch fitted

Jointing - Jointing shall be carried out in accordance with instructions contained in the publication "GIB Living Solutions® Site Guide"
Do not use topping compound in tiled areas
Use only chemical setting compounds such as GIB Tradeset® or GIB® Bedding compound, flushed out and reinforced only with paper tape.

Notes
- **Where the framing or fastener centres required for tiled GIB Aqualine® are closer than those specified for GIB® FRR and Noise Control Systems, the GIB Aqualine® specification shall prevail.**
- **Where single layer linings occur on steel framing the minimum lining thickness shall be 13mm.**
- **See "Waterproof Membranes" page 9 re tiled finishes in shower areas.**

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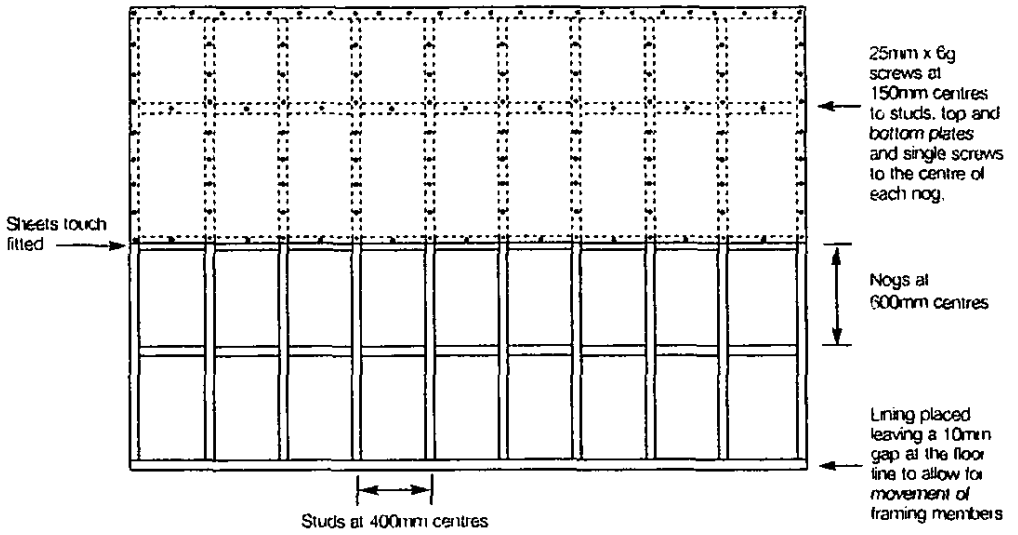
Framing and Lining Installation - Tiled Walls

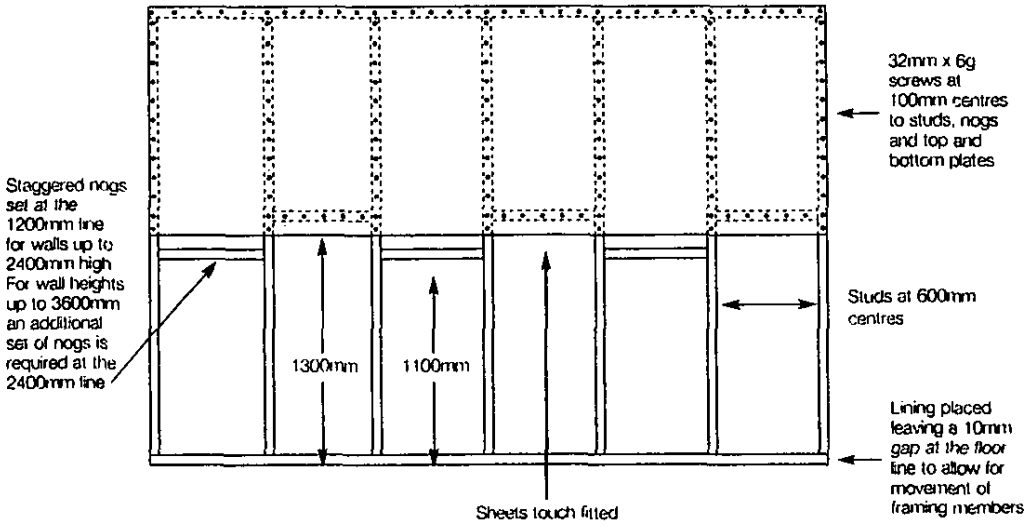
Fastening and Jointing the Lining in Tiled Areas - Horizontal Fixing

10mm GIB Aqualine® - Tiles up to 12.5kg/m²



Fastening and Jointing the Lining in Tiled Areas - Horizontal Fixing

13mm GIB Aqualine® - Tiles up to 32kg/m²



Ceilings

Battens or ceiling joists shall be spaced at 450mm centres maximum for 10mm GIB Aqualine® and 600mm centres maximum for 13mm board.
Fixing and jointing as for standard GIB® detailed in the publication "GIB Living Solutions® Site Guide".
Tiling is not recommended on GIB® Plasterboard soffits and ceilings.

GIB®

Tiling, Flexible Sheet Vinyl, Rigid Sheet Shower Linings

Tiling

- Tile grouting and sealing shall be carried out in accordance with the requirements of AS3958 Part 1 1991 (Guide to the Installating of Ceramic Tiles).
- Provide for surface control joints at 4 metre centres maximum.
- The adhesive shall be organic based complying with AS2358 - 1990 (Adhesives for Ceramic Wall Tiles and Mosaics, Part 1 - 1.3(a) Type 1).
- Note that the adhesive must be combed in a horizontal direction only.

Flexible Sheet Vinyl - Showers and Other Wet Areas

- GIB Aqualine® is a suitable substrate for flexible vinyl wall finishes in wet areas of residential, commercial or institutional buildings
- **Framing requirements and installation procedures for the GIB Aqualine® substrate shall be as given on page 5 of this publication, except that the lining gap at the floor should be reduced to 5mm when a pencil cove detail is used.**
- The installation of metal reinforcing angles (32 x 32 x 0.55mm) behind internal GIB Aqualine® corners is recommended for sheet vinyl applications in showers or shower over bath situations (see illustration page 13)
- The GIB Aqualine® lining must be jointed and stopped to a paint quality finish (Level 4) - trowel marks can telegraph through even a commercial grade 2mm vinyl
- GIB Aqualine® must be sealed with an oil-based sealer when used as a substrate for flexible vinyl wall coverings and the sealer must be fully cured before application of the vinyl adhesive
- A minimum vinyl thickness of 2mm is recommended for the wall finish in commercial or institutional bathrooms and showers
- In areas directly exposed to liquid water, all joints in flexible sheet vinyl must be heat welded
- Installation of the flexible vinyl must be carried strictly in accordance with the specifications provided by the suppliers/manufacturers of the vinyl and only approved proprietary systems must be used

Rigid Sheet Shower Linings

- The manufacturers/suppliers of thin (usually 2-3mm) and rigid acrylic shower linings commonly recommend direct adhesive fixing to wall linings using solvent-based adhesives
- Water temperature changes will cause movement of the thin acrylic sheet, which in turn will stress the adhesive and wall lining substrate
- The low vapour transmission of GIB Aqualine® slows down the evaporation rate of adhesive
- Some suppliers of rigid sheet acrylic shower linings recommend a minimum of one week for the adhesive to cure fully
- Care must be taken to ensure that rooms are adequately ventilated and the adhesive is fully cured before the shower is used
- Consult the manufacturer/supplier of the shower lining for full installation details

Penetrations, Sealants and Waterproof Membranes

Penetrations and Sealants

- Ensure that all cut-outs for pipe penetrations are made neatly and slightly oversize with a hole saw. These penetrations should be of a diameter approx 12mm greater than that of the pipe.
- Gun a bead of mould inhibited Silicone Sealant to the full depth of the GIB Aqualine® in the following locations.
  - Around all tap/pipe bodies
  - Carefully seal the gap between the bath rim and the bottom edge of the GIB Aqualine®
  - Seal between the upstand of preformed shower bases and the bottom edge of the lining
  - Where an impervious junction is required at the floor/wall line, carefully seal the gap between the bottom edge of the board and the finished floor
- Do not locate shower heads or taps on fire rated or intertenancy walls. Should this be unavoidable then reference should be made to the publication "Penetrations and Closures in GIB® Fire Rated Systems". Alternatively, use tested and approved proprietary solutions.

Waterproof Membranes (tiled shower areas and splashbacks to baths only)

- In showers, shower over bath situations and the splashback area around the bath (see illustrations pages 10, 11, 12) the GIB Aqualine® system is not complete and ready for tiling until coated with a waterproof membrane over the lining and the jointed areas.
- Only insitu waterproofing materials which are covered by a CSIRO or BRANZ Appraisal are recommended. These may be applied by brush or roller methods to the manufacturers recommendations. Typically, these types of membranes are not suitable for paint and wallpaper finishes. A selection of suitable membranes are listed below.
- Waterproof membranes must be fully cured and dry prior to application of floor screeds or tiling adhesives.
- Embed reinforcing mats in the membrane at all internal corners of the shower (including floor/wall junctions)

Suppliers of wet area waterproofing systems

Construction Chemicals Pty Ltd
Phone 09 273 5444
Liquid Flash Waterproofing Membrane - CSIRO
Technical Assessment 209

Bostik NZ Ltd
Phone 0800 267 845
Ultraseal Wet Area Waterproofing System - CSIRO
Technical Assessment 197

Fernz Construction Materials Ltd
Distributed through Eureka Tiles
Phone 0800 255 444
Dampfast waterproofing membrane - CSIRO
Technical Assessment 236

Wet-Seal Australia
Distributed through Wet-Seal New Zealand
Phone 0800 436 000
The Wet-Seal system waterproofing membrane.
BRANZ Appraisal Certificate No. 372(2000)

* Appraisals listed are current at time of print. However, it is necessary to verify if appraisals are current at time of installation.

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Typical Wet Area Details - Timber Frame

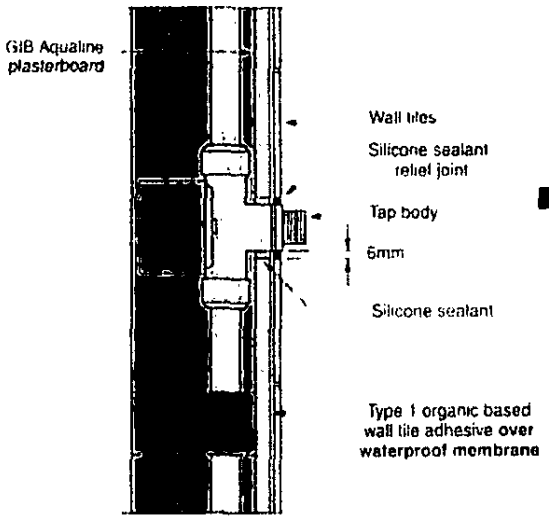


Figure 1 Typical Plumbing Penetration
(Where impact noise from pipes is an issue surface fix all pipes on resilient brackets)

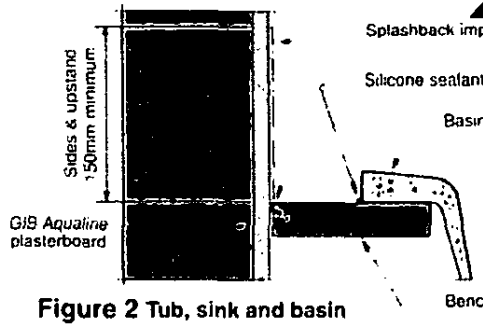
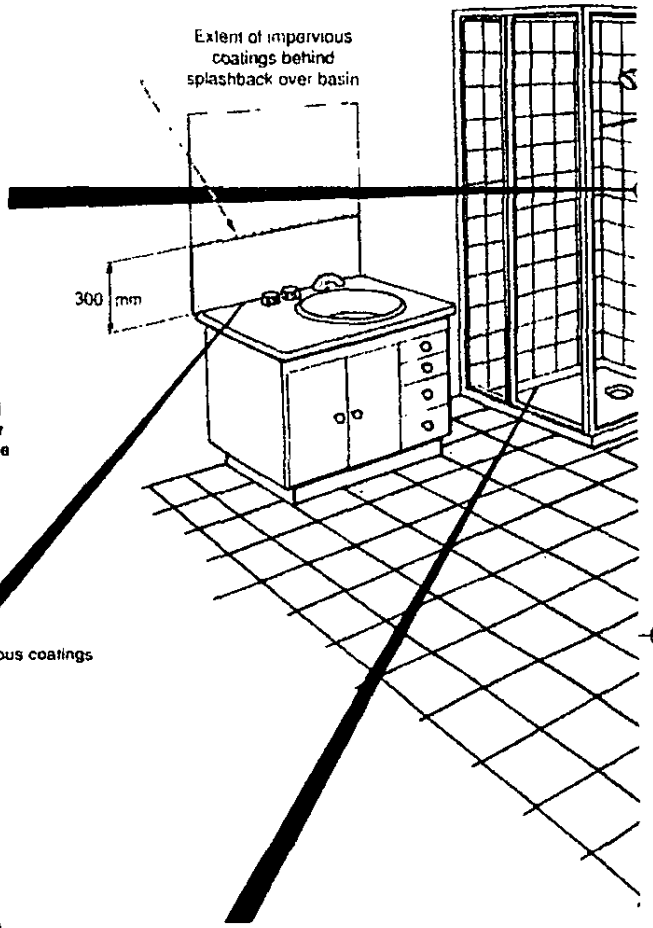


Figure 2 Tub, sink and basin



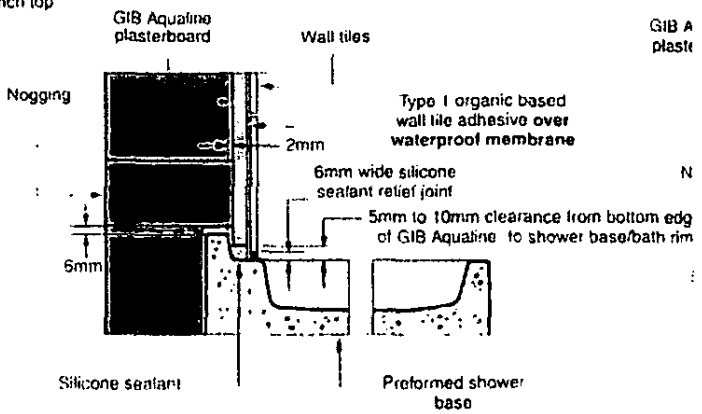


Figure 3 Preformed Shower Base Wall Junction
(Suitable where fire and sound ratings are not critical)

Notes:
- **Silicone sealants shall be of the mould inhibited type.**
- **For details on Fire Rated and/or Noise Control systems, refer pages 16, 17.**

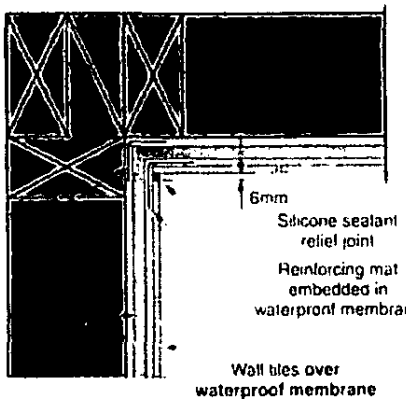
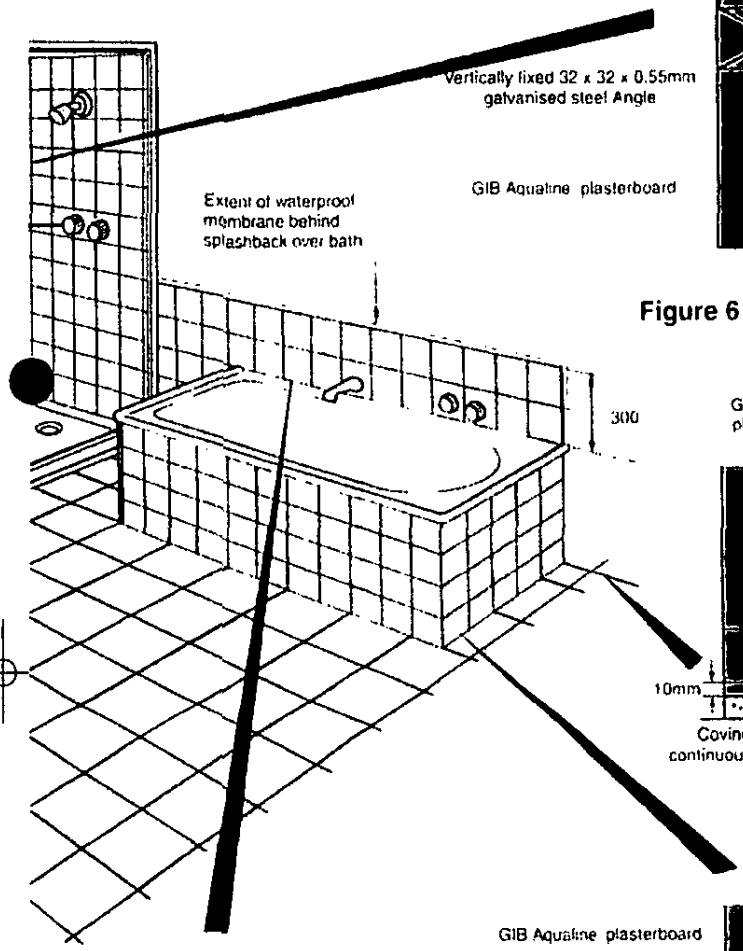
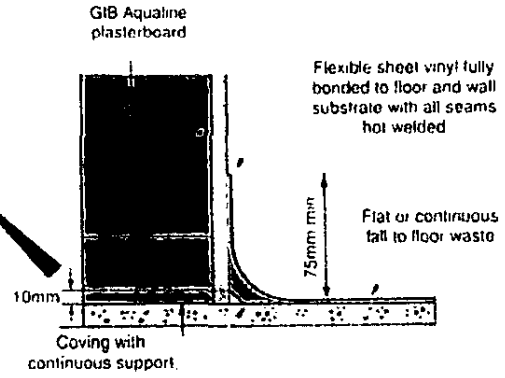


Figure 6 Tiled Shower – Internal Corner Detail





(a) Vinyl floor covering

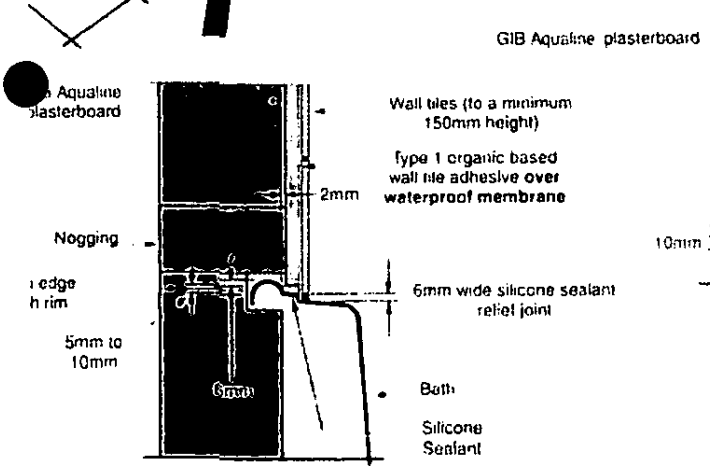
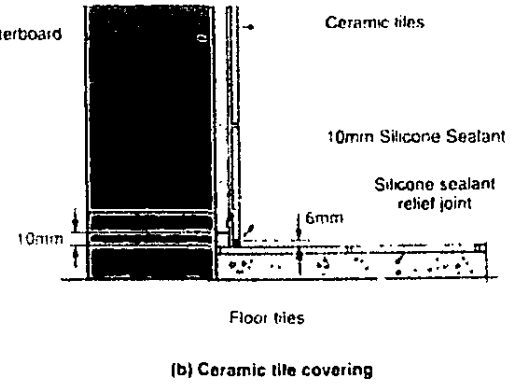


Figure 4 Bath Wall Junction Detail
(This detail is not permitted in Fire Rated or Noise Controlled areas)



(b) Ceramic tile covering

Figure 5 Wall to Floor Junctions
Bathrooms, Kitchens and Laundries

Shower Over Bath Details

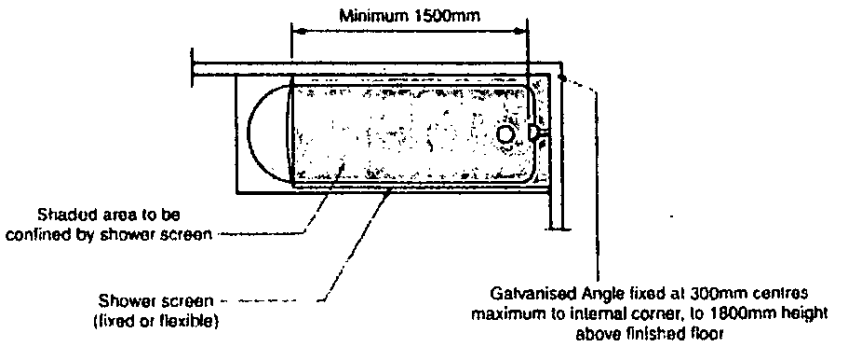


Figure 7
Plan view

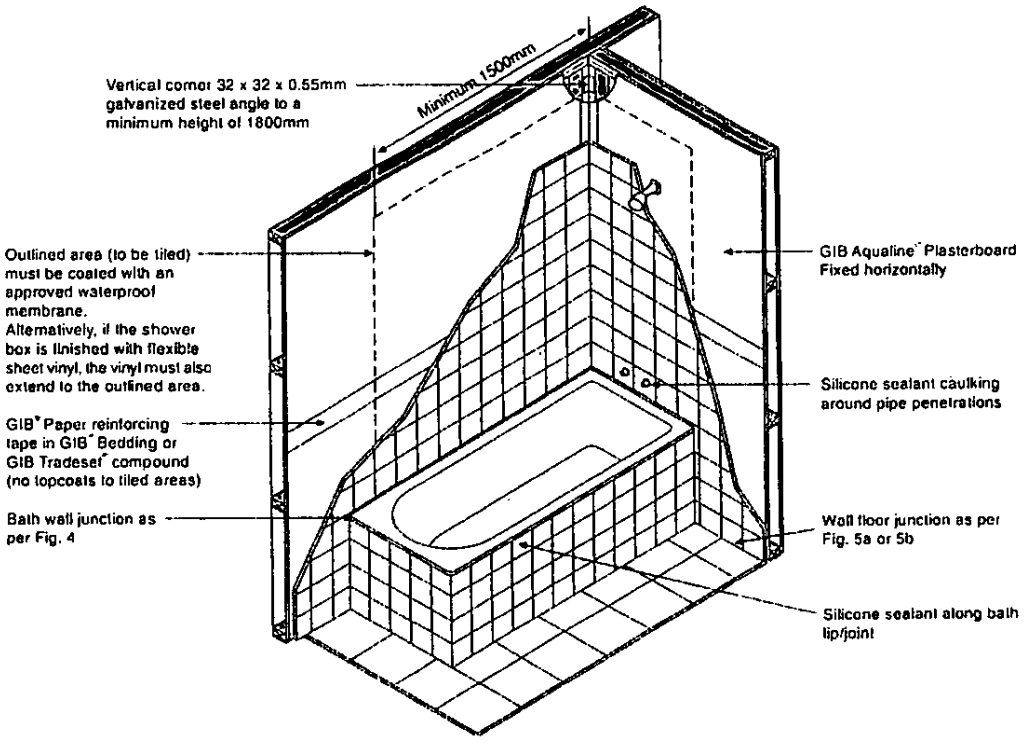


Figure 8
Isometric view

GIB

Typical Shower Details with an In-Situ Waterproofing Membrane

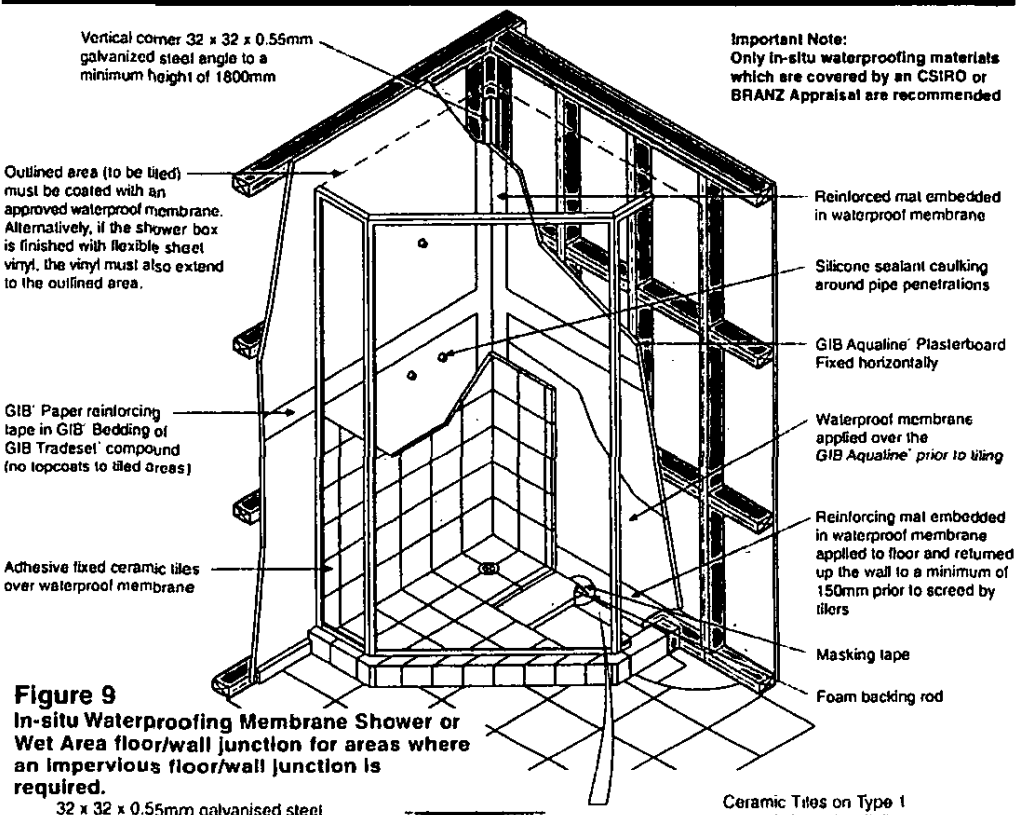
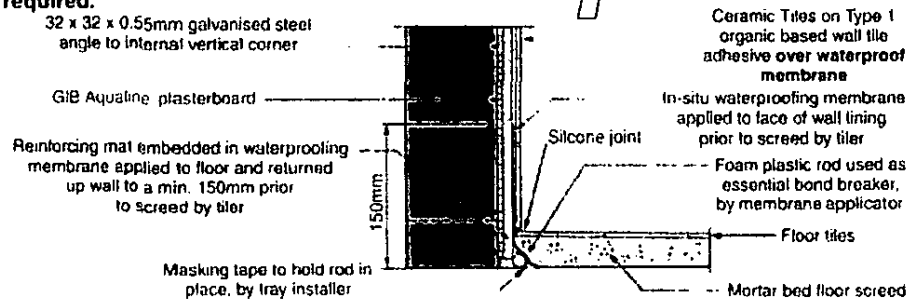
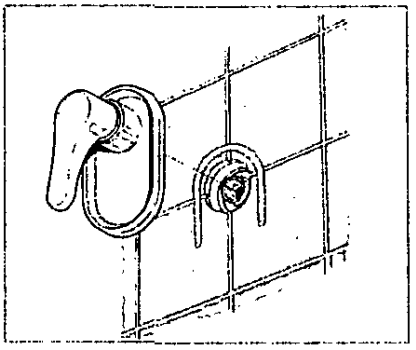


Figure 9
In-situ Waterproofing Membrane Shower or Wet Area floor/wall junction for areas where an impervious floor/wall junction is required.

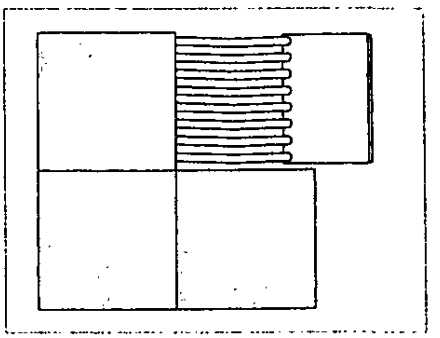


Sealing Under Mixer Fascia



Run a bead of silicone sealant around the mixer unit on the tiles extending below the bottom of the pipe aperture.

Applying Tile Adhesive



Tile adhesive must be combed horizontally to prevent water ponding at base of the wall.

Typical Wet Area Details - Steel Frame

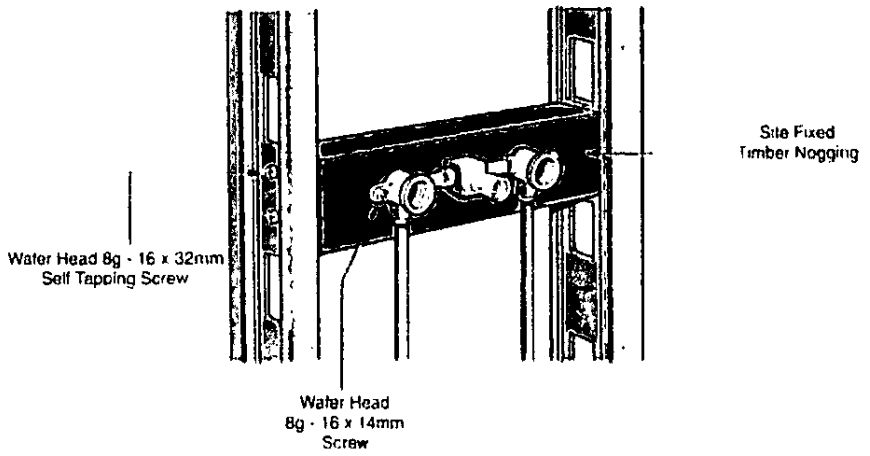


Figure 10
Shower Set Fixed to Site Fixed Nogging
(Always locate shower sets on walls where impact noise is not an issue)

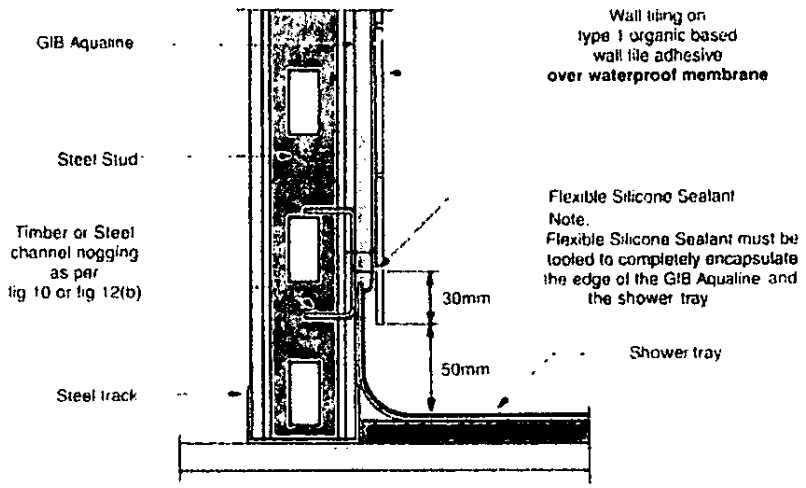


Figure 11
Shower Tray.
(Suitable where fire and sound ratings are not critical)

Typical Wet Area Details - Steel Frame

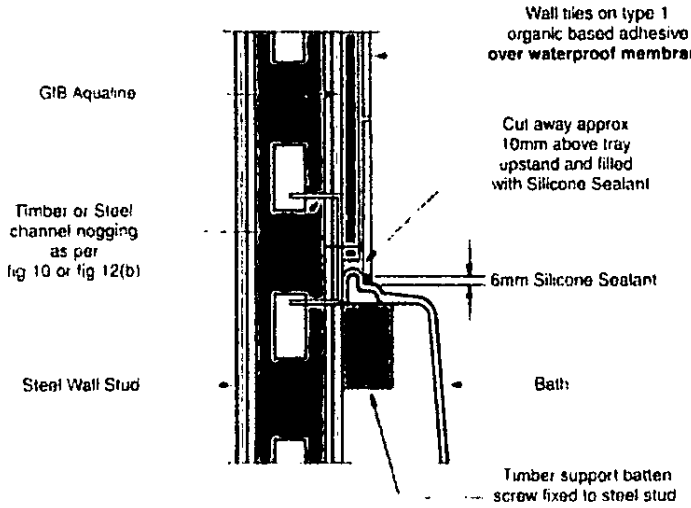


Figure 12(a)
Preformed Bath Wall detail for Steel Framing
(Suitable where fire and sound ratings are not critical)

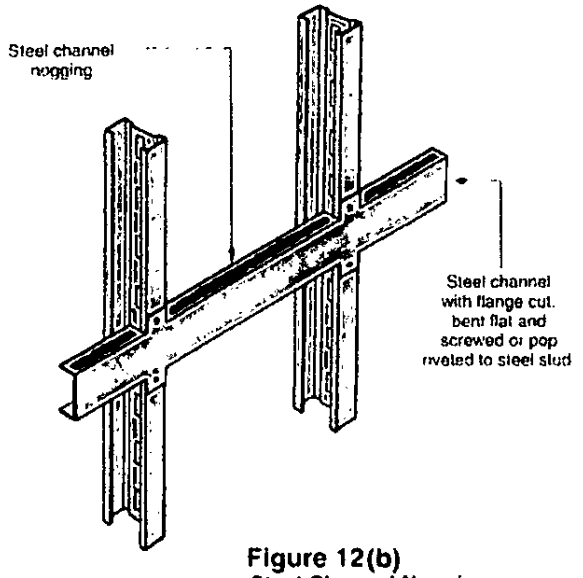


Figure 12(b)
Steel Channel Nogging

Typical Wet Area Details For Fire or Sound Rated Systems

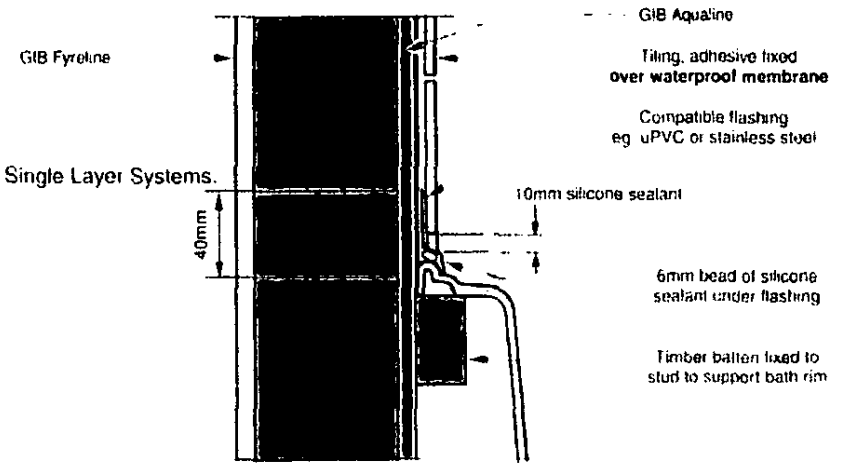


Figure 13 **Timber Stud: Typical Fire Rated Bath Wall Junction Detail.**

Note: 1. Steel studs utilise the same detail.
2. Double layer systems allow GIB Aqualine® to be fixed directly over GIB Fyreline®.

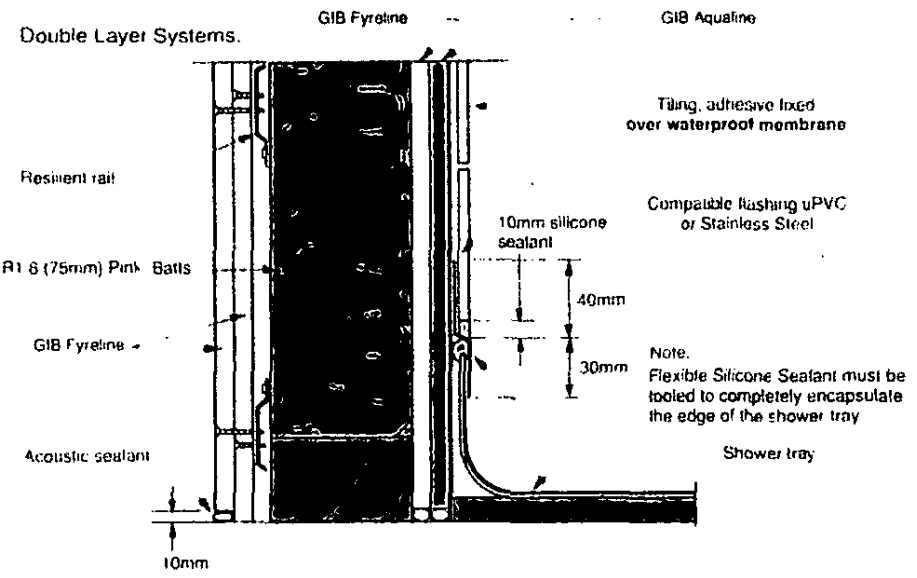


Figure 14 ***Timber Stud: Typical Noise Control Shower Base Wall Junction***

Note: 1. Generally position the resilient rail on the opposite side of the wall to the bath or shower.
2. The NZBC Clause G6 requirement of STC 55 does not apply between bathrooms.
3. Steel studs utilise the same detail **except that the inner lining on both sides of the frame shall be fixed hard to the floor.**

Typical Wet Area Details For Fire or Sound Rated Systems

Penetrations

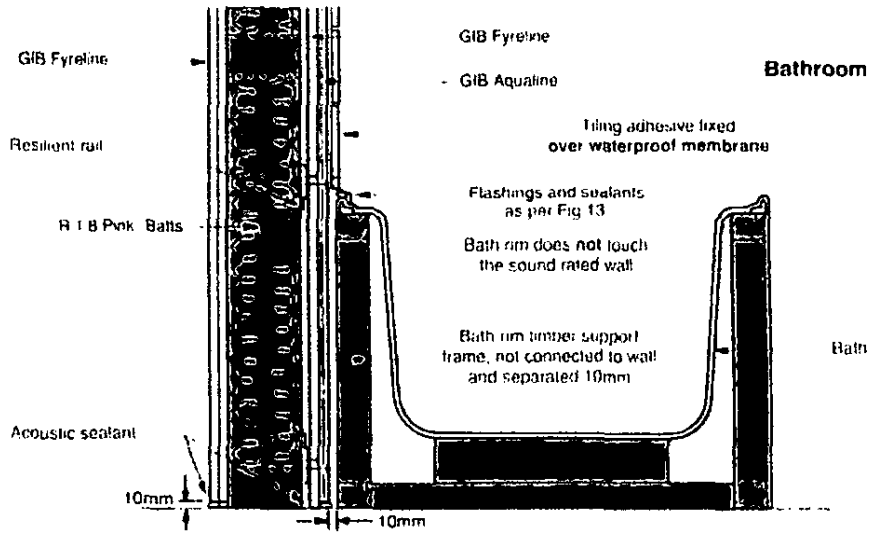
Avoid penetrations in Fire Rated and/or Noise Control walls.
Where the use of electrical outlets or switches on these walls is unavoidable, use only certified fire and acoustic rated fittings - these are readily available on the New Zealand market.

- Use only one outlet per stud cavity
- Never place outlets in back to back configurations
- *Do not locate shower heads, taps or any impact noise source appliance, e.g. driers on a noise control wall.*

Figure 15

Timber Stud: Typical Noise Control Double Layer System with Resilient Rail, Installed Adjacent Bath.

Note:
1. For best practice we recommend that the resilient rail is normally positioned on the opposite side of the wall to the bath or shower.
2. The following detail is recommended when a bath is located on the resilient rail side of the wall.
3. Steel studs use the same detail except that the inner lining on both sides of the frame shall be fixed hard to floor.



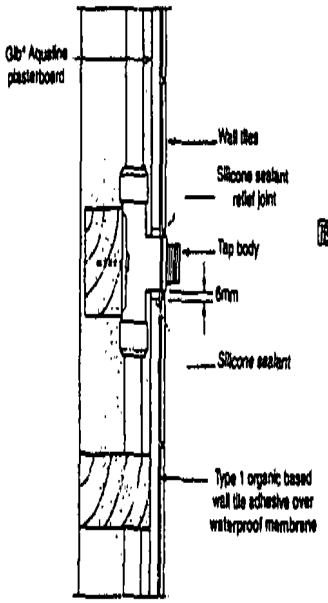


Figure 1 Typical Plumbing Penetration
(Where impact noise from pipes is an issue surface fix all pipes on resilient brackets).

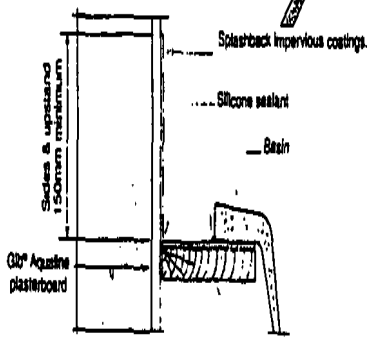
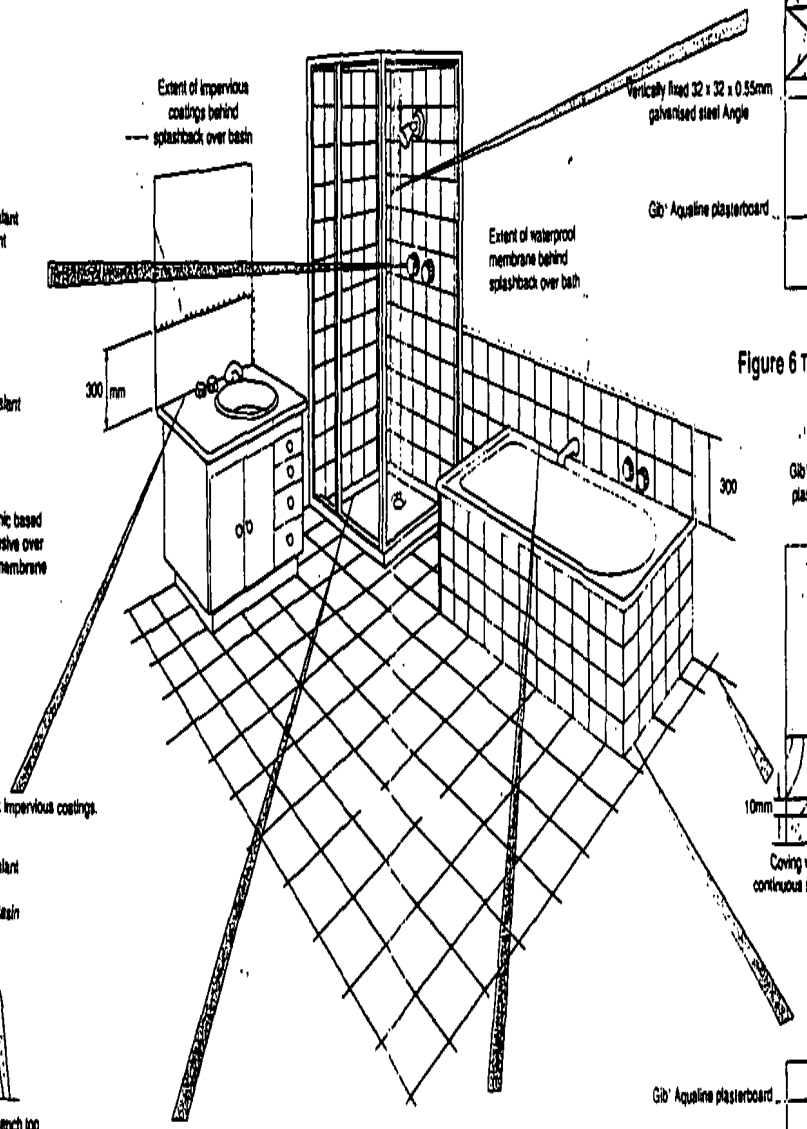


Figure 2 Tub, sink and basin



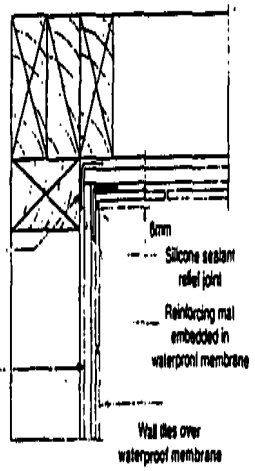
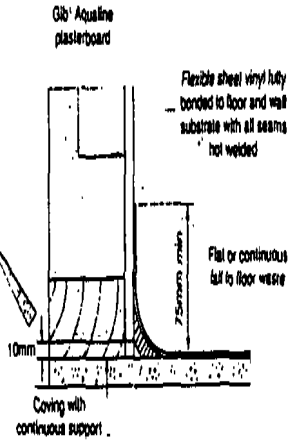
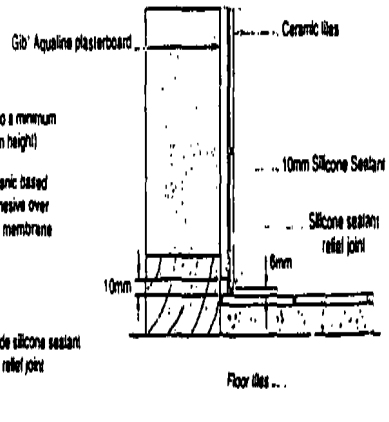


Figure 6 Tiled Shower - Internal Corner Detail



(a) Vinyl floor covering



(b) Ceramic tile covering

Figure 5 Wall to Floor Junctions
Bathrooms, Kitchens and Laundries

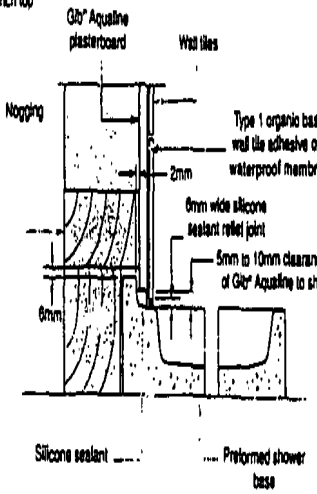


Figure 3 Preformed Shower Base Wall Junction
(Suitable where fire and sound ratings are not critical)

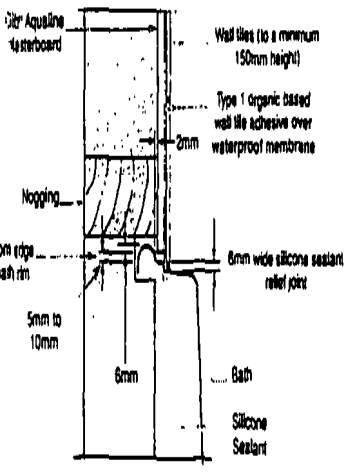


Figure 4 Bath Wall Junction Detail
(This detail is not permitted in Fire Rated or Noise Controlled areas)

Notes:
- Silicone sealants shall be of the mould inhibited type.
- For details on Fire Rated and/or Noise Control systems, *refer pages 18, 17.*

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3.0 COMPONENT SELECTION GUIDE

Design details, which support the information contained in this document, are available from the Palliside website www.palliside.co.nz or on CD from Dynex Extrusions Ltd.
A full list of the design details available can be found in the Palliside Technical Guide (paragraph 3.1).
Refer to the back of this document for contact details.

1.0 INSTALLATION PREPARATION AND OVERVIEW

1.1 Storage and Handling

Weatherboards must be laid flat in their original packaging (or otherwise covered) on bearers at 600mm centres. Do not lay other materials on top. Incorrect storage technique can result in buckling or distortion.

Weatherboards come in packs of four lengths. To remove weatherboards from the pack, cut through the full length of sleeve (outside boards in pack face inwards) and lift each weatherboard out.

Where possible it is recommended that two people carry out handling and fixing of Palliside.

1.2 Temperature

Additional care should be taken when fixing Palliside at temperature extremes. Where possible installation should be carried out in a temperature range of between 10°C and 25°C

In colder temperatures, care should also be taken when cutting and nailing the product. For example, it may be necessary to pre-drill the nail holes in each weatherboard.

1.3 Setting Out

The effective cover height of a Palliside weatherboard is 260mm nominal.[1]

To work out the actual cover height of each course of weatherboard, remove 2 lengths from the packet and place them together measuring from the bottom of the lower board to the base of the second and use this as a guide for board courses. Make up a storey rod using this cover height to use as a guide.

A *storey rod* can be a length of timber or other material with the cover height for each course of weatherboard marked out on the length. This can be used to work out where the weatherboard will finish at head flashing and soffit height, as well as helping ensure corner alignment is maintained throughout the installation.

1.4 Tools Required

Palliside requires no special tools and can be cut and nailed like timber using a wide variety of standard building equipment including circular saws, jig saws and other power tools.

1.4.1 Cutting

Palliside weatherboards and trims can be cut using any of the following methods:

- **A standard hand saw or tenon saw.**
- **An electric circular saw or drop saw, using a fine-toothed blade (minimum 20 teeth).**
- **An electric jigsaw or router (when cutting a straight horizontal line when the head flashing falls on part of the board profile, or for cutting utility holes, etc.**

1.4.2 Hole Forming

When cutting or drilling holes for utility pipes, standard hole-forming attachments can be used. Care should be taken not to force the jigsaw or drill too hard or quickly.

1.4.3 At the Base of Openings

Mark the board in place, remove and cut to suit using a jigsaw. An alternative to this is to cut down either side to the score line using a saw, use a utility knife to score along the length of the weatherboard and then snap the section out by hand.

[1]Weatherboard cover heights do not vary significantly from batch to batch

1.4.4 At the Head of Joinery

For best results a router (or jigsaw with a guide) can be used when cutting head flashing detail into the weatherboard.

Notes:

- **Surfaces of circular saws must be free from burrs prior to working with Palliside.**
- **Remember to always adopt standard safety precautions when using power tools to cut Palliside.**

1.5 Fixings

Fixings for Palliside (timber frame)

Type of Fixing	Installation Method Drained Cavity	
	Over Structurally Fixed Battens	Over Non-Structurally Fixed Battens
Manual Nailing	The HDG 40 x 2.5mm Palliside nail must be used (fixed at maximum 600mm centres). The Palliside nail has been specially designed with a smaller (5mm) head. 5 kg boxes of Palliside nails are available as part of the standard range of accessories.	Unless installing over structurally installed battens[2], a 60 x 2.8mm HDG flat head nail must be used (fixed at maximum 600mm centres). Such nails can be sourced from your preferred Building Merchant.
Impulse Driven Nails A nailing tool such as a Paslode finishing nailer can be used to fix Palliside weatherboards	Paslode ND50mm SS304 grade brads, or equivalent (2 per stud, skewed, at a maximum spacing of 600mm centres). *(ITW/Paslode product code B20054)*	Paslode ND60mm SS304 grade brads, or equivalent (2 per stud, skewed, at a maximum spacing of 600mm centres). *(ITW/Paslode product code B20055)*
Screws Palliside may be fixed using screws	8 gauge x 1¼" SS304 grade countersunk square drive wood screws or equivalent. *(MSL/Fortness Code SFQX 832)*	8 gauge x 2" SS304 grade countersunk square drive wood screws or equivalent *(MSL/Fortress Code SFQX850).*

1.5.1 Summary on Fixings

1.5.1.1 Use of Standard Palliside Nails Over a Drained Cavity

The standard 40x2.5mm Palliside nail can be used when nailing Palliside to a structural batten system. (Refer to Palliside Technical Guide)

1.5.1.2 Requirement for Stainless Steel in Sea Spray Zones

Due to the unique hidden nailing system and anti-capillary groove, there is no requirement to use stainless steel nails when fixing Palliside in sea spray zone locations as specified in NZS 3604.

The specification of Stainless brads and screws deals with the best option in absence of a HDG finish.

In these locations, any nail fixings that are to be exposed and not hidden by the weatherboard interlock; fixing should be of equivalent size, with a minimum SS316 treatment.

Accordingly, in these locations it would also be prudent to increase the specification of screws that are to be exposed, and not hidden by the weatherboard interlock, to SS316 grade.

1.5.1.3 Curved Walls

As covered in the Palliside Technical Guide (paragraph 2.10.2) when Palliside is to be installed to a curved wall, the weatherboard needs to be screwed in place using 8 x 1¼" SS304 grade countersunk square drive screw (MSL/ Fortress Code SFQX832) or equivalent.

1.5.1.4 Steel Frames

As steel framed construction is a specific design, the manufacturer of the steel frame should be consulted to ensure any fixing selected is suitable, however as a guide the minimum specification should be a self-drilling SS304 grade countersunk square drive screw or equivalent. The length of the fixing must cater for the thickness of the thermal break (minimum 10mm) and allow for a minimum 10mm penetration through the frame.

[2]Standard Palliside nails can be used when installing Palliside on a cavity meeting the parameters of Paragraph 2.12.4 of the Palliside Technical Guide for structurally installed battens.

2.0 PALLISIDE FIXING PROCEDURES (DRAINED CAVITY)

Pre-line Checklist

- Has the correct type of building paper/wrap been selected and installed correctly?
- Has flashing tape been applied to the base of the sill and to all corners of windows and door openings?
- Is the moisture content of the timber 18% or less?
- Is the timber frame straight and studs inline?

2.1 Installation of Cavity Battens

- **All Vertical battens must be installed at a maximum 600mm centres.**
- **A continuous horizontal batten is permissible at the soffit only.**
- **An additional run of vertical battens should be allowed for at the side of openings.**
- **Vertical Battens on external corners should be offset slightly by 10mm to allow a continuous air gap behind the Palliside corner base flashing.**
- **Horizontal spacers are required to allow Palliside horizontal starting trims to be fixed at the required 300mm centres providing they are:**

  a) A maximum 100mm in length

  b) Installed with a minimum slope of 5°

  c) Spaced at least 100mm away from any vertical batten or edge of window opening

2.1.1 WANZ Window Installation System

We recommend that the principles of the Window Association of New Zealand - Window Installation System are adopted when specifying Palliside to be installed over a drained cavity. These principles are covered in relevant Palliside design details for installation around windows. (Refer to the Palliside Technical Guide, paragraph 2.12, for an overview of scope for installing Palliside over a drained cavity).

In principle this means allowing for the use of joinery support bars at the base and cavity closer flashings at the head of all openings. These are available for purchase from your preferred aluminium joinery manufacturer.

2.1.1.1 WANZ Support Bar.

The WANZ Support bar is installed at the base of openings to help improve the support of aluminium joinery.

The support bar is installed ensuring that it is at least 100mm short of either side of the side of the opening.

2.1.1.2 Cavity Closer Flashing

The WANZ cavity closer flashing is installed at the head of all openings (allowing for the head flashing to be installed in front of the cavity batten rather than behind).

It needs to be cut and installed a minimum 50mm past the external face of the battens either side of the opening (the layout of battens should take this into consideration).

The back of the cavity closer flashing must be taped to the building paper/wrap and battens installed above the cavity closer. Packers at 300mm centres should be installed to enable the head flashing to be fixed correctly.

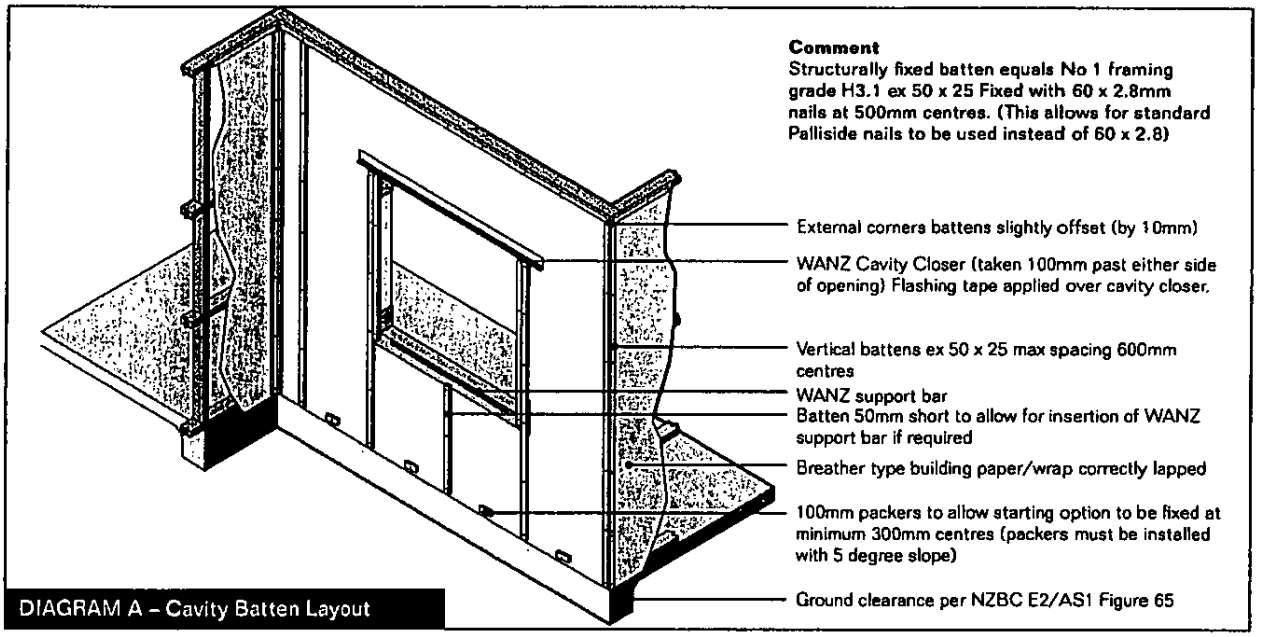


DIAGRAM A – Cavity Batten Layout

2.2 Installation of Base Accessories (Starting Options)

Before the installation of weatherboards and joinery commences, all base accessories need to be fixed in place. This should occur after the straightening of frame and installation of building paper/wrap (and after the installation of cavity battens).

Base accessories include all starting pieces, all corner base pieces, and the two-part jointer base piece[1].

- **Fix all base accessories at 300mm centres.**
- **Use a chalk line and level to ensure that selected horizontal starting options are fixed level. This is particularly crucial with starter strip.**
- **Starting accessories should also be left slightly short of the selected corner option base pieces and vertical trims, not overlapped.**
- **Mitre trims where required.**

2.2.1 Starter Strip

Palliside starter strip should be installed so there is a minimum 50mm weatherboard overhang in accordance with the requirements of the New Zealand Building Code, (refer ground clearances in the Palliside Technical Guide).

If installed over a drained cavity the **Palliside cavity vermin tray** should be attached prior to the installation of the accessory to the battens

- **Starter strip can be used when installing Palliside above joinery between brick veneer (Refer design detail DC31)**
- **This accesory cannot be used when starting with a part board, or along raked areas**

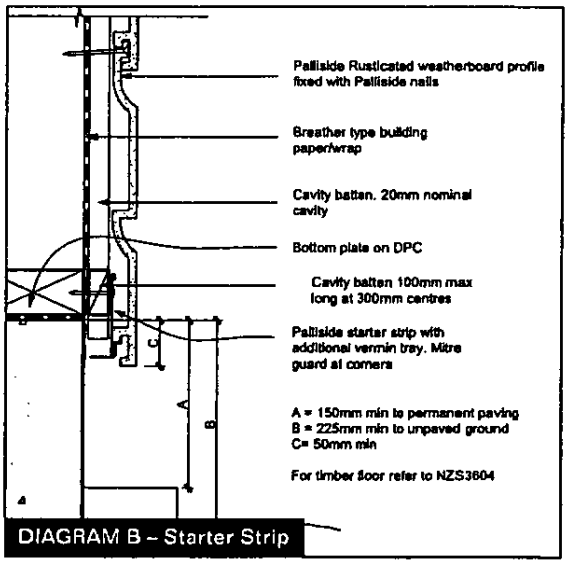


DIAGRAM B – Starter Strip

2.2.2 Cavity Vermin Tray

The cavity vermin tray clips into the base of the Starter Strip or can be glued to the back of the desired starting option.

The cavity vermin tray meets the requirement of E2/AS1 which requires a minimum opening area of 1000mm² per lineal metre of wall and must be installed at the base of the cladding, and in accordance with NZBC Acceptable Solution E2/AS1, where a gap is greater than 4mm wide.

[1] If the 2-Part jointer option is selected.

2.2.3 One Part Channel Trim

When can One Part Channel be used with the Rusticated Profile Weatherboard?

The One Part channel can be used as a universal starting option, around the apron of top storeys that contain raked/sloped rooflines and/or different starting heights or as a vertical trim abutting another cladding.

When can One Part Channel be used with the Traditional Profile Weatherboard?

The One Part channel can be used as a vertical trim abutting another cladding but is not ideally suited as a starting option for horizontal part board starts and raked/sloped rooflines[2].

When Installed on a horizontal, 5mm drain holes must be drilled at maximum 600 centres.

2.2.4 2-Part Channel

When can 2-Part Channel be used with the Rusticated Profile Weatherboard?

The 2-Part channel trim can be used as a universal finishing option for both gable ends and horizontal finishes where the weatherboard does not finish on a scallop, around the apron of top storeys that contain raked/sloped rooflines and/or different starting heights or as a vertical trim abutting another cladding[3].

When can 2-Part Channel be used with the Traditional Profile Weatherboard?

The 2-Part channel trim can be used as a universal finishing option for both gable ends but not horizontal finishes, around the apron of top storeys that contain raked/sloped rooflines or as a vertical trim abutting another cladding.

2.3 Installation of Corner Options

All base pieces of corner options must be installed **prior** to the installation of the weatherboard and must be fixed at 300 centres.

It is permissible to join base pieces if required. (When joining a 2 piece option, stagger the base and cap join).

When installing over a drained cavity, vertical batten on corners should be offset slightly to allow airflow behind the base piece.

2.3.1 90° External Corner Soaker Option

When using the Palliside corner soaker option the correct shaped base piece must be installed prior to the installation of weatherboards. (Refer Diagram C.1)

Once the weatherboards have been installed to one wall, continue on the second wall clipping in place the corner soaker cap pieces (which match the shape of the Palliside profile). Ensure that the soakers line up tidily. If there is difficulty fitting these in place or gaps are prevalent to one side, check to ensure that weatherboards are aligned correctly.

No solvent or sealant is required to hold these in place.

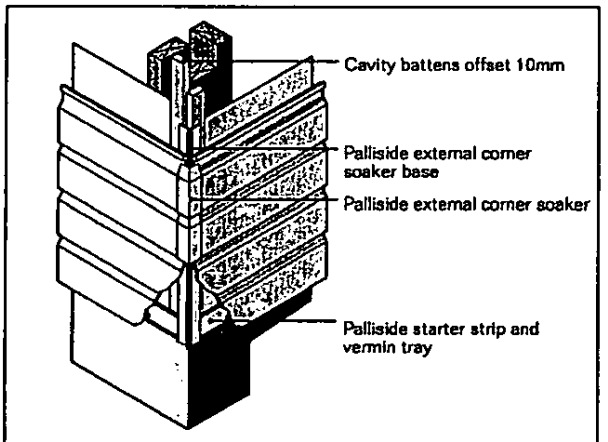


DIAGRAM C.1 – External Corner Soaker

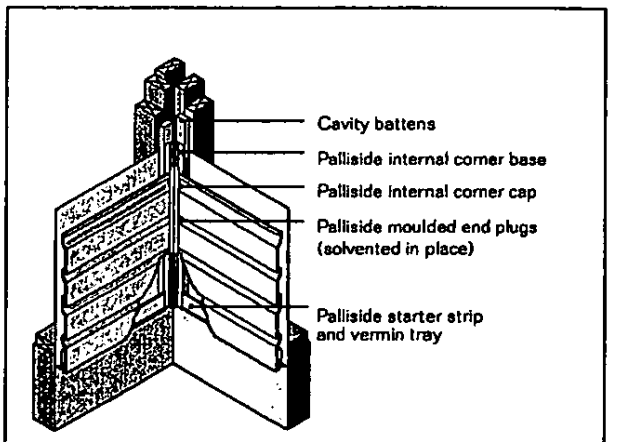


DIAGRAM C.2 – Internal Corner

[2]One Part channel is suitable for use as an alternative to the Palliside window scriber when installing over a drained cavity. This trim assists with the location of the moulded end plugs installed into the profile gaps.

[3]Providing that the spine of the flashing is not visible.

2.3.2 90° Boxed Internal Corner Option

This two-part option provides a boxed finish for 90° internal corners.

The base piece has specially designed location tabs (refer diagram C.2) that assist the location of the weatherboard. The weatherboards are then installed before the male cap piece is pushed in place. This cap features fins to aid the installation of the Palliside moulded end plugs that are inserted in to the gaps using solvent cement.

2.3.3 90° and 135° Boxed Corners

2-Part Boxed 90° External Corner (Refer design detail DC07)

When preferred there is an option available for 90° boxed external corner finish. While the base piece is installed prior to the installation of weatherboards, once the male cap piece is pushed into place and allowance made for the fixing of Palliside moulded end plugs.

2-Part Boxed 135° Corner (Refer design detail DC37)

The 135° corner can be used for either internal or external corners by reversing the base section, as is commonly required around bay windows.

Care should be taken to avoid taking the weatherboards past the clearly marked witness lines of the selected base piece. The cap piece is then fixed in place and allowance made for the Palliside moulded end plugs to be inserted using solvent cement.

2.3.4 Non-Standard Corners *(Refer design detail DC25)*

Drawings are available showing how to provide custom made back flashings for non standard corners.

2.3.5 Timber Boxed Corners *(Refer design detail DC32)*

If preferred, timber corner facings may be used to enhance the character of design. A drawing is available demonstrating how to complete this option. A timber scriber can be cut to suit the traditional weatherboard profile or moulded end plugs can be used.

Timber facings should be screwed through the Palliside into the framing behind, sealed and painted to suit.

2.4 Jointing Options

Note: As stated in the Palliside Technical Guide covering (paragraph 2.5) weathertightness scope; there is no limitation when using the moulded flat soaker option for drained cavity installation.

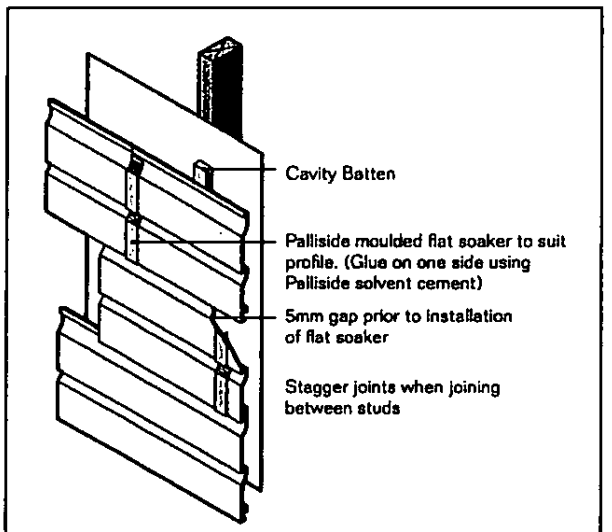


DIAGRAM D.1 – Moulded Flat Soaker

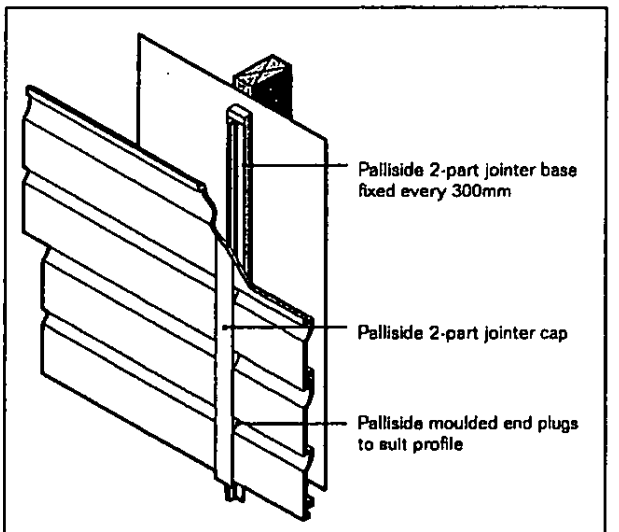


DIAGRAM D.2 – 2-Part Jointer

2.4.1 Moulded Flat Soakers

Moulded flat soakers that match the shape of the chosen weatherboard profile can be used. When using this option the soakers can be installed off stud, providing that weatherboard joints are staggered.

When installing weatherboards a 5mm gap must be a left to cover minimal thermal movement. The flat soaker can be inserted later by carefully applying solvent cement to one side of the back of the flat soaker. (Push the soaker in place ensuring that that it engages correctly and that the spine of the soaker is hard against the weatherboard on the solvented side).

There is no base piece required for this option

2.4.2 2-Part Jointer

The female base piece is installed prior to installation of weatherboards and must be fixed in place at maximum 300mm centres. When fixing weatherboards leave them 5mm short of the spine of the base piece. The cap is then fixed in place and allowance made for Palliside moulded end plugs to be inserted in place using solvent cement.

This jointing option can only be used when joining on stud. This jointing option can be hidden by strategic placement of downpipes etc.

2.5 Installation of Weatherboard

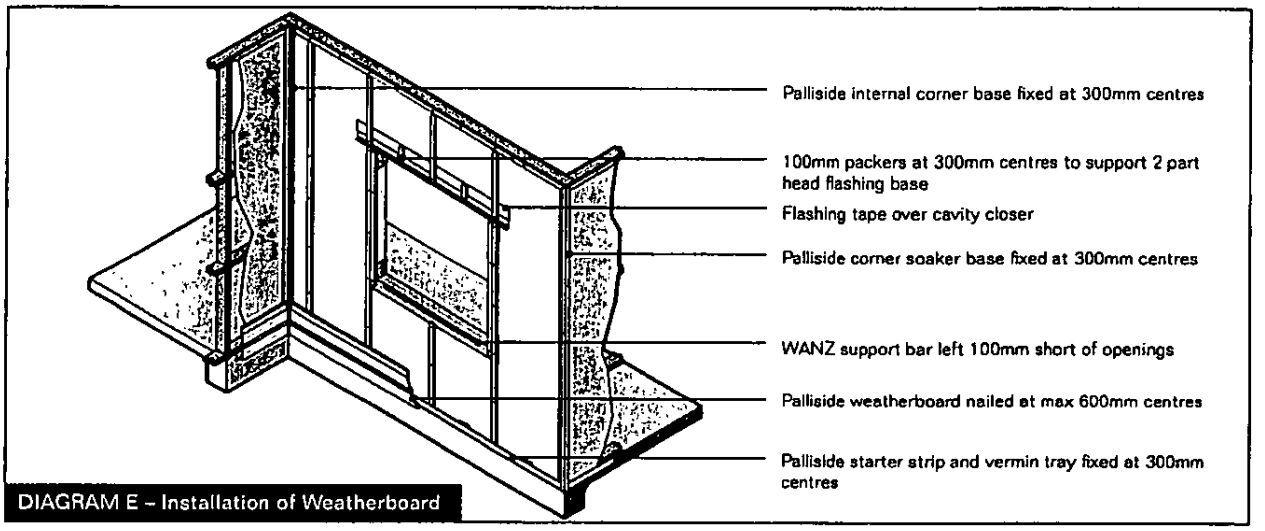


DIAGRAM E – Installation of Weatherboard

Once starting heights have been confirmed, building paper/wrap correctly lapped and fixed and base accessories have been fixed in place, it is time to commence the installation of weatherboards

When nailing Palliside, point the fixing slightly downward (this is to avoid splitting the top of the back part of the weatherboard, which leads to creeping out of level during installation) and nail from one end to the other or from the middle outwards.

Fix at maximum 600mm centres leaving a 5mm[4] gap between weatherboards when joining the boards.

Notes:

- **Ensure Palliside nails, are hit home firmly but not over nailed**
- **When using brads use 2 per stud skewed.**
- **When using screws ensure that the head of the screw is flush with the fixing groove to ensure the next weatherboard can overlap without interference.**

Push into place the next course of boards correctly and continue fixing.

The locking procedure is designed tight to protect from water and dust. If difficulty is experienced interlocking the weatherboards, lay a timber off-cut on the upper edge of the board and gently tap into place with a hammer. Do not hit directly down on top of the weatherboard.

It is advisable to check that the courses of weatherboard remain level using a spirit level and/or storey rod.

[4] **When using the moulded flat soaker joining option.**

2.5.1 Install Weatherboard to Sill Height

Carry out installation of weatherboard as described earlier to the base of the opening, cutting weatherboard around opening to suit (making sure that the cut of the weatherboard is no higher that the sill trimmer plate). Pack out weatherboard at sill trimmer. Fix the cut board at maximum 600mm centres. To ensure that the fixing will be covered by the widow joinery, place it within 10mm of the top of the cut board.

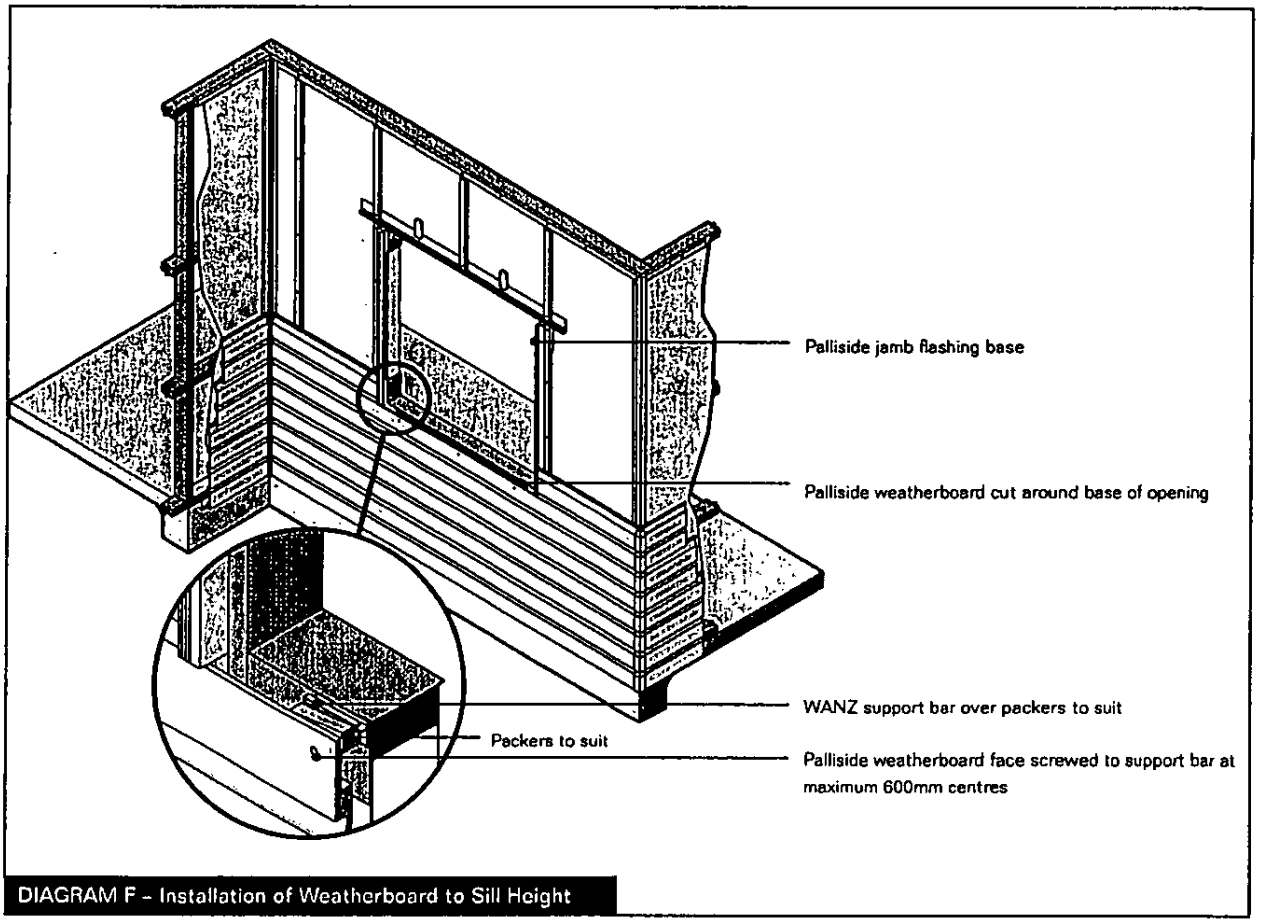


DIAGRAM F – Installation of Weatherboard to Sill Height

2.5.1.1 Packing Out Cut Weatherboards

When starting or finishing on a part board or where a part board finishes below joinery, timber packers should be used to pack out the weatherboard. Board off-cuts (6mm x 2) can often be used for packing out the Rusticated profile (18mm).

Any horizontal cut areas still need to be nailed in place at a maximum 600 mm centres. Nail these areas so that the fixing is not visible (eg. Covered by joinery or trim). Fastfix fasteners can be used in some instances, particularly in holding the weatherboard and head flashing in place above windows.

2.5.1.2 Cut Traditional Board Start (Horizontal Only)

Due to the tapered nature of the traditional weatherboard profile, starting part way up the face of the weatherboard may make the area unsuitable for using any of the standard starting trims discussed in this document. Therefore particular care needs to be taken with the weatherboard cut.

If desired, the two-part channel trim can be used by modifying (reducing) the base and cap to allow the cap to fit tighter to the base. Due to the modification, solvent cement may be required to glue the cap piece in place. Drain holes still need to be drilled to allow moisture to get out.

2.5.1.3 Installation of Weatherboard Below Doors and Ranch Sliders *(Refer design detail DC44)*

Palliside weatherboard must be cut around and continued below doors and ranch sliders. The WANZ Support bar also meets the requirement of vermin proofing in this application.

2.6 Installation of Window Flashings and joinery

Windows should not be installed into the openings until the weatherboard has been fixed to the sill height and sill and jamb base flashings fixed correctly in place.

All aluminium joinery should be compliant with the parameters outlined in the Palliside Technical Guide (paragraph 2.9.1).

2.6.1 Installation at Base of Opening (Sill)

There is no sill tray required when installing Palliside over a drained cavity, however the cut weatherboard below the opening must be fixed to the support bar/packer (if used) at maximum 600mm centres before installing joinery.

Depending on the gap between the front of the weatherboard some sort of vermin protection may be required. This can be achieved by trimming the required tear off strips from a length of vermin tray and placing it facing outward fixed in place behind the face of the weatherboard. The vermin strip will be non-visible after installing the selected joinery.

2.6.2 Installation of Jamb Flashing Base and Joinery

The base of the vertical jamb flashing is fixed in place either side of openings prior to the installation of joinery and weatherboards. This flashing is compatible for both Palliside profiles.

Cut the jamb flashing base to match the height of the opening. Fix this flashing in place so that the spine of the jamb flashing is flush against the side of the opening. Repeat this process for both sides of the opening.

At this point measure the width of the joinery ensuring you will have a minimum flange cover of at least 10mm either side of the opening once the joinery is installed, as outlined in the Palliside Technical Guide (paragraph 2.9.1)

2.6.3 Installation of Joinery

Place joinery into the opening then pack and nail in place ensuring that the joinery is level.

While the joinery does not need to be centred it must be fixed so that:

- **A minimum 7.5mm gap is maintained around the perimeter between the joinery reveal and the opening (to allow for an airseal to be installed).**
- **There is at least 10mm flange cover over the jamb flashing base either side (the line on the face of the jamb flashing base nearest the spine indicates the minimum 10mm cover required) and 8mm at the sill.**

Do not remove any of the tear off tabs from the jamb flashing base at this stage.

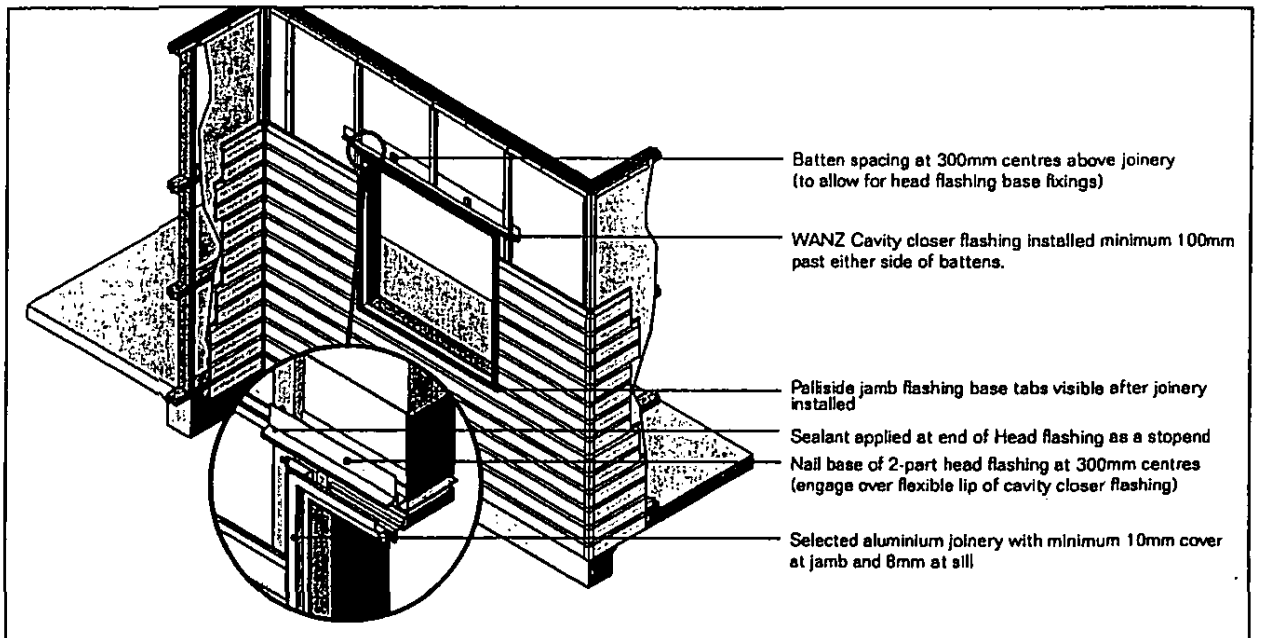


DIAGRAM G – Installation of Joinery

2.6.3.1 Windows Close Together

Where two windows closely adjoin each other it may be necessary to tack windows in place and remove at least one while the weatherboard is installed to the head flashing height.

2.6.4 Installation to Head of Window

Continue to install weatherboards either side of the opening up to the head flashing level.

2.6.5 Installation of Head Flashing

Clip together the 2-part head flashing and place it above the joinery so that the base engages the flexible lip of the cavity closer against the cavity battens behind and the cap rests on the flange of the aluminium. Centre this in place so the there is a minimum 20mm cover either side of the joinery. Nail through the base of the head flashing at 300mm centres. There is no need to tape the head flashing when it is placed in front of the cavity battens.

- **Nail packers (to suit) in place to the base of the head flashing evenly spaced at maximum 600 centres.**
- **Apply sealant at either end of the head flashing to form a head flashing stop end.**
- **Remove the head flashing cap and insert cut weatherboard in place**

2.6.6 Installation of Weatherboard Above Joinery

Measure where the cut is required for the head flashing to penetrate the face of the weatherboard. Cut the weatherboard out to suit, taking care to ensure that the horizontal cut for the head flashing is neatly finished and will allow the head flashing to sit tidily

2.6.6.1 Full Weatherboard Profile Above Joinery

If it works out that a full weatherboard profile can be placed above the head flashing it will be necessary to cut a slot into the weatherboard either side of the opening to allow for the head flashing to be fitted in place.

Then trim the nailing groove from a weatherboard off-cut (e.g. taken from the cut around the base of the opening) and nail this across the base of the head flashing, level with the nailing groove either side of the opening. Place the weatherboard in place and continue.

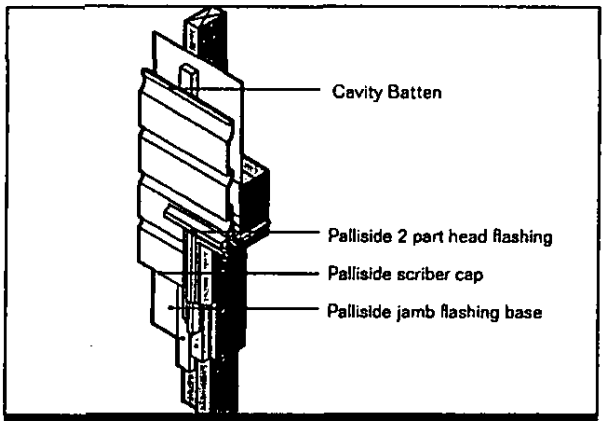


DIAGRAM H.1 - Cut Weatherboard Profile at Head Flashing

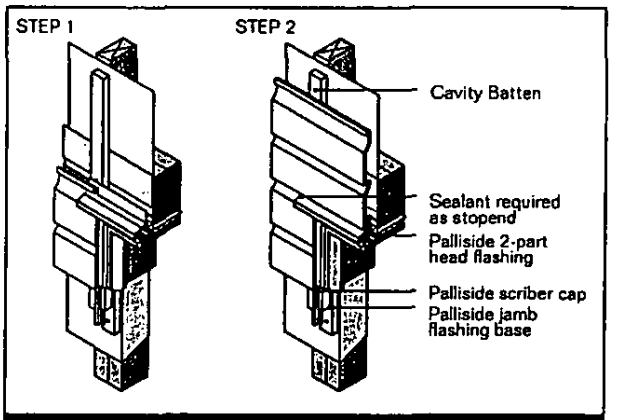


DIAGRAM H.2 - Full Weatherboard Profile at Head Flashing

2.6.6.2 Slot to Side of Head Flashing.

In instances where the base piece of the head flashing penetrates the cut weatherboard slightly, slope the cross-section of the cut on an angle to allow the base to sit nicely. Use sealant to provide additional protection in these areas.

2.6.6.3 Securing Weatherboard Above Head Flashing in Place

When the head flashing has been cut into the weatherboard profile it is necessary to hold the base of the weatherboard in place above the head flashing using Fastfix Fasteners, unless head flashing has been installed in accordance with paragraph 2.6.6.1

To achieve this ensure that the weatherboard is correctly packed out and pre-drill 6mm holes at 600mm centres spaced evenly across the face of the opening. Hammer Fastfix fastener in place.

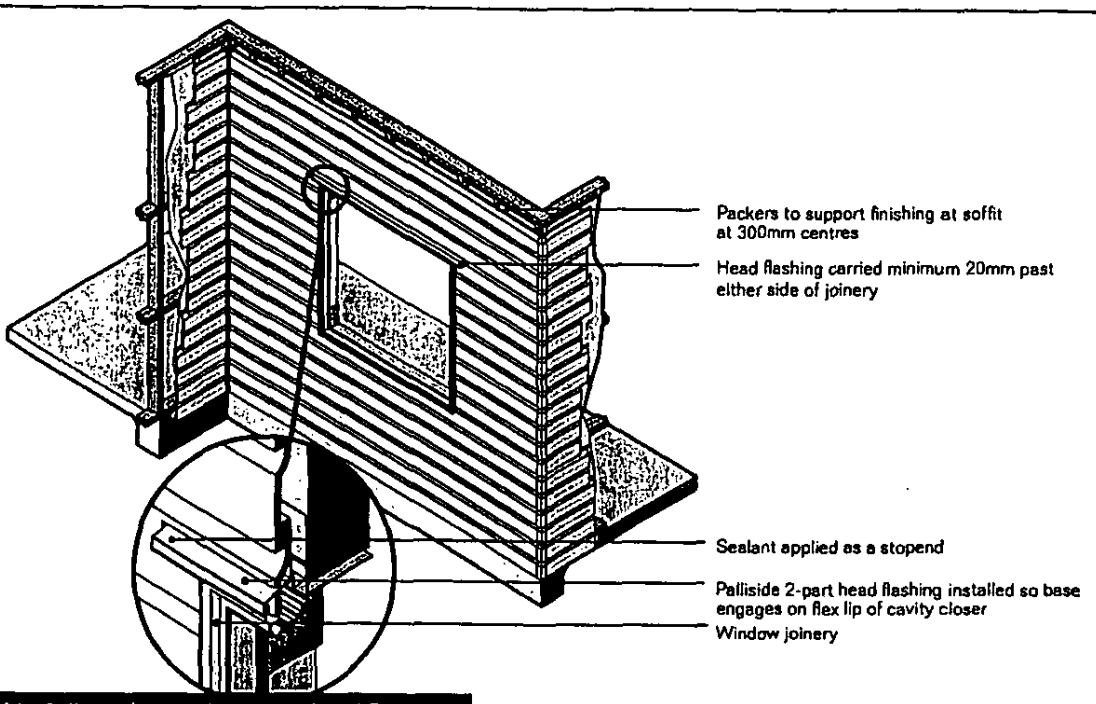


DIAGRAM I – Palliside Installation Above Head Flashing

2.7 Installation to Soffit

Carry out the installation of the weatherboard above the head flashing to soffit.

2.7.1 Soffit Finish

Trim and pack out weatherboard to suit soffit height (particularly horizontal soffit finishes). For best results reduce the spacing of these packers to 300mm centres.

2.7.1.1 Horizontal Soffit Finish

Palliside foam soffit mould is a 40mm x 18mm cornice moulding which can be used as a horizontal finish at soffit line. This trim is available in 3.6m lengths to match the chosen Palliside colour.

This accessory may be either face nailed using 40x2.0mm HDG jolt-heads punched and covered with a dab of matching solvent applied to hide the fixing, or fixed using finishing brads (2 skewed at 300mm centres).

When installing the Rusticated Profile the 2-Part Channel trim may also be suitable providing that the weatherboard does not finish in the scallop part of the profile.

2.7.1.2 Gable Ends and Rakes

It is recommended that the Palliside 2-Part Channel trim should be used in these areas as a finishing trim.

If using the 2-Part Channel the base will need to be fixed in place prior to the installation of the top weatherboards. Before inserting the cap, insert a continuous strip of Polyethylene Foam (PEF) Rod or Inseal tape placed between the spine of the 2-Part Channel base and the weatherboard.

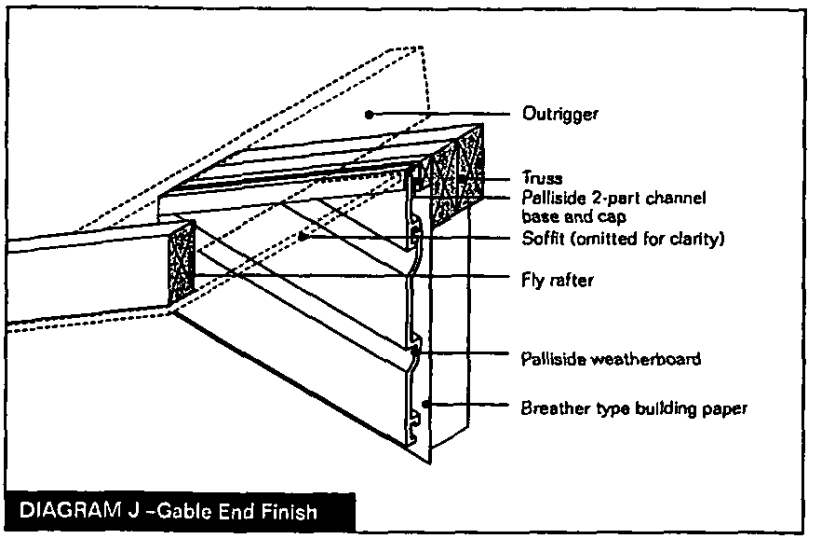


DIAGRAM J –Gable End Finish

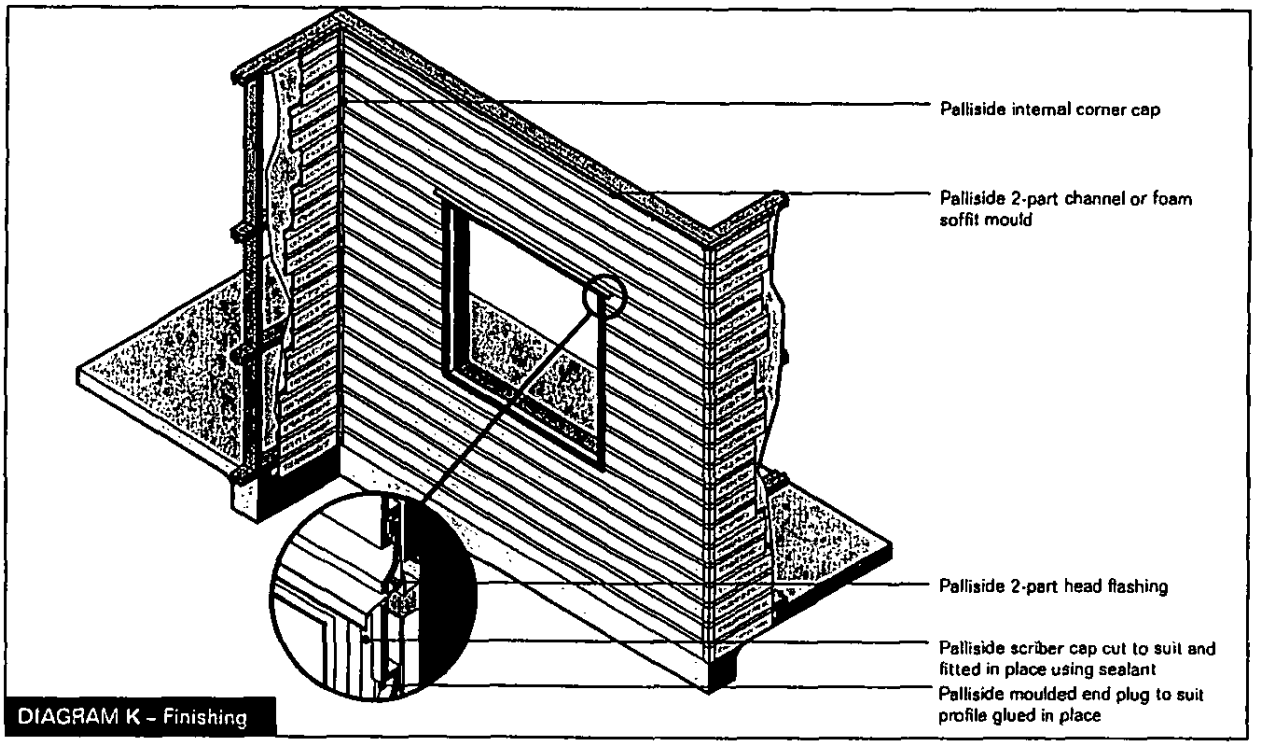


DIAGRAM K – Finishing

2.8.1 Openings

2.8.1.1 Prefit the Scriber Caps

Cut the scriber cap to suit the total height of the window allowing for a 15° taper to the top. This will allow for a tidy finish where the head flashing cap is inserted later.

Prefit the scriber cap in place to the side of the window ensuring that the scriber abuts firmly to the side of the aluminium joinery. (It may be necessary to remove one of the tear-offs from the jamb flashing base to allow this to occur)

2.8.1.2 Installation of Head Flashing Cap Piece

Install the cap of the head flashing in place so the front face is resting on the front of the scriber caps. Apply sealant where the head flashing cap sits on top of the head of the aluminium joinery flange.

2.8.1.3 Sealing Scriber Caps in Place

Once the head flashing cap has been installed, remove the scriber cap and carefully apply a bead of sealant to the surface of the scriber where it intersects the base of the jamb flashing and re-insert in place.

Note: Sealant is a preferred option rather than solvent cement for this area as it will allow the removal of these cap accessories later if necessary.

2.8.1.4 Insertion of End Plugs

Install the Palliside moulded end plugs to the side of the windows by carefully applying solvent cement into the gaps of the weatherboard profile and inserting the end plug in place, flush with the outside of the scriber cap.

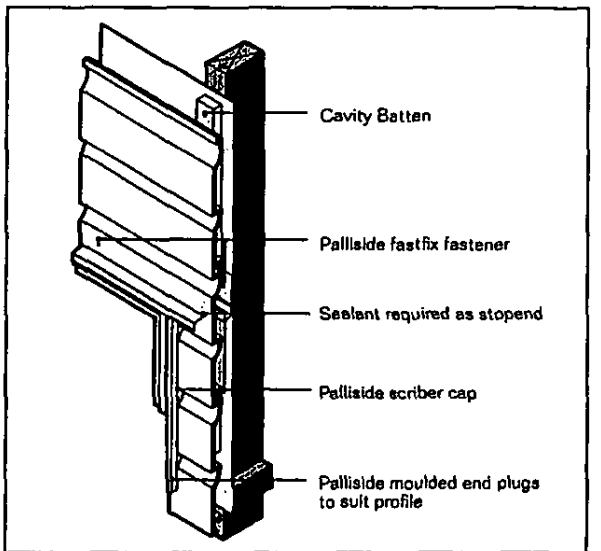


DIAGRAM L – Scriber Cap Finish at Head Flashing

2.9 Continue the Installation Process on Remaining Walls

If the 90° external corner soaker option has been selected Palliside corner soakers can be pushed (clipped) in place (using the rubber handle of a hammer or rubber mallet) after the installation of each course of boards. This helps keep track of board profile alignment.

2.9.1 Finishing of Corners and Trims

All other finishing trims including boxed corner caps, internal corner caps and flat soakers can be applied during the weatherboard installation process or later at the completion of the installation if preferred. End plugs can then be applied where applicable with solvent cement.

2.9.2 Solvent Cement and Sealant

Solvent cement is used for fixing Palliside end plugs and flat soakers in place.

- **When using solvent cement, care should be taken to avoid any solvent being placed on the parts of extruded PVC accessories that are visible such as the caps of boxed corners and channel trims (this can lead to dimpling).**
- **Excess solvent should be removed straight away by using a damp rag. Do not wait for solvent to dry before doing this.**
- **Be aware that Palliside solvent cement takes time to adhere therefore apply solvent and wait approximately 2 minutes before installing end plugs or flat soakers.**
- **Apply solvent to gap where end plug is to be placed; do not apply solvent to the end plug itself.**
- **Apply solvent to one side of the flat soaker and push in place wiping away excess solvent.**

A range of MS based sealants matching the Palliside colours is available. These and other neutral cured or MS based sealants can be applied to Palliside in the following scenarios:

- **To form a flashing stop-end above joinery**
- **Around the area where the head flashing penetrates the weatherboard to the sides of joinery.**
- **Installation of the jamb flashing scriber caps**
- **As an alternative to Palliside solvent cement**
- **Finishing around penetrations such as pipes, etc.**

Note: The use of solvent cement or sealant should not substitute the use of sound weathertightness principles and/or tidy finishing.

2.9.3 Installation of Airseals

As specified in the Palliside Technical Guide, paragraph 2.8.3, Windows, doors and other penetration openings shall be fitted with flexible air seals (that comply with NZBC Acceptable Solution E2/AS1 Paragraph 9.1.6).

2.9.4 Specific Details

A range of details are available for access from the product website **www.palliside.co.nz.**

These include:

2.9.4.1 Pipe Penetrations (Refer design detail DC20)

Ensure pipe penetrations are flashed correctly as shown in the design detail. Pipe flanges and/or sealant should be applied where required to provide additional protection.

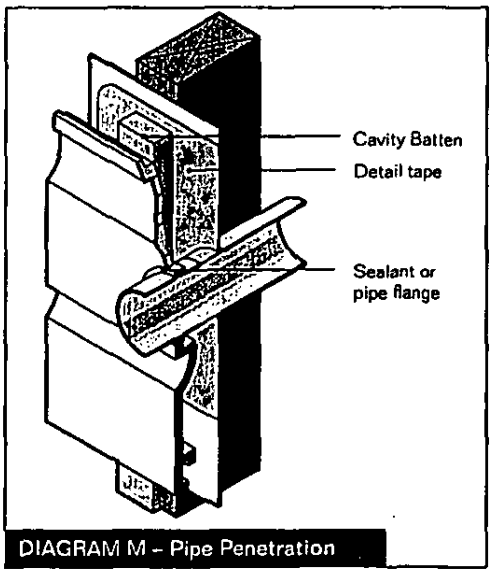


DIAGRAM M – Pipe Penetration

2.9.4.2 Boxed Timber Corners, Timber Facings and Planted Timber Sills (Refer design details DC32-DC35)

Details are available covering the installation of timber corners and facings and may help add additional character to the home.

Facings are screwed in place through the Palliside weatherboards, may be finished using moulded Palliside end plugs to suit the chosen profile or a traditional timber scriber. Once gaps have been filled/sealed, these can be painted either to match the Palliside or in a colour to suit.

2.9.4.3 Meter-box Head Sill and Jamb (Refer design details DC13-15)

Ensure that the installation of the meter-box is carried out in accordance with the appropriate details as shown in these design detail.

2.9.4.4 Non-Standard Corners and Customised Flashings (Refer design detail DC25)

This details the custom flashing of non-standard corners

2.9.4.5 Palliside to Brick Veneer Junction Details (Refer design details DC25-30)

When installing Palliside weatherboards in combination with brick veneer a range of junction details (Internal Corner, External Corner, Brick Sill, Inter-storey and Vertical Join) are available. These details provide a suggestive means of flashing between these claddings. Other methods may be adopted providing that they demonstrate sound weathertightness principles. If in doubt speak with the designer, consult your local BCA or phone Dynex Extrusions Limited for guidance.

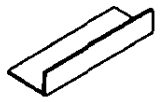
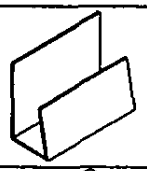
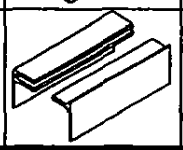
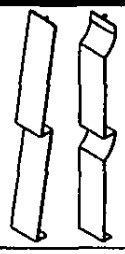
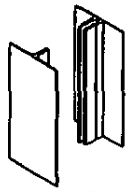
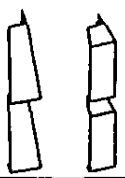
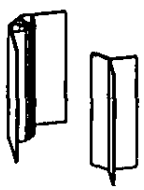
2.9.4.6 Palliside Installed Above Joinery Between Brick (Refer design detail DC31)

This detail sets out the method of installing Palliside weatherboard above joinery between brick veneer.

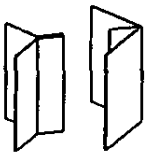
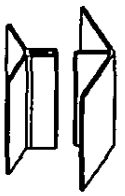
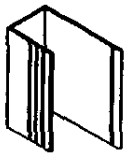
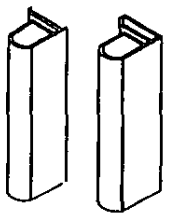
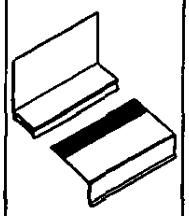
2.9.4.7 Drained Cavity Inter-Storey Junction (Refer design detail DC42)

Refer to the Palliside Technical Guide, paragraph 2.12.6, to see whether there is a requirement for this junction.

3.0 COMPONENT SELECTION GUIDE

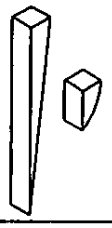
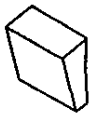
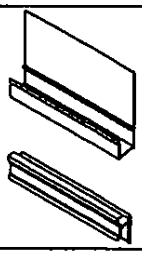
Item	Item Code	Length	Description	Installation of base piece	Installation of Cap Piece	Comments & references
STARTING TRIMS refer paragraph 2.1						
Starter strip MVSWHT3.6		3.6m	Required when installing a full board at the base of the application. Not required to be colour matched due to it being a non-visual base accessory.	Prior to Installation of weatherboard	n/a	Diagram B Paragraph 2.2.1
Cavity Vermin Tray MVCVT3.6		3.6m	Required when installing Palliside over drained cavity. Not required to be colour matched due to it generally being a non-visual base accessory.	Prior to Installation of weatherboard	n/a	Diagram B Paragraph 2.2.2 Drained Cavity only
One-Part Channel Trim Insert Colour MVCH__3.6		3.6m	Also referred to, as 'J' mould is available in colours to match selected Palliside weatherboard.	Prior to Installation of weatherboard	n/a	Paragraph 2.2.3
2-Part Channel Trim Insert Colour MV2CH__3.6		3.6m	2-Part Channel trim is available in colours to match selected Palliside weatherboard.	Prior to Installation of weatherboard	After weatherboard has been installed	Paragraph 2.2.4 and 2.7.1
JOINTING OPTIONS refer paragraph 2.4						
Moulded Flat Soaker Insert Colour MVSF__ Rusticated OR Traditional Insert Colour MVSFTRAD__		per unit	Moulded flat soakers come in double profile and are available in a colour and shape to match the weatherboards. One side of the soaker is adhered using solvent cement.	n/a	During or after weatherboard has been installed	Diagram D.1 Paragraph 2.4.1 Soakers can be joined between stud providing they are staggered
2-Part Jointer Insert Colour MVJ__2.7 Base and Cap		2.7m	Vertical joints on stud can be made using the two-part jointer that is available in colours to match selected Palliside weatherboard.	Prior to Installation of weatherboard	After weatherboard has been installed	Diagram D.2 Paragraph 2.4.2 (Base must be fixed on stud)
CORNER OPTIONS refer paragraph 2.3						
External 90° Corner Soaker Option MVCB2.7 (Base)		2.7m	The Corner Soaker Base can only be used in conjunction with the Corner Soakers and is not required to be colour matched due to it being a non-visual base accessory.	Prior to Installation of weatherboard	n/a	Diagram C.1 Paragraph 2.3.1
Insert Colour MVSC__ Rusticated OR Traditional Insert Colour MVSCTRAD__		per unit	Moulded corner soakers come in double profile and are available in a colour and shape to match the weatherboards.	n/a	During installation of weatherboard to 2nd wall	Diagram C.1 Paragraph 2.3.1
Boxed 90° Internal Corner MVIBWHT3 (Base) Insert Colour MVIC3__ (Cap)		3.0m	This option provides a boxed corner finish for 90° internal corners. Only the Male cap piece is required to be colour matched as the base piece is non-visual.	Prior to Installation of weatherboard	After weatherboard has been installed	Diagram C.2 Paragraph 2.3.2 (End plugs required)

Colour Codes: WH = white, CR = cream, GN = green, TEA = tea

Item	Item Code	Length	Description	Installation of base piece	Installation of Cap Piece	Comments & references
Boxed 90° External Corner Insert Colour MVIE__3.6 (Female and Male)		3.6m	This option provides a boxed corner finish for 90° external corners. Each unit comprising a female base piece and a male cap piece, both matching the selected Palliside colour	Prior to Installation of weatherboard	After weatherboard has been installed	Diagrams C.1 Paragraph 2.3.3 (End plugs required)
2-Part Boxed 135° Corner Insert Colour MV135__2.7 Reversible to suit both external and internal option		2.7m	The 135° corner can be used for either internal or external corners by reversing the base section, as is commonly required around bay windows. And is available to match the selected Palliside colour.	Prior to Installation of weatherboard	After weatherboard has been installed	Paragraph 2.3.3 (End plugs required)
WINDOW FLASHINGS refer paragraph 2.6						
WindowJamb Flashing Base MVWJFB3.6		3.6m	The base of the vertical jamb flashing is fixed in place either side of openings prior to the installation of joinery and weatherboards. The jamb flashing is not required to be colour matched due to it being a non-visual base accessory. This flashing is compatible for both Palliside profiles.	After sill tray has been installed and prior to insertion of joinery	n/a	Diagram F Paragraph 2.8.2
Window Scriber Cap Insert Colour MVWSCR__3.6 Rusticated OR Traditional Insert Colour MVWSCR TRAD__3.6		3.6m	The scriber cap is inserted into the jamb flashing base and available to match the selected Palliside colour. There is a different cap required to match each profile thickness and Palliside end plugs are still required to complete the installation.	n/a	After weatherboard windows and head flashing have been installed	Diagram L Paragraph 2.8.1
2-Part PVC Head Flashing Insert Colour MV2Z__3.6B (Base) Insert Colour MV2Z__3.6C (Cap) MV2ZAL__3.6 (Aluminum cap)		3.6m	The Palliside 2-Part head flashing is designed to improve the ease of installation of the weatherboard above joinery and is available in matching Palliside colours. If preferred an aluminium cap piece can be purchased and used with the PVC base piece (and powder coated to the match the joinery colour)	Prior to the installation of the weatherboard above the inserted joinery	Once the weatherboard above the opening has been installed and the scriber caps have been inserted in place	Diagrams H.1 H.2 and L Paragraph 2.6.5 and 2.8.1.2

Colour Codes: WH = white, CR = cream, GN = green, TEA = tea

FINISHING TRIMS refer paragraph 2.8

Item	Item Code	Length	Description	Installation of base piece	Installation of Cap Piece	Comments & references
Moulded End Plugs Insert Colour MVEP__ Rusticated OR Traditional Insert Colour MVEPTRAD__		Per Unit	Palliside end plugs are available in both rusticated and traditional profiles to match selected Palliside colours.	n/a	Insert in to profile gaps with solvent cement after weatherboard joinery and all vertical trim caps have been installed	Diagrams K and L Paragraph 2.8.1
Fastfix Fastener Insert Colour PSF12__		50 Per Pack	Palliside fastfix fasteners are mainly used to hold a cut weatherboard above the head flashing in place and come in colours to match selected Palliside weatherboard.	n/a	Once weatherboard above joinery has been fixed in place.	Paragraph 2.6.6.3
Foam Soffit Mould Insert Colour FMBC8__3.6		3.6m	Palliside foam soffit mould is a 40mm x 18mm cornice moulding which can be used as a horizontal finish at soffit line. This trim is available to match the chosen Palliside colour.	n/a	Once top weatherboard has been installed	Diagram I Paragraph 2.7.1
Solvent Cement Insert Colour MCS__		180gm Tube	Available in matching Palliside colours to cement in place end plugs and flat soakers			Paragraph 2.9.2
Palliside Nails PSIDENAILS		5kg Box	Palliside 40 x 2.5mm Nail			
Sealant Insert Colour MSMSS__		375ml Canister	Available in matching Palliside colours for finishing around head flashing and other areas requiring attention to detail			Paragraph 2.9.2
Cavity Closer Trim and Support Bar			For use at the head flashing level for cavity installation only. For use at base of opening to support joinery. Comes in white as not required to be colour matched			Available for Purchase via preferred window fabricator

Colour Codes: WH = white, CR = cream, GN = green, TEA = tea

Notes

Contact Details

For further information visit the website www.palliside.co.nz or alternatively contact:

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FREEPHONE 0800 439 639

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4.1 PROFILE METAL LONG RUN ROOFING

The following is a full copy (excluding guidance notes) of the MasterSpec® specification for Dimond Roofing Systems.

4311D DIMOND PROFILED ROOFING

1. GENERAL

Related work

1.1 RELATED SECTIONS
Refer to 4312D DIMOND PROFILED GRP NATURAL LIGHTING for natural lighting sheeting
Refer to 7413 RAINWATER SYSTEMS for rainwater disposal

Documents

1.2 DOCUMENTS REFERRED TO
Documents referred to in this section are:

AS/NZS 1170	Structural design actions Part 2: Wind actions
AS/NZS 2728	Prefinished/pre-painted sheet metal products for interior/exterior building applications – performance requirements
NZS 3604	Timber framed buildings
AS 3566	Self-drilling screws for the building and construction industries
NZS 4203	General structural design and design loadings for buildings
AS/NZS 4534	Zinc and zinc/aluminium-alloy coatings on steel wire

NZ Metal Roofing Manufacturers Inc: NZ metal roofing & wall cladding code of practice

Documents listed above and cited in the clauses that follow are part of this specification. However, this specification takes precedence in the event of it being at variance with the cited document.

1.3 MANUFACTURER'S DOCUMENTS
Manufacturer's and supplier's documents relating to work in this section are:

Dimond Roofing and Cladding Systems Manual, September 2001

Copies of the above literature are available on the **Dimond** website www.dimond.co.nz or by phoning **Dimond** on 0800 DIMOND (0800 346 663).

Requirements

1.4 QUALIFICATIONS
Roofers to be Dimond Certified Commercial Installer, or experienced, competent roofers familiar with **Dimond** products.

1.5 MAINTENANCE DATA
Provide two bound copies of all relevant **Dimond** maintenance information on completion of the roofing work.

1.6 WARRANTY

Warrant this work under normal environmental and use conditions against.

Coating:	15 year failure of coating adhesion (manufacturer's standard warranty)
Penetration:	15 year weatherproofing by material penetration (manufacturer's standard warranty)
Execution:	5 year weatherproofing by substandard workmanship
From:	Date of completion of installation

Refer to the PRELIMINARIES AND GENERAL section for details of when completed warranty must be submitted.

Performance

1.7 FIXINGS, WIND

Design and use the fixings appropriate for the wind zone (R) and topographical classification (T) of this site and building height; as required by NZS 3604, or by wind loads given by NZS 4203 or AS/NZS 1170 Part 2. Allow for specific loadings at corners and the periphery of the roof, where localised pressure factors apply.

1.8 CO-ORDINATE

Co-ordinate to ensure substrate and preparatory work is complete and other work programmed in the order required for access and completion of the roof.

1.9 PERFORMANCE

Accept responsibility for the weather-tight performance of the completed roofing system, including all penetrations through the roof and junctions with walls and parapets.

2. PRODUCTS

Materials – General

2.1 WIRE NETTING

Galvanized hexagonal 75 mm mesh from 1 mm diameter steel wire to AS/NZS 4534.

2.2 SAFETY MESH

Aus Mesh galvanized wire mesh.

2.3 UNDERLAY

Breather type kraft paper laminates.

2.4 DIMOND ROOFING

Refer to 4. SELECTIONS / drawings.

2.5 FLASHINGS GENERALLY

Formable grade 0.55 mm BMT for galvanized, Zincalume® and pre-coated steel, and 0.90 mm BMT for aluminium to the same standards as the profiled sheets, notched where across profile or provided with a soft edge.

2.6 FLASHINGS TO VERGE, RIDGE AND HIP

Supplied by **Dimond** to match or to suit the roofing.

2.7 FASTENERS GENERALLY
Durability of all fasteners not less than the roofing material being fixed.

2.8 FIXING CLIPS TO TROUGH SECTION ROOFING
Galvanized steel (powder coated for aluminium) to suit the material and profile of the rigid sheet and location as required by **Dimond** for **Dimondek 300** and **Dimondek 400**. Fix to steel with 16 mm x 10 gauge galvanized wafer head self-drilling screws and to timber with 50 mm long galvanized spiral rolled flat head nails.

Fix **Dimondek 630** clips to steel with 12 gauge x 20 mm tek screws and to timber with 10 gauge x 25 mm long wafer head timbertite screws – Class 4.

2.9 FIXING SCREWS
To AS 3566. Screws appropriate to the roofing material and the supporting structure, and wind load as required by **Dimond**, and with a durability not less than the material fixed.

2.10 RIVETS
Sealed aluminium, minimum diameter 4.8 mm.

Accessories

2.11 SEALANT
Neutral curing silicone or polymer sealant as required by **Dimond** and used as directed.

2.12 CLOSURE STRIPS
Non-bituminous compressible, profiled closed cell foam strips to fit the sheet profile.
Brand: Ecofoam
Profile: To suit selected cladding profile

3. **EXECUTION**

Conditions

3.1 INSPECTION
Inspect the roof framing and supporting structure to ensure that it is complete and fully braced ready for roofing and free from any misalignments or protrusions that could damage the roofing.

3.2 STORAGE
Take delivery of and accept packs of roofing dry and undamaged on delivery. Reject all damaged material. Store on a level firm base clear of the ground, with packs well ventilated and completely protected from weather and damage. Do not allow moisture to build up between sheets.

3.3 HANDLING
Avoid distortion and contact with damaging substances, including cement. Do not drag sheets across each other or other materials. Protect edges and surface finishes from damage. Use soft, flat sole shoes when fixing and for all other work on the roof.

3.4 SEPARATION

Isolate dissimilar materials in close proximity as necessary by painting the surfaces or fitting separator strips of compatible materials. Place isolators between metals and treated timber and cement based materials. Do not use unpainted lead sheet in contact with or allow water run-off onto galvanized steel or Zincalume®.

Application

3.5 SET-OUT & LAYING

Carefully set out to allow cover flashings of equal width at the ends of the building. Lay sheets with side laps away from the line of sight ensuring ends of sheets are true to line. Check during fixing to eliminate creep or spread and use string lines along purlin centres to keep fastenings in line.

3.6 FORMING

Form stop-ends and downturns to **Dimond** recommendations.

3.7 SEAL CUT EDGES

Seal cut edges of pre-coated steel sheet with cut edge protection lacquer before fixing to **Dimond** requirements.

3.8 END LAPS

End laps are not permitted, except where specifically detailed to **Dimond** requirements.

3.9 THERMAL MOVEMENT

Roof fixing and jointing to conform with **Dimond** requirements for thermal movement

3.10 FIXING GENERALLY

Install and fix in accordance with the Dimond Roofing and Cladding Systems Manual and the NZ Metal Roofing Manufacturers Inc: NZ metal roofing & wall cladding code of practice and to **Dimond** required fixing patterns and details for each area of the building roofing. Use only screws as required by **Dimond**. Paint colour matched fixings and accessories before installation.

3.11 FIX UNDERLAY

Fix wire netting where specified, drawn tight and nailed or screwed to purlins with edges butted and wired together to form a complete net. Fit and lap roofing underlay over the netting to suit roofing sheets, with 40 mm oversail into gutter, to the underlay manufacturer's requirements.

3.12 FIX INSULATION

Run and fix insulation blanket as detailed and to the insulation manufacturer's requirements.

3.13 MARKING AND CUTTING

Cut only by shearing tools. Do not use black lead pencils for marking Zincalume®, Colorsteel® or ColorCote® products.

3.14 FIX SHEETS

Fix sheets in place using the fastening system required by **Dimond** for specified profiles, making due allowance for dynamic local wind pressures on the building and thermal movement in the sheet.

3.15 FLASH

Flash roof to parapets, walls and penetrations to detail in the Dimond Roofing and Cladding Systems Manual and to the New Zealand Metal Roofing Manufacturer's Association Inc: NZ metal roofing & wall cladding code of practice and **Dimond** requirements. Cut accurately and fix using sealant and rivets to detail and to **Dimond** requirements to form a weatherproof cover. Ensure flashings are designed and installed to avoid water ponding.

3.16 FIX RIDGES AND HIPS

Cut accurately and fix using primary fasteners to the purlins. Join using sealant and rivets to detail and to the New Zealand Metal Roofing Manufacturers Inc: NZ metal roofing & wall cladding code of practice. Ensure flashings are designed and installed to avoid water ponding.

3.17 FIX VERGE AND CAP FLASHINGS

Cut accurately and fix using primary fasteners to the purlins. Join using sealant and rivets to detail and to the New Zealand Metal Roofing Manufacturers Inc: NZ metal roofing & wall cladding code of practice. Ensure flashings are designed and installed to avoid water ponding.

3.18 PENETRATIONS

Flash and overflash all penetrations through the roof.

3.19 PENETRATIONS AND JUNCTIONS

Check that adjoining walls and parapets are prepared ready for the installation of the roofing. Confirm that openings have been prepared ready for the installation of skylights and other penetrations through the roof. Required work includes the following:

- underlay turned up at wall and parapet lines
- underlay finished and dressed off to all openings, ready for the installation of skylights and other penetrations
- roofing installation neatly finished to all sides of openings and to all wall and parapet junctions
- installation of flashings (those required to be installed prior to installation of penetrating elements and/or wall linings)

Completion

3.20 REPLACE

Replace damaged or marked elements.

3.21 LEAVE

Leave this work complete with all necessary flashings, undercloaks, valleys, ridges and hips all properly installed as the work proceeds so the finished roof is completely weathertight.

3.22 REMOVE

Remove all trade rubbish, swarf and unused materials from the roof and surrounds daily during the work. Sweep down at the end of each day, and clean out spoutings, gutters and rainwater pipes on completion of the roof. Remove debris, unused materials and elements from the site.

3.23 PROTECTION

Protect the completed work from damage for the remainder of the construction period. If access is given to the roof for later work, provide properly constructed walkways or platforms to eliminate damage.

4. SELECTIONS

4.1 UNDERLAY

Brand/type. –

4.2 INSULATION

Brand: –

Type: –

Thickness: –

Facing: –

Materials - roofing products

4.3 DIMOND TROUGH SECTION ROOFING

Profile name: –

Metal: Steel

BMT: 0.55 mm

Coating system: –

Dimond colour: –

4.4 DIMOND SYMMETRICAL RIB PROFILE ROOFING

Profile name: –

Metal: –

BMT: 0.55 mm

Coating system –

Dimond colour –

4.5 DIMOND ASYMMETRICAL RIB PROFILE ROOFING

Profile name: Styleline

Metal: Steel

BMT: 0.55 mm

Coating system –

Dimond colour: –

4.6 DIMOND CORRUGATE

Metal: Steel

BMT: 0.55 mm

Coating system: Unpainted Zincalume

Dimond colour: –

4.7 DIMOND CURVED PROFILE ROOFING

Profile name: V-Rib

Metal: Steel

BMT: 0.55 mm

Coating system: –

Dimond colour: –

4.8 DURACLAD

Type:	Opaque, PVF film surfaced glass reinforced sheeting
Profile:	–
Colour:	White

4.9 DURACLAD GC

Type:	Opaque glass fibre reinforced sheeting with a gel coat top surface.
Profile:	–
Colour.	–

(a) Description:
Dimond long run roofing and wall cladding systems are available in a variety of sheeting materials together with the appropriate fasteners, underlay, supporting netting and perimeter and penetration flashings. Table 2.1A summarises the sheeting material options available.

Please also refer to the Habitats Colour Chart, Section 1.3 for the full range of available colours in each of the paint coating types. Other materials and thickness may be available upon enquiry.

Table 2.1A Sheeting Material Options

Material	Grade	Thickness (mm)	Metal Coating	Prepaint Finish Available	Relevant Standards
Steel	G550	0.40 or 0.55 BMT	Zinc[1] or Zinc/Aluminium[2]	Yes	AS 1397
	G250/300[3]	0.40 or 0.55 BMT		Yes	
Aluminium (plain or embossed)	5052	0.70 or 0.90 BMT	N/A	Yes	AS 1734
	5251	0.70 or 0.90 BMT	N/A	Yes	
Stainless Steel	304	0.70	N/A	No	AS 1449
	316	0.70	N/A	No	
Copper	110A	0.55	N/A	No	AS 2738
	122A	0.55	N/A	No	
GRP	Duraclad	1.7	N/A	Yes	–

1 Galvsteel™
2. Zincalume®
3. For some machine-curved products only

BMT Base Metal Thickness

(b) Scope Of Use:
Dimond long run metal roofing and wall cladding systems are intended for use in constructing the building envelope for commercial buildings and residential buildings subject to limitations listed below.

(c) Requirements:
Attention to the following details is required to ensure the expected system performance is achieved.

	Reference
• The selection of the type and grade of sheeting material and fasteners must be based on the life expectancy required and the severity of the external and internal environments.	2.1.1.2 2.1.1.3 2.1.1.4 2.2.3
• Correct choice of breather type or vapour barrier underlay to suit the building environment.	2.1.3.5
• Site storage that keeps product dry and protected from damage.	
• Sheeting handling that prevents surface damage.	
• Avoidance of excessive spans or insufficient fasteners for the expected loads.	2.1.3.1 2.1.4
• Correct placement and flashing of penetrations through the roof.	
• Correct layout and installation of the sheeting, underlay and netting.	
• Allowance for thermal expansion and contraction.	2.1.3.4
• Sufficient roof pitch to permit complete surface water drainage.	2.1.4
• Control of allowable contact with dissimilar materials.	2.1.3.3
• Awareness and implementation of maintenance requirements, particularly for surfaces not washed by natural rainfall.	2.1.1.3
• Correct choice of material for collection of drinking water from a Zincalume or colour finished roof is required.	2.2.1.4

Continued on next page ...

(d) NZBC Compliance:

Test information available from Pacific Coilcoaters and BHP NZ Steel, and past history of use of long run metal roofing and cladding products in New Zealand indicate that, provided the product use and maintenance is in line with the guidelines contained in the current literature referenced, Dimond long run metal roofing & wall cladding systems can be expected to meet the performance criteria in clause E2 of the New Zealand Building Code, for a period of not less than 15 years.

(e) Use Outside the Stated Guidelines:

If the need arises to use Dimond long run roofing & cladding outside the limitations and procedures given in this or other referenced literature, or if any doubt exists on product handling or use, written approval for use must be obtained from Dimond before the project commences.

AS/NZS 2728: 1997, (Australia/New Zealand Standard – Prefinished / Prepainted Sheet Metal Products For Interior / Exterior Building Applications – Performance Requirements), classifies the atmospheric environment into 7 categories and provides a guide to the selection of prefinished products in these categories.

In Table 2.1B and 2.1C overleaf we have created a guide showing which categories the more common roofing and cladding materials and coatings can be used in. Only 6 of the 7 categories defined by the standard are covered, as the 7th one, Tropical, is not relevant in New Zealand.

For further classification information please refer to AS/NZS 2728:1997

Table 2.1B Atmospheric Classification Definition

Mild	sheltered areas that are far inland (very few in NZ)
Moderate	areas that are protected from marine influence. Are inland areas other than those that are far inland
Industrial	industrial areas that are inland
Marine	large parts of NZ including areas 100m – 400m from the shoreline in sheltered areas (inner harbour and estuaries) and more than 1 km from breaking surf shoreline Can extend up to 30kms inland depending on topography and prevailing winds.
Severe Marine	areas that range from 100m to 1km from breaking surf shoreline. In high wind areas the distance inland will increase. It also includes areas that are less than 100m (but can extend up to 400m depending on prevailing winds) from the shoreline in sheltered areas.
Very Severe Marine	in areas up to and including 100m from breaking surf. Will extend inland 400m or more where strong prevailing winds exist.
Industrial & Geothermal	areas of high corrosion including chemical plants and geothermal areas.
Severe Chemical Environments (additional to AS/NZS 2728)	unusually harsh conditions due to moisture generation and/or chemical usage or storage (eg. cool stores, animal shelters, fertiliser storage). Will require specific material selection for sheeting, fasteners and netting. Contact Dimond.

Table 2.1C Environment Categories and Suitable Sheeting and Fastener Materials

Atmospheric Conditions	Substrates	Prefinished Paint Coating Types	Branded Sheeting Products	Recommended Screw Fastener Material	Washer Material
Mild Moderate Industrial Marine	Zinc Coated Steel	–	Galvsteel™	Climaseal 4®	Galvanised
	Zinc/Aluminium Coated Steel (150g/m²)	–	Zincalume®	Climaseal 4®	Zincalume®
		Polyester, Acrylic	ColorCote® ZR8™/Colorsteel® Endura™	Climaseal 4®	Colorcote ZR8™/CS Endura™
		PVF²	Colorcote® ZRX™	Climaseal 4®	Colorcote ZRX™
	Aluminium	–	Plain or embossed finish	304 Stainless Steel	Aluminium
		Polyester, Acrylic	ColorCote® AR8™	304 Stainless Steel	Colorcote AR8™
		PVF²	ColorCote® ARX™	304 Stainless Steel	Colorcote ARX™
	Stainless Steel	–	–	304 Stainless Steel	304 Stainless Steel
	Copper	–	–	304 Stainless Steel, Bronze	–
	Glass Reinforced Polyester (GRP)	Gel Coat	Duraclad®, Webglass	304 Stainless Steel	Weatherlok (UV Stabilised PEA)
Severe Marine	Zinc/Aluminium Coated Steel (200g/m²)	Polyester	Colorsteel® MAXX™	Climaseal 4®	Colorsteel MAXX™
	Zinc/Aluminium Coated Steel (150g/m²)	PVF²	ColorCote® ZRX™	Climaseal 4®	Colorcote ZRX™
	Aluminium	–	Plain or Embossed	304 Stainless Steel	Aluminium
		Polyester, Acrylic	ColorCote® AR8™	304 Stainless Steel	Colorcote AR8™
		PVF²	ColorCote® ARX™	304 Stainless Steel	Colorcote ARX™
	Stainless Steel	–	–	304 Stainless Steel	304 Stainless Steel
	Copper	–	–	304 Stainless Steel, Bronze	–
	Glass Reinforced Polyester (GRP)	Gel Coat	Duraclad®, Webglass	304 Stainless Steel	Weatherlok (UV Stabilised PEA)
Very Severe Marine Industrial Geothermal	Zinc/Aluminium Coated Steel (200g/m²)	Polyester	Colorsteel® MAXX™	Climaseal 4®	Colorsteel MAXX™
	Aluminium	–	Plain or embossed finish	304 Stainless Steel	Aluminium
		Polyester, Acrylic	ColorCote® AR8™	304 Stainless Steel	Colorcote AR8™
		PVF²	ColorCote® ARX™	304 Stainless Steel	Colorcote ARX™
	Stainless Steel	–	–	316 Stainless Steel	Stainless Steel
	Copper	–	–	316 Stainless Steel, Bronze	–
	Glass Reinforced Polyester (GRP)	Gel Coat	Duraclad®, Webglass	316 Stainless Steel	Weatherlok (UV Stabilised PEA)
Severe Chemical	Glass Reinforced Polyester (GRP)	Gel Coat	Duraclad®, Webglass (Consult Dimond)	Consult Dimond	Weatherlok (UV Stabilised PEA)

Warranties for commercial applications are issued on a job by job basis. It is imperative that care is taken during the planning process to choose the Roofing, Wall Cladding and Fastener system that will provide the life expectancy in the environment in which it will be installed, as incorrect selection could result in no warranty being available.

To assist you in determining the system that will best meet your warranty expectations Dimond have in place a Warranty Inquiry Service. Your design decisions on product type, material thickness, profile, paint coating type and colour, along with site details including address, distance from sea and degree of exposure will be required to enable us to provide a meaningful warranty. To access the service, please contact your Dimond Key Account person or phone 0800 DIMOND.

All warranties will carry a required maintenance clause, which must be complied with to ensure the warranty remains valid. Often aspects of design such as roof shape and roof pitch can influence the maintenance requirements. Due consideration of these factors during the design process is wise.

As a general guide, provided the materials are correctly selected from Table 2.1C for the environment, and building design does not impact on durability, it is reasonable to expect the following warranty periods will be available for your roofing and wall cladding. Please note that no warranty is available for Galvsteel material regardless of which environmental category it is used in.

Guideline Warranty Periods

Steel substrate with appropriate paint coating.

- Commercial roofs:
  15 years to perforation of substrate and fastener strength retention.
  15 years to paint coating peeling, flaking or excessive fade.
- Residential roofs (dependent on environment):
  Up to a maximum 30 years to perforation of substrate and fastener strength retention
  Up to a maximum 20 years to paint coating peeling, flaking or excessive fade.

Aluminium (unpainted):

- Commercial and residential roofs:
  15 years to perforation of substrate.

Aluminium substrate with appropriate paint coating:

- Commercial roofs:
  15 years to perforation of substrate and fastener strength retention.
  15 years to paint coating peeling, flaking or excessive fade.
- Residential roofs:
  30 years up to and including Severe Marine, and 20 years in Very Severe Marine, to perforation of substrate and fastener strength retention.
  15 to 20 years dependent on environment to paint coating peeling, flaking or excessive fade.

Duraclad

- Commercial and residential roofs and walls:
  20 years to fibre show through or perforation of sheet.

Routine Maintenance

Washing

All metal surfaces must be kept clean for best durability warranty conditions. Routine washing either by natural rainwater or by manual washing and scrubbing with a soft bristle brush.

The frequency of washing must be sufficient to prevent build up of debris, dirt or salt deposits and will vary depending on location and degree of protection from rainfall.

As a general guide the following frequencies can be used as a starting point.

Environment	Washing Frequency
Moderate / Marine	Every 6 – 12 months
Severe Marine	Every 3 – 6 months
Very Severe Marine	Every 3 months

The need to wash can be reduced by building design that avoids the creation of metal roof or wall surfaces that are sheltered from natural rainfall.

Overpainting

Substrate in Good Condition

Clean the surface and overpaint with 2 coats of an acrylic roof paint system, following the paint manufacturer's instructions.

If the roof or wall cladding has had less than 2 years exposure to weathering, the acrylic paint manufacturer should be consulted for advice on pretreatment of surface to ensure adequate adhesion.

Substrate Requires Refurbishment

Clean the surface and coat any surface corrosion with a suitable conversion treatment and primer, then overpaint with 2 coats of an acrylic roof paint system, following the paint manufacturer's instructions. Check and replace any fasteners exhibiting advanced corrosion.

Rubbing

Hard rubbing on the unpainted Zincalume surface can cause black marks on the Zincalume surface if the clear coating is worn through. If rubbing is unavoidable we recommend it be kept to a minimum to avoid the wear through of the protective clear coating.

2.1.1.4 LIFE CYCLE COSTING AND MAINTENANCE OPTIONS

The selection of the most appropriate roofing and wall cladding material to meet cost-performance requirements within a chosen time period should be made with the assistance of Life Cycle Costing comparisons.

Input for these comparisons requires:

- Environment type
- Expected useful life for each material / maintenance option
- Type of regular maintenance (if any) and associated cost
- Material types of sheeting and fastener, and their durability
- Material and installation costs
- Discount rate (%) to convert costs to present value

The following Tables 2.1D, E, F, G provide a guideline comparison for general cases. The Tables are based on:

1. Environment descriptions as defined in Section 2.1.1.2. Specific chemical exposure has not been included in the Life Cycle Analysis.

2. Market rates for the sheeting and fastener materials detailed and for installation labour. These rates have been converted to relative costs based on the initial installed cost of unpainted Zincalume®.

3. A choice of three different maintenance options identified on the Tables by the following key:

   R Replacement Option –
   No maintenance other than regular washing to keep surface clean. Sheeting and fasteners replaced once the sheeting has reached an advanced state of deterioration, but before perforation and leakage occurs.

   F Refurbish Option –
   No maintenance other than regular washing to keep surface clean until surface deterioration is at a point where refurbishment will add to the life of the sheeting rather than leave for later replacement.

   A Acceptable Appearance Option –
   Regular washing to keep surface clean, and repainting of the surface to maintain a good standard of acceptable appearance, where this is important (e.g. high visibility walls). Once painted, repainting is required every 8 years.

4. In some cases the F and A maintenance options will eventually include sheeting and fastener replacement. The number of replacements expected in any case is shown on the Tables with shading to the following key.

No replacement of sheeting and fasteners
One replacement of sheeting and fasteners
Two replacements of sheeting and fasteners

5. The relative costs are given as initial installed cost at 0 years (with lowest cost option assigned the relative value of 1.0) and then as the present value of future maintenance costs required to deliver a sheeting life of 20, 30, 40 or 50 years. Present value has been calculated at a discount rate of 10%.

Continued on next page...

6. The combination of steel and aluminium is based on material with similar load span capability. No account has been taken of extra maintenance that may be required to repair foot traffic damage (which in some case may be higher for aluminium than steel).

7. The costs used for Duraclad do not include the extra support framing that may be required for this material in comparison with steel or aluminium. Depending on use (e.g.: wall cladding versus roofing) this difference may not be significant.

Table 2.1D Relative Life Cycle Costs – Moderate Environment

Roofing / Cladding Options			Relative Life Cycle Cost for Period				
Material							
Sheeting	Fastener	Maintenance	0 Years	20 Years	30 Years	40 Years	50 Years
Zincalume®	Class 3	R	1.00	1.00	1.00	1.09	1.09
Post-painted Zincalume®	Class 3	F	1.32	1.32	1.39	1.43	1.46
		A	1.32	1.54	1.58	1.59	1.62
Colorsteel® ENDURA™ or ColorCote® ZR8™	Class 3	R	1.21	1.21	1.21	1.27	1.27
		F	1.21	1.21	1.21	1.24	1.25
		A	1.21	1.28	1.32	1.34	1.35
ColorCote® ZRX™	Class 4	R	1.46	1.46	1.46	1.46	1.50
		F	1.46	1.46	1.46	1.47	1.48
		A	1.46	1.46	1.50	1.53	1.54

Table 2.1E Relative Life Cycle Costs – Industrial / Marine

Roofing / Cladding Options			Relative Life Cycle Cost for Period				
Material							
Sheeting	Fastener	Maintenance	0 Years	20 Years	30 Years	40 Years	50 Years
Zincalume®	Class 3	R	1.00	1.00	1.24	1.24	1.24
Post-painted Zincalume®	Class 3	F	1.32	1.44	1.48	1.50	1.52
		A	1.32	1.54	1.58	1.60	1.65
Colorsteel® ENDURA™ or ColorCote® ZR8™	Class 3	R	1.21	1.21	1.21	1.31	1.31
		F	1.21	1.21	1.25	1.26	1.27
		A	1.21	1.28	1.32	1.34	1.35
ColorCote® ZRX™	Class 4	R	1.46	1.46	1.46	1.46	1.50
		F	1.46	1.46	1.46	1.48	1.49
		A	1.46	1.46	1.50	1.53	1.54
Colorsteel® MAXX™	Class 4	R	1.54	1.54	1.74	1.74	1.74
		F	1.54	1.79	1.90	1.95	1.99
Aluminium (unpainted)	304 S/S	R	1.56	1.56	1.56	1.56	1.56
Duraclad	304 S/S	R	1.52	1.52	1.52	1.59	1.59
		F	1.52	1.52	1.63	1.68	1.72

Table 2.1F Relative Life Cycle Costs – Severe Marine Environment

Roofing / Cladding Options			Relative Life Cycle Cost for Period				
Material Sheeting	Fastener	Maintenance	0 Years	20 Years	30 Years	40 Years	50 Years
Colorsteel® ENDURA™ or ColorCote® ZR8™	Class 4	R	1.23	1.67	1.67		
		F	1.23	1.42	1.64	1.66	1.67
ColorCote® ZRX™	Class 4	R	1.46	1.46	1.76	1.76	
		F	1.46	1.57	1.57	1.75	
		A	1.46	1.58	1.64	1.83	
Colorsteel® MAXX™	304 S/S	R	1.54	1.54	1.86	1.86	
		F	1.54	1.91	2.17	2.22	
Aluminium (unpainted)	304 S/S	R	1.56	1.56	1.56	1.75	1.75
ColorCote® ARX™	304 S/S	R	2.15	2.15	2.15	2.15	
		F	2.15	2.15	2.15	2.18	
		A	2.15	2.23	2.26	2.28	2.29
Duraclad	304 S/S	R	1.52	1.52	1.52	1.59	1.59
		F	1.52	1.52	1.63	1.68	1.72

Table 2.1G Relative Life Cycle Costs – Very Severe Marine Environment

Roofing / Cladding Options			Relative Life Cycle Cost for Period				
Material Sheeting	Fastener	Maintenance	0 Years	20 Years	30 Years	40 Years	50 Years
Colorsteel® MAXX™	Class 4	R	1.54	2.06	2.06	2.18	
		F	1.54	1.91	2.23	2.29	
Aluminium (unpainted)	304 S/S	R	1.56	1.56	1.87	1.87	
ColorCote® ARX™	304 S/S	R	2.15	2.15	2.15	2.24	
		F	2.15	2.27	2.30	2.46	
Duraclad	304 S/S	R	1.52	1.52	1.52	1.59	
		F	1.52	1.52	1.63	1.68	1.72

8.5 Membrane Roofs and Decks

8.5.1 Limitations

This Acceptable Solution is limited to *membranes* composed of butyl or *EPDM* installed over plywood substrates for:

a) Roofs with a minimum fall of 1.5° (1:40),

b) *Decks* with:
   i) a minimum fall of 1° (1:60),
   ii) a maximum area of 40 m²,
   iii) no steps in level within *deck* area,
   iv) no integral roof gardens, and
   v) no downpipe direct discharge to *deck*,

COMMENT:
Discharging gutters directly onto *decks* increases the chances of water entry into sensitive areas.

Direct discharge may be allowed into gutters calculated to have sufficient water carrying capacity, but this is outside the scope of this Acceptable Solution.

c) Internal gutters with a minimum fall of 1 in 100, with no seams in the gutters closer than 1 m to an outlet, and

COMMENT:
Seams should be avoided in gutters where possible. Where they cannot be avoided they should be positioned at a high point or a change in plane to reduce the risks of ponding on the seams. Seams in gutters are particularly difficult to form at outlets through enclosed balustrade walls, and the risk of failure is high. Failure of a seam can result in damage to underlying walls.

d) Decks with removable raised surfaces to give level access as shown in Figure 17A.

The application of directly-applied wearing or decorative surfaces to *membranes* is not covered in this Acceptable Solution.

COMMENT:
EPDM and butyl rubber *membranes* are subject to damage when on trafficable roof *decks*. A suitable wearing surface will help reduce such damage.

8.5.2 General

Installation of *membrane cladding* shall be by trained installers, approved by the manufacturer or the NZ agent (in the case of imported *membrane).*

COMMENT:
It is recommended an installer has successfully completed, or demonstrated skill to the level of, an NZQA recognised course.

8.5.3 Plywood substrates

Plywood shall be:

a) A minimum of 17 mm complying with AS/NZS 2269,

b) At least CD Grade Structural plywood with the sanded C face upwards, and

c) H3.1 with treatment type compatible with *membrane* and adhesives used, and kiln dried after treatment.

COMMENT:
The compatibility of LOSP-treated plywood must be checked with *membrane* suppliers.

If using plywood containing copper-based preservatives, check the compatibility of adhesives and *membranes* with copper with the product manufacturers.

8.5.4 Butyl and EPDM

Butyl rubber and *EPDM* rubber used for *membrane* roofing or *decks* shall:

a) Be a minimum thickness of:
   i) 1 mm for roofing or when used for *decks* with a protective wearing surface, or
   ii) 1.5 mm with no protective surface, and

b) Comply with the following parts of Table 1 in ASTM D6134:
   i) tensile strength,
   ii) elongation,
   iii) water absorption,
   iv) water vapour permeance, and
   v) heat aging followed by:
      a. tensile strength
      b. elongation, and

c) Have adhesives, primers and seam tapes that:
   i) comply with BRANZ EM 5, and
   ii) are part of a complete system approved by the manufacturer or supplier of the *membrane.*

8.5.5 Installation

8.5.5.1 Plywood

Substrates must be dry when *membranes* are applied. The plywood and the timber substructure shall have a maximum moisture content of 20% when a *membrane* is adhered.

COMMENT:
This will generally require substrates to be covered to prevent rain wetting, or to be pre-primed to avoid moisture uptake.

Manufacturers' recommendations should be consulted, as some require a lower moisture content in order to validate guarantees.

Plywood substrates shall be fixed according to the following requirements:

a) Panels shall be laid with staggered joints (brick bond),

b) The edge of sheets shall be supported with *dwangs* or *framing*, unless a structurally tested tongue-in-groove edge provides equivalent support,

c) The maximum span shall be 400 mm in each direction,

d) Plywood shall be laid with the face grain at right angles to the supports,

e) A 20 mm triangular fillet shall be used at the base of any 90° upstand,

f) External edges shall be chamfered with a minimum radius of 5 mm, and

g) Plywood shall be fixed:
   i) with 10 g x 50 mm stainless steel countersunk head screws,
   ii) with 3 mm gaps between all sheets,
   iii) at 150 mm centres on edges, and
   iv) 200 mm in the body of the sheets.

COMMENT:
Closed-in construction spaces under *membrane* roofs and *decks* shall have adequate ventilation to prevent the accumulation of moisture under the *membrane*. There should be a minimum gap of 20 mm between the underside of the substrate and any insulation.

For roof or *deck* areas over 40 m², roof vents will be required. Roof vents are not covered by this Acceptable Solution.

8.5.5.2 Butyl and EPDM

Seam tapes shall be used on all joints of:

a) Roofs or *decks* with falls less than 5° (1:12),

b) Gutters or where water could pond,

c) Penetrations through the *membrane* where butyl or *EPDM flashing* is required,

d) *EPDM membrane*, and

e) Butyl *membranes* that contain *EPDM*.

COMMENT:
Coloured butyl *membranes* contain *EPDM*, which makes them more difficult to adhere properly.

Seams should be aligned parallel to the fall of the *deck* to minimise ponding. The use of joins in butyl or *EPDM* should be avoided in gutters. Where this is not possible, the plywood should be rebated to minimise the effect of the seam.

Where a penetration is made through the *membrane* subsequent to laying, the *flashing* should be installed by the applicator of the *membrane* system.

All joints in the plywood and junctions of plywood with other materials shall have 25 mm polyethylene release tape applied before application of the *membrane*.

8.5.6 Roof and deck drainage

Roofs and *decks* shall be *constructed* to provide falls as shown in Figure 56.

Roofs and *decks* shall be *constructed* so that:

a) The highest point of the roof or *deck* is a minimum of 100 mm below an adjoining floor as shown in Figure 56,

b) *Membrane upstands extend to a minimum* level of 50 mm above the floor level at all walls or *parapets* as shown in Figure 62,

COMMENT:
This will lead to a minimum total *membrane* upstand of 150 mm which, if the clearance of the *cladding* from the *deck* or roof surface is at the minimum of 35 mm, gives an overlap of 115 mm.

c) Water discharges either:
   i) directly into roof outlets with a minimum diameter of 75 mm as shown in Figure 64, or
   ii) via *scupper* openings, into a rainwater head, or a gutter with a minimum width of 300 mm as shown in Figure 63,

d) Where the discharge is through a *parapet* or *enclosed balustrade*, the *scupper* opening shall have a minimum clear opening of 200 mm wide and 75 mm high, with a lip as shown in Figure 63,

e) External corner upstands in the *membrane* around the *scupper* opening are formed as shown in Figure 57, and

COMMENT:
Refer to E1/AS1 for specific drainage requirements, as minimum sizes for outlets and gutters may be higher than shown in this Acceptable Solution.

f) When an internal outlet is used, allowance for additional run-off shall be provided by:
   i) an overflow in addition to the outlet, or
   ii) an extra outlet, with both outlets sized to take the full required capacity.

When an overflow is provided in addition to the outlet, a lip to the overflow shall be formed as shown in Figure 63.

Figure 56: *Falls in membrane roofs and decks*
Paragraphs 8.5.6 and 8.5.6 a)

NOTE: (1) Refer Figure 62 for thresholds and clearances.
(2) Junction *saddle flashing* – refer Figure 13.

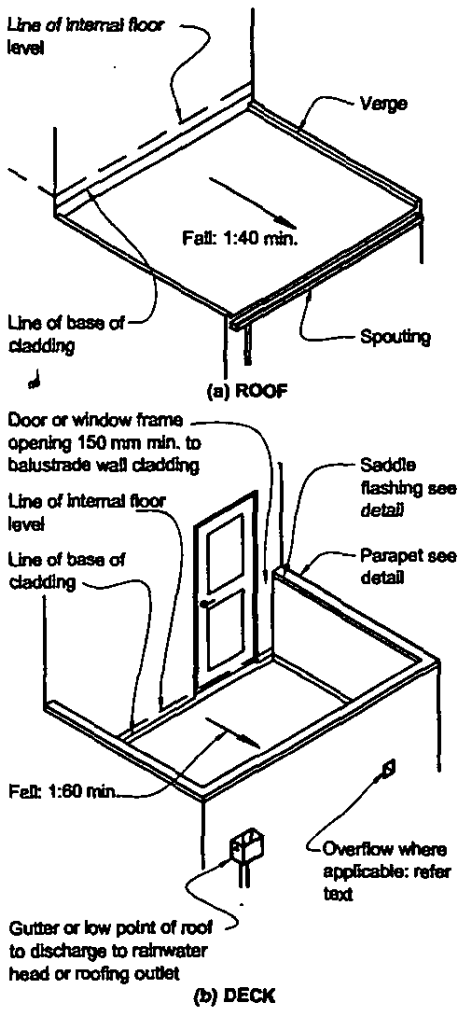
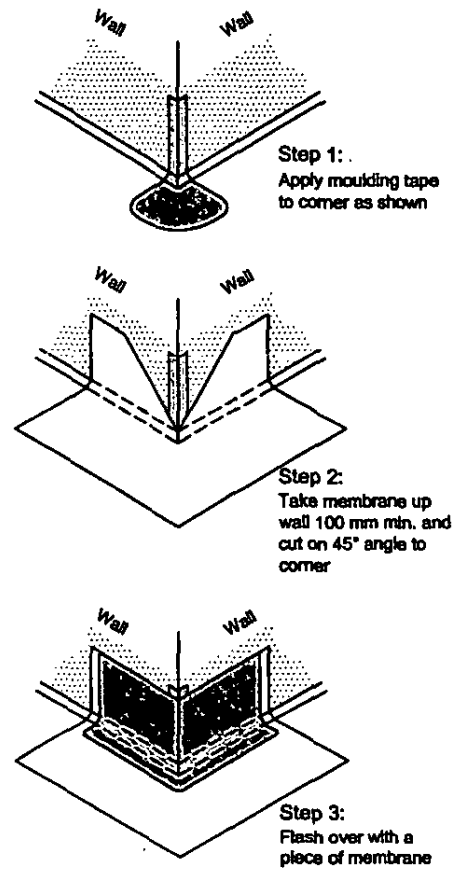


Figure 57: External corner in upstand
Paragraphs 8.5.6 e) and 8.5.8 a),
Figures 59 and 63



8.5.7 Control joints

All *control joints* in the substrate shall be accommodated in the *membrane* roof design.

The design of *control joints* for *membrane* roofing is subject to *specific weathertightness design* and is outside the scope of this Acceptable Solution.

8.5.8 Junctions

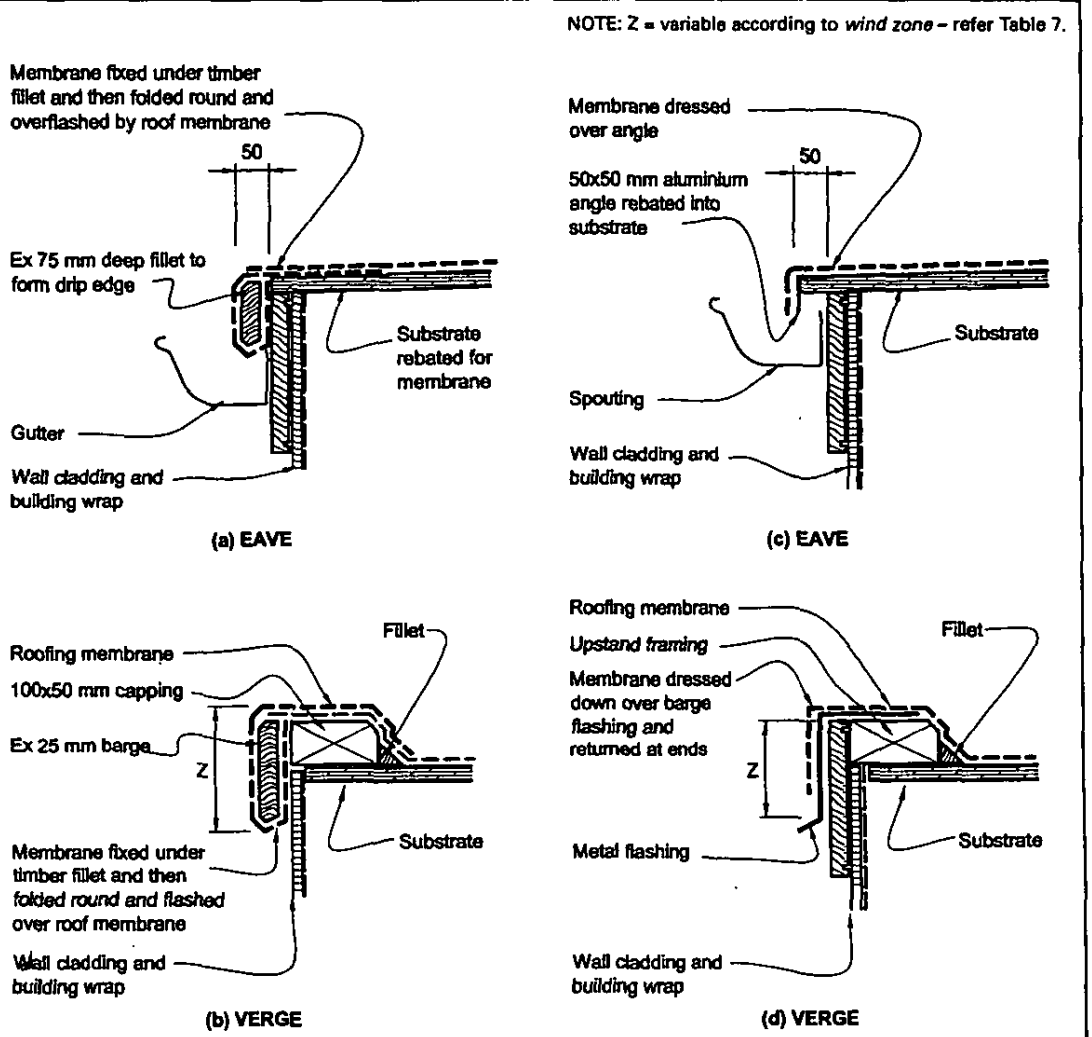
All junctions of roof or *deck* to walls, *parapets* and *enclosed balustrades* shall be made *weathertight* using the following appropriate details:

a) Figure 57: External corner in upstands,

b) Figure 58: Internal corner in upstands,

c) Figure 61: Verges and *eaves*,

Figure 61: Verges in membrane
Paragraph 8.5.8 c)



8.5.9.1 Handrails

Fixing of posts for *handrails* into *membrane roofs* or *decks* is not covered by this Acceptable Solution.

COMMENT:
Any fixing of posts into *membrane* roofs or *decks* will require *specific weathertightness design*.

The fixing of posts into tiles over a *membrane* is particularly risky, and should be avoided.

8.5.10 Gutters

Deck gutters and internal outlets shall be *constructed* as shown in Figure 64.

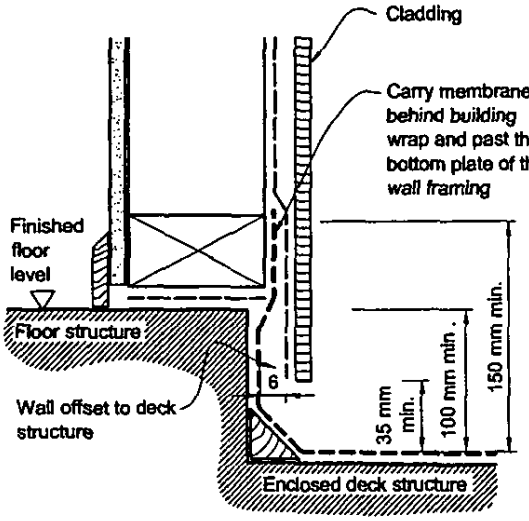
COMMENT:
Internal outlets should have a dome-type cover to reduce risk of blockage, except where this could constitute a pedestrian hazard.

When an overflow is provided for roofs or *enclosed decks* as per Paragraph 8.5.6 f) *i)*, the overflow shall have a cross-sectional area equal to 1.5 times the cross-sectional area of the calculated discharge downpipe.

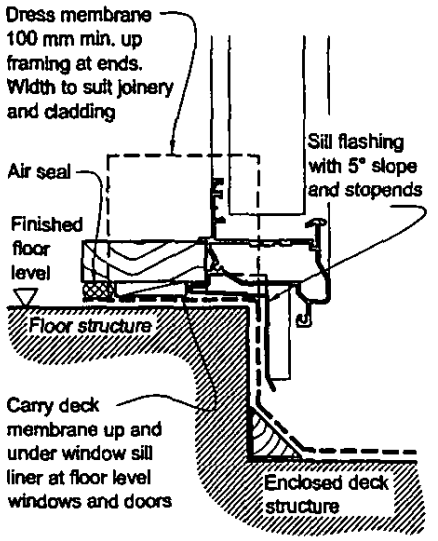
Any plywood adjacent to *deck* gutters shall be treated to H3.1, and protected from water splash.

Figure 62: Junctions with walls for membrane
Paragraphs 7.4.3, 8.5.6 b), 8.5.8 d) and 8.5.8.1

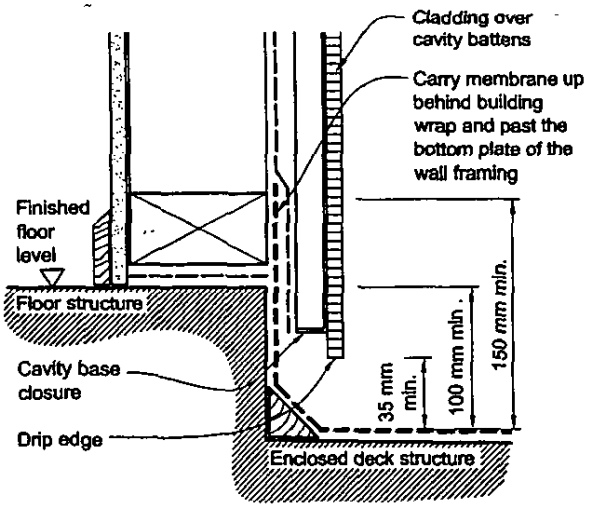
NOTE: (1) Internal corners to be formed as shown in Figure 58.
(2) Dimensions are shown to *membrane*. However, where there is an additional material applied over the *membrane*, all dimensions shall apply to the highest level of the wearing surface.



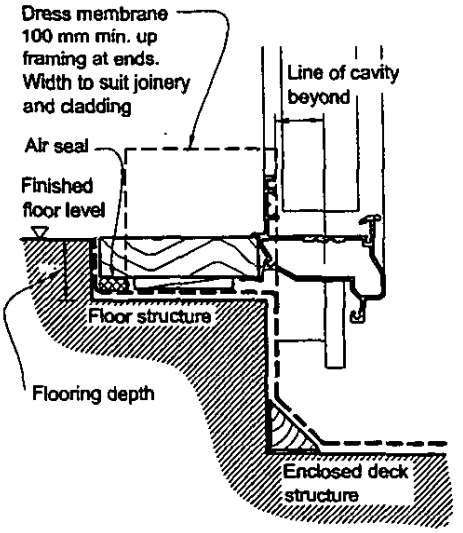
(a) DIRECT FIX THRESHOLD AT WALL



(b) DIRECT FIX THRESHOLD AT OPENING



(c) CAVITY THRESHOLD AT WALL



(d) ALTERNATIVE THRESHOLD AT OPENING

Figure 63: Rainwater head and scupper opening in membrane
Paragraphs 8.5.6 d) and f)

NOTE: (1) A preformed *scupper* unit may be used, but this will require *specific weathertightness design.*
(2) External corners of *scupper* opening to be formed as shown in Figure 57.

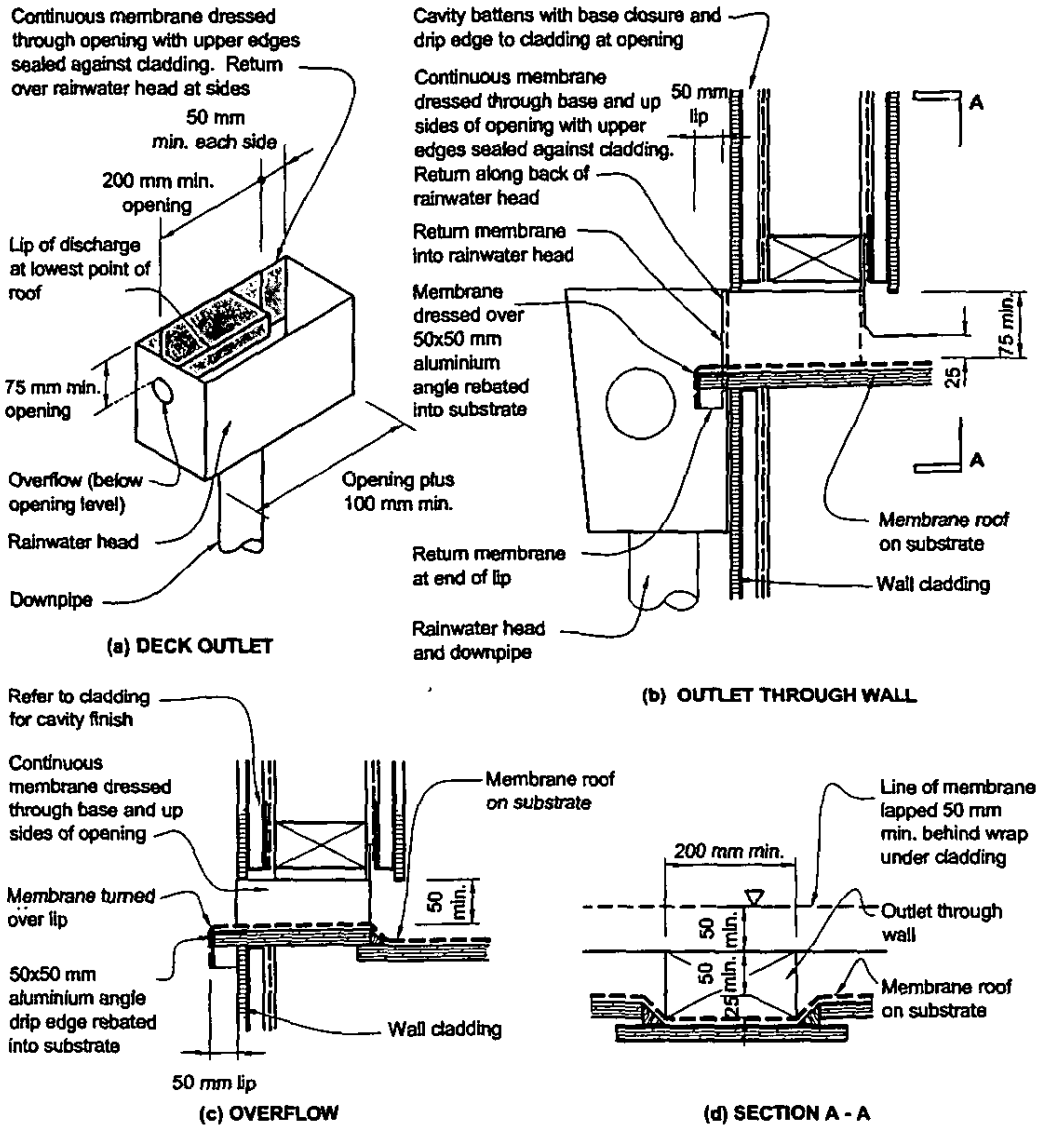
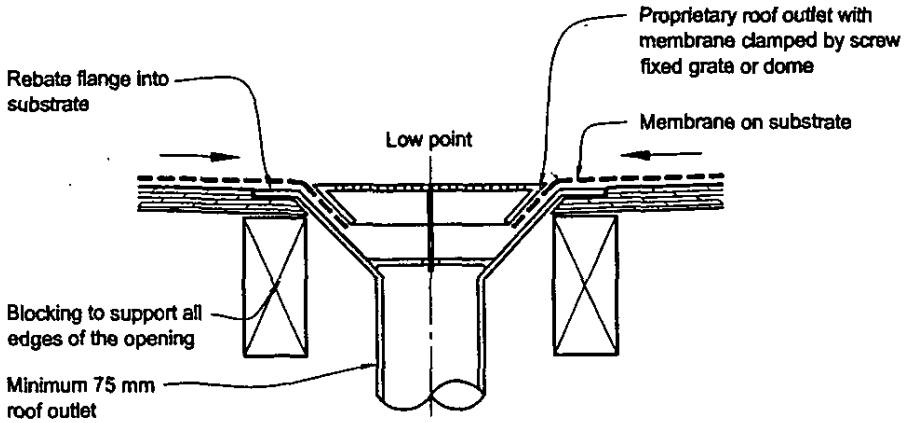
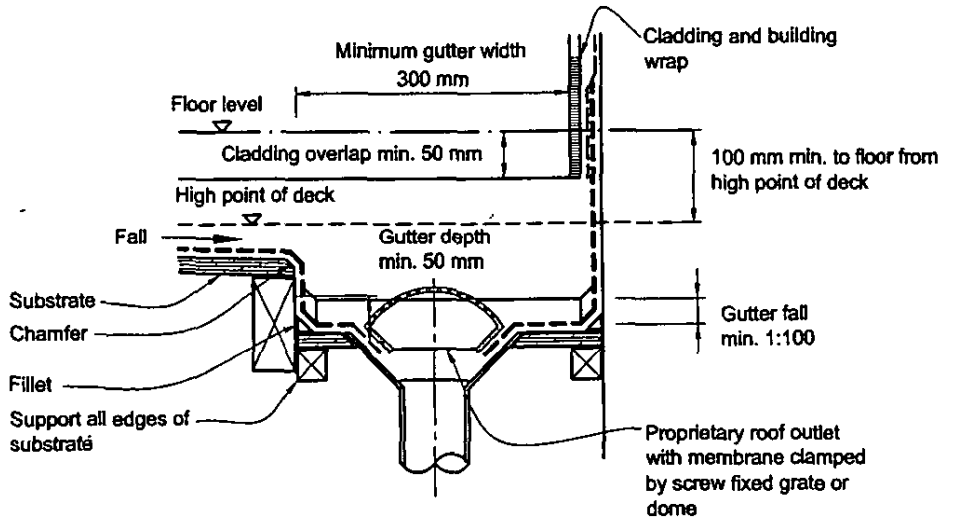


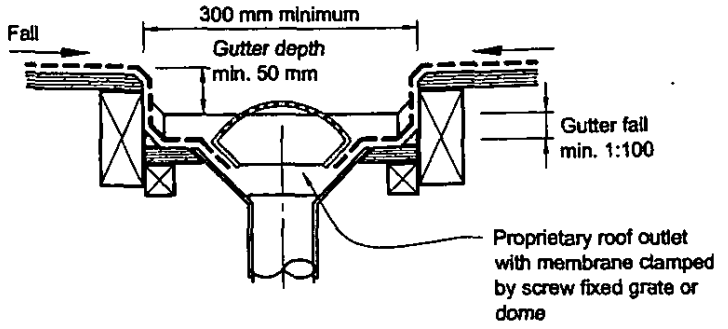
Figure 64: Gutters and outlets in membrane
Paragraphs 8.5.6 c) and 8.5.10



(a) TYPICAL GUTTER OUTLET



(b) EDGE GUTTER



(c) CENTRAL GUTTER

SPECIFICATION

PROPOSED DEVELOPMENT for

THE NEW ZEALAND HOUSING FOUNDATION.

TYPE 5A HOUSE
LOT 32 – NO. 19 TITCH PL ,
GLEN EDEN.

BUILDERS: Goldsmith Developments . ph: 021 750 280.
Revised Plan – prepared 10.09.2009.

This Specification is to be read in conjunction with the accompanying drawings and any other drawing which may be issued during the currency of the contract.
Any item shown in this Specification and not shown on the drawings and vice versa shall be equally binding as though included in both.
The contractor shall provide a form of contract which is to be completed by all parties before the commencement of any work on the site.
Any additions, omissions or variations to the contract shall be authorized in writing and an agreed price stated.
The owners are to ensure that all boundary marker pegs are in place and exposed for the inspection.

This project has been designed to comply with the New Zealand Building Code and Building Regulations. Specific design is by a registered Engineer.
It is the responsibility of the contractors and workmen employed in this contract to make themselves familiar with the related documents pertaining to their trade.

ALL WORK MUST COMPLY WITH THE NEW ZEALAND BUILDING CODE.

BENNETT DRAUGHTING
116 RED HILL ROAD
PAPAKURA
(09) 296 6369

PRELIMINARY AND GENERAL (ALL TRADES)

1. Building Consents

The Contractors shall arrange to obtain all permit to build, etc., arrange all inspections and pay all fees as required by the local authorities.

2. Protection of work.

All parts of the work liable to injury and all adjoining property, existing work, footways, trees, etc. are to be protected until completion of the contract.

3. P.C. Sums (Net sums).

The P.C. Sums quoted in this specification are net and the contractor or sub—contractor concerned must add any cartage, fixing charges and profit he requires to all such items.

4. Site.

The site of the works will be pointed out to Tender's who are advised to visit same and check the slope of the ground, quality of the soil, etc., as no extras will be paid for foundation work, site drainage and leveling not detailed or specified.

5. Building Codes

The whole of the work in this contract is to be carried out in strict accordance with the N.Z. BUILDING CODE AND TO COMPLY WITH N.Z.S 3604 .

6. Extent of work.

This contract comprises the erection and completion in the soundest and. most workmanlike manner of all the work shown or reasonably implied on the accompanying drawings and in accordance with this specification and the supply of all plant, tools, labour, materials, fixtures and fittings required for the due completion of the work.

7. Insurance.

The Contractor shall at all times, keep the whole of the works fully covered by insurance, fire. Public liability. Workers' Compensation, etc.

8. Temporary Services.

The Contractor shall arrange for all temporary services, pay all fees in connection therewith and remove same on completion of the contract. Sheds, toilet, power, water, access to the building site, scaffolding.

9. Maintenance.

The Contractors shall maintain the property for a period of 30 days after completion, and any damage done, arising during that time through faulty workmanship or materials shall be made good at the Contractor's expense.

EXCAVATOR

1. General.

ALL GROUND IS ASSUMED TO BE " GOOD GROUND " AS SPECIFIED IN NZS 3604.
THE CONTRACTOR MUST ENSURE ALL GROUND COMPLIES OR CONSULT A GEOTECH ENGINEER IMMEDIATELY.

Remove all turf or other vegetation, including trees, Stumps, etc., from the area to be built on.

Bulldoze the site to the levels shown on the drawings. (Check original conditions).

Excavate as required for all wall footings, pile footings, steps etc., as shown on the drawings.

Footing excavations are to be taken down to a solid bearing arid to be not less than 450mm deep.

Excavations are to be stepped to suit the slope of the ground, and kept level at the bottom, maintained free from water or fallen material and shall be firm before placing reinforcing or concrete.

Backfill and ram the earth around the foundations after concrete work has firmly set.

Deposit the surplus spoil on the site as directed by the Owners.

CONCRETOR

1. Materials.

Concrete to be pre—mixed with a test of 20 Mpa after 28 days.(.25 MPA in Sea Spray Zone). Reinforcement to be round mild steel rods or reinforcing mesh, as detailed, free from scale, loose rust, paint, grease, dirt, etc. Formwork shall be erected and braced in such a manner that the concrete shall finish to the dimensions shown or specified. The formwork is to be hosed out and kept wet before and while the concrete is being placed.

2. Concrete Work

Construct the various footings as detailed on the drawings and reinforced as shown.

Hard filling to be 75mm down scoria or 'run of the pit' metal compacted in layers of l50rnn depth maximum. Blind with 25mm of sand and overlay with black polythene damp proof course with taped joints.

All floor slabs to be laid to true and straight surfaces, screeded, wood floated and finished with a steel float or power float to a fine finish. Thickness and reinforcing as detailed on the drawings.

Allow to build in all holding down bolts, pipes, wires etc., as required, prior to the pouring of the concrete. Holding down bolts to be 300mm maximum from corners and at 900MM centers maximum.

BLOCKLAYER

1. Materials.

Blocks are to be of the sizes as shown on the drawings, delivered to the site on pallets and to be free from cracks and chipped edges.

Mortar is to consist of sand, cement and a liquid lime based plasticiser, mixed according to the lime manufacturer's directions.

2. Laying

Construct the various block walls as shown on the drawings.

Corners to be plumbed both ways, courses to be level and straight.

The blocks are to be kept dry before and during laying and while the mortar is setting.

Sills are to be purpose made masonry unit sill blocks; Jamb blocks are to be rebated.

Ventilators are to be matching in colour and size, spaced 600 mm from the corners and at 1.8m intervals.

Joints are to be 10 mm thick max, rounded on exposed faces.

Build in holding down bolts 300 mm from the corners and at 1.2m centers.

Reinforce and concrete fill the various bond beam courses and vertical cavities as shown on the drawings.

On completion clean down all exposed faces of the block work and leave free from all defects and mortar stains.

BRICKLAYER

1. Materials.

Bricks to be hard square, well burnt .....bricks, delivered to the site in packets and free from chipped edges. The bricks are to be wetted before laying.

Mortar to consist of sand, cement and a liquid lime based plasticiser, mixed according to the lime manufacturer's directions.

2. Laying.

Construct the various brick and brick veneer walls, chimney, flower boxes, etc., as shown on the drawings.

All corners are to be plumbed both ways and the courses are to be level and straight. Perpends are to be in alignment. Joints to be 10mm thick maximum weatherstruck on exposed faces.

Sills are to be bricks on edge, or purpose made sill bricks as directed protruding 25 *mm* beyond the face of the wall.

Build in vermin proofing at bottom plate level and galvanised ties spaced at riot more than 500 mm horizontally and every third course vertically.

Maintain a 40mm.min cavity to be kept clear of all mortar droppings and to be drained and ventilated.

Co-operate with the Carpenter in the building in of all exterior joinery.

On completion clean down the exposed faces of all brickwork and leave free from all defects, mortar stains.

Construction.

All materials are to be the best of their respective kinds and grades, laid true to their various lines and levels and constructed in a proper tradesmanlike manner, to make the whole of the works a sound construction in accordance with the **N.Z. BUILDING CODE AND NZS 3604 .**
All framing must comply with the B.I.A. acceptable solutions in B2 / ASI .
It is recommended that all framing be treated to H1.2 MINIMUM. Bottom plates should be H3.1 minimum.

All timberwork abutting or resting on masonry units, concrete or brickwork is to be protected with bitumen—fabric damp proof course.

Plates to be in long straight lengths. Bottom plates and wall plates to be butt joined over continuous support, top plates to be halve jointed or butt jointed and fastened with 4n nail plates.

Studs are to be set out to accommodate 2.4m high wall lining sheets. Bowed studs are to be straightened with saw cuts, wedges and 100 x 25 mm or 75 x 25 strapping.

Lintels are to be supported on 100x50 understuds with a full-length stud beside both ends.
Additional fixings to lintels are to comply with NZS 3604 1999.

Nogging (Dwangs) shall be wall thickness x 50 mm spaced in rows at 800 mm centers maximum (or as manufacturers requirements), set out to accommodate the wall lining sheets and drilled or notched for ventilation. To be nailed with two 65mm nails at each end.

Ceiling nogging (dwangs) to be set out to accommodate the ceiling lining sheets and cornices, around the perimeter of each room and in rows at l.8m centers maximum.

Metal angle bracing to be let in flush with the face of the wall frames and raked as nearly as practicable to 45 degree's. Refer bracing element plan and BRANZ, Sheet A and B.

The wall frames are to be assembled, squared, braced and erected, The bottom plates are to be straightened and fastened down, the corners are to be plumbed both ways using a plumb bob and line and the top plates are to be held straight with temporary bracing until the ceiling and roof framing and bracing has been complete

Ceiling joists to be on edge and spiked to the wall plates with one 100mm and one 75mm nail at each end. Where practicable, the ceiling joists are to come alongside rafters and to be spiked thereto.

Ceiling joists spanning more than 2.4m are to be stiffened with ceiling runners well spiked at every crossing.
150 x 50 runners will span up to 3.6 m.
200 x 50 runners will span up to 4.8 m

Ceiling bracing is required at all gable ends. Refer bracing element plan.

Rafters to be plumb cut to ridges and hip rafters and to be birdsmouthed to plates and fastened with one 100 mm and one 75mm nail to the plates.

Supply and fix the necessary ridge boards, hip rafters/valley rafters, valley boards, underpurlins and roof struts and collar/ties as required to complete the roof framing and as detailed on the drawings.

Alternatively, where detailed, the roof framing is to be constructed with Engineer designed 'Gangnail / Mitek" roof trusses fixed plumb, fastened to the plates with framing anchors, stiffened with runners and braced at each end of the building. The trusses are to be positioned directly over studs or supporting nogging is to be fixed between the studs directly under the top plate.(or 150 x 40 over as per NZS 3604 1999).

Ceiling battens are to be 75x40 " Dry " at 400 max. cts **OR as specified by ceiling material manufacturer.**

Purlins (iron roof) to be spaced to accommodate the roof covering and ridging and fastened to the rafters.

Eaves runner to be nailed to the outside of the wall frames. Eaves bearers to be nailed securely to each rafter overhang.

DRAINAGE

1. General.

Before commencing the Drainlayer should read the General conditions of the Contract.
All work is to be carried out by a Registered Drainlayer to comply with the NZ Building Code.

2. Extent of Work.

Excavate for supply and lay all drains, fittings etc. as required to complete the Drainage Works for this Project including sanitary sewer and stormwater systems. All Excavation to comply with The NZ Building Code.

3. Materials.

To be good quality lines.

1) Pipes to be First Quality 100mm PVC in accordance with NZS 764: 1981 and NZS 4452: 1986.

2) Fittings and Gullies to be PVC to NZS 7604: 1981.

3) Install inspection fittings to both Sanitary Sewer and Stormwater Drains as required in The NZ Building Code.

4. Laying.

Excavate for and Lay pipes to even falls with all necessary bends and junctions, cleaning eyes and inspections.

Fit Rubber Ring joins and clean out pipes as work proceeds.
Connect up to connections as per plans.

5. Completion.

The Sanitary Sewer and Stormwater lines must be tested to the satisfaction of the local authority inspector and any defects made good before backfilling.

All Backfilling to be as Original Ground Level.

PLUMBING

1. General.

Before commencing the plumber must read the General conditions of the contract in the specification.

All Plumbing work must comply with all requirements of The NZ Building Code and The Standards Association of NZ

On Completion the Building must be watertight with all installations in working order.

The Plumber shall clean all the fittings and taps that are installed and protect all installations from Damage.

2. Insurance.

The Plumbing Contractor shall have an Adequate Public Risk Policy to cover any damage by Himself or his Employees.

3. Piping.

Piping throughout shall be copper to both hot and cold water lines with Appropriate Fittings. Piping shall be to NZS 4606

4. Cold Water Supply.

Tap off from mains service pipe in 15mm copper.

All pipework to W.C., Bath, H.W.C, Showers Basins, Sink and Tubs to be in copper.

Provide one brass hose tap where directed by owner.

All piping outside the Building shall be buried to a minimum depth of 450mm to grassed areas and 600mm in sealed areas .

5. Hot Water Cylinder.

Supply and Fix a 180-litre capacity Rheems mains pressure electric hot water cylinder with element and thermostat.

Provide an Apex Mains pressure valve pack to suit

Thermostat to H W C set at 60 deg C with a tempering valve (installed alongside H W C) to set temperature to bath, shower and vanity at 55 deg. C.

Provide Seismic Restraint to the H.W.C as per attached details.

Equipotential Bonding is to be provided alongside the H.W.C.

6. Hot Water Supply.

Run hot water lines from cylinder to bathroom in 12mm copper in accordance with NZS 4606:

7. Sanitary Ware.

Supply and Fix all items detailed on the plans.

Toilets to be Porcelain W.C. Pan, Dual Flush Cisterns, Plastic toilet seats and flush pipe in accordance with NZS 3331, NZS 2028 and NZS 4616.

8. Taps.

All Taps to be as directed by owner

9. Wastes.

Fix 32 mm & 40mm PVC wastes with PVC traps from the sink, tub, baths, basins and showers to discharge into gullies. Backvent as Directed.

Traps to be as per the Relevant sections of the National Building Code.

10. Vent Pipes.

Carry up all vent pipes from drains and fittings as required by the NZ Building Code.

ELECTRICIAN

1. Generally.

This contract includes the supply and installation of the electric wiring system complete. The whole of the work shall be carried out strictly in accordance with the local authorities' by—laws and the electrical contractor is to obtain all permits from the supply authority, pay all fees in connection therewith and arrange for all inspection required.

2. Supply.

Arrange for a mains supply to the building. Check the conditions before tendering.

3. Boards.

Provide and set up as required one-meter board and case with all necessary equipment thereon neatly labeled.

Provide and set up where directed a switchboard panel with all necessary fuses, switches and main switches property mounted and labeled, and hinged on one side. This panel can be combined with the meter board if convenient to the Owners.

4. Lights

Provide and fix the lights, switches and power outlets as listed hereunder, all to be positioned by the Owners after the floor has been laid.

Passage and stairwell lights to have two way switches.

.....Interior lights.

..... Exterior lights.

.....Power outlets with switch gear.

5. Fittings

Allow the P.C. Sum of.....for the purchase of an electric range and allow to order, take delivery of and install same.

Allow to wire up the thermostatically controlled hot water cylinder element, supplied under "Plumber".

Allow the P.C. Sum of ..... for the supply of an electric wall heater and allow to order, take delivery of and install same.

Allow the P.C. Sum of.....for the purchase of special light fittings and allow to order, take delivery of and fit same.

Allow to supply and install an exhaust hood or fan to manufacturers details.

Allow to wire up for the waste disposal unit supplied under "Plumber".

Allow to provide and install a selected razor outlet positioned as directed by the Owners.

Earth all metal waste pipes, and metal fittings as required by the regulations. Aerial, earth and TV aerial sockets as directed by the Owners.

PAINTER AND PAPERHANGER

1. Generally.

Allow to submit the plan to a colour service for a colour scheme and, to the Owners for approval.

All paint and varnish is to be delivered to the job in new tins, unopened and currently usable.

2. Exterior.

Woodwork — Prime, stop and paint in one undercoat and one finish coat with a high gloss finish.

Stained work — One coat of stain prior to fixing, the nail holes, etc., are to be stopped with coloured stopping followed by one further coat of the stain.

Metalwork, including spoutings, downpipes, wrought iron work, etc. —Approved primer for galvanised iron, one undercoat and one finish coat.

Allow to paint exposed surfaces as required. Primer, undercoats and finish coats as required.

3. Interior

Interiors of all service rooms to be primed or sealed, stopped, undercoated and finished with high gloss enamel.

All other ceilings to be given two coats of flat ceiling paint. All other wall areas to be lined with wallpaper, hung in single lengths, plumb, and with butt joints.

P.C. value.....per roll.

Flush doors only to be sealed, and given two coats of satin finish varnish. To be rubbed down between coats.

All other interior finishing woodwork to be primed, stopped, undercoated and finished with a semi—gloss paint.

4. Completion.

On completion the residence is to be left clean and tidy, window and other glasswork is to be cleaned. All trade debris is to be removed from the site and the building left clean and ready for occupancy.

INSULATION

ALL INSULATION MUST COMPLY WITH HI/AS1 – ENERGY EFFICIENCY.
ZONE 1 . SCHEDULE METHOD.

Floor	: R 1.3 min.
Ext. Walls	: R 1.9 min.
Ceilings	: R 2.9 min.
Vertical Glazing	: R 0.26 .

JOINER

1. Timber Grades

Exterior Joinery — Heart Rimu or Rad. P.P.T. Huttloc.

Door Sills — Heart Matai.

Sashes — Redwood or Rad. P.P.T. Huttloc

Interior Joinery D.A. Rimu.

All to be dry seasoned timber run to standard profiles.

2. Windows.

Aluminium windows where detailed shall be delivered to the site, stored on edge and protected from breakages, damage, plaster splashes, etc. To be installed as per the manufacturer's direction.

Timber windows to be of the sizes and types as indicated on the drawings with all members run to standard or J.M.F. 'Sundyne' profile, of standard construction and high class workmanship. Opening awning type sashes to be fitted with 'Interlock' stays of approved sizes.

The windows are to be glazed with standard quality glass, with selected obscured glass to bathroom and W.C. windows and as directed.

All windows (& exterior doors) are to have expandable foam filler to the trim cavity.

All Glazing to NZS 4223

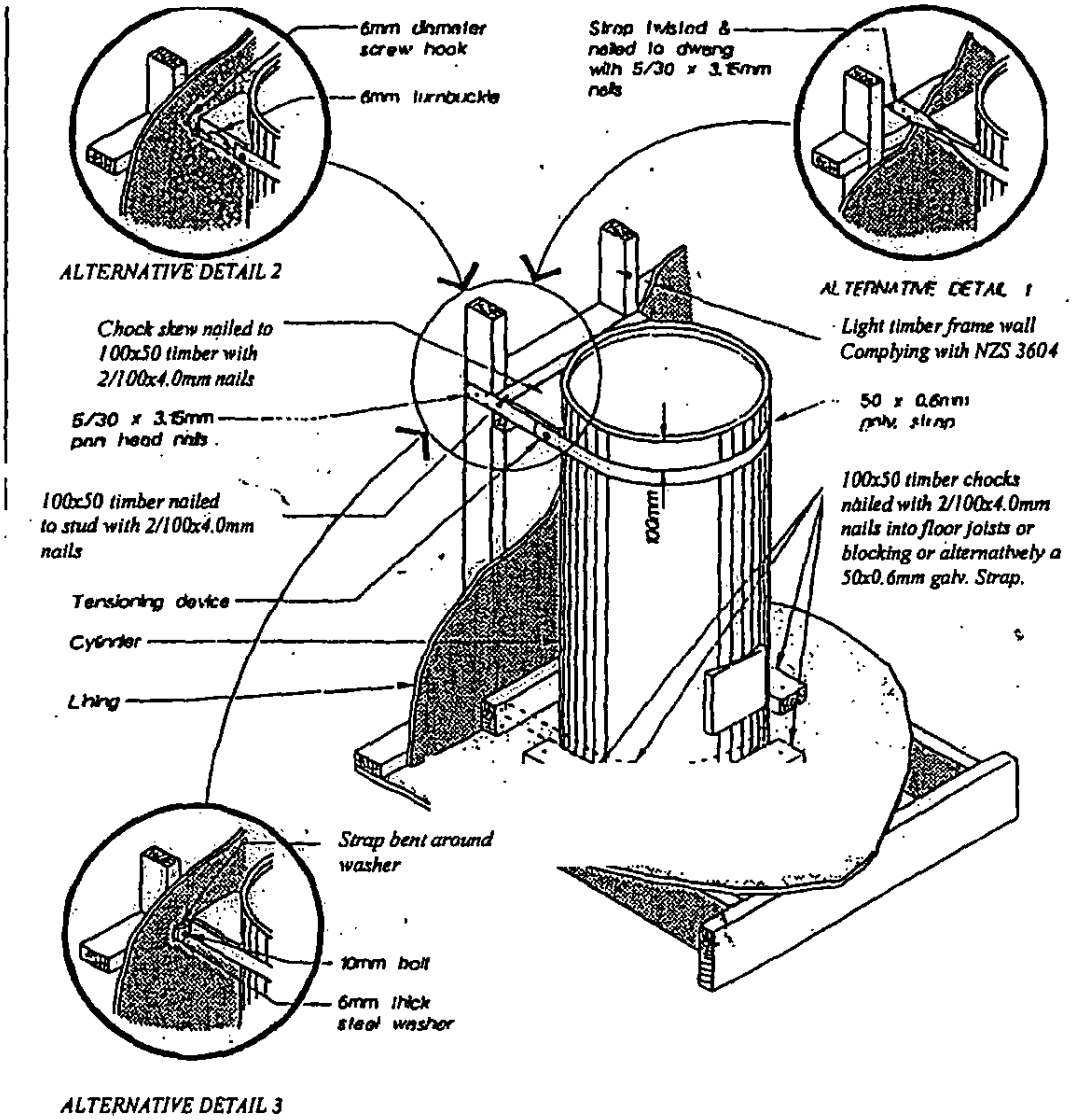
3. Doors.

Exterior door frames and doors are to be of standard sizes and of the types as shown on the drawings.
Interior doors are to be flush type,.....facing sheets and clashing strip to the closing edge.

TO ACHEIVE COMPLIANCE WITH HI/AS1 ALL EXTERNAL JOINERY MUST BE DOUBLE GLAZED – RATING : R 0.26

FIGURE 16: Seismic restraint of storage water heaters – less than 350 litres

Paragraph 4.10.3(b)



Bracing Design

Storey.	lower of 2
Foundation Type	Slab
Wind Zone.	high
LOWER LEVEL	
Attic space	no
Earhquake Zone.	C

Job No:

Address:

Date - 10/09/2009

Location From PIM

Region	
Terrain	
Exposure	
Topography	
TopoGraphic Zone	

FOR EARTHQUAKE.

Roof Weight.	light			
Roof Pitch.	26 - 45 deg			
Cladding	heavy	Walls	E= 6.9	BUs/m2

FOR WIND.

Building Height.	8	m
Roof Height.	3	m
Stud Height.	2.4	m

walls across	= 154	BUs/m2
walls along	= 154	BUs/m2

ROOF or BUILDING LENGTH.	BL =	10.6 m
ROOF or BUILDING WIDTH.	BW =	12.33 m
GROSS ROOF or BUILDING PLAN AREA.	GPA =	101 m2

Earthquake Load. (Walls)	E x GPA =	6.9	x	101	=	697 BUs
Wind - Across. Walls	W x BL =	154	x	10.6	=	1632 BUs
Wind - Along. Walls	W x BW =	154	x	12.33	=	1899 BUs

Bracing Design

ALONG - Walls Lower Storey										
							WIND		E/QUAKE	
Label	Min. Bu's	No.	Brace Type	Height (m)	Length (m)	Rating	B.U.'s Achieved	Rating	B.U.'s Achieved
A			TYPE8	2.4	7.2	200	1440	200	1440
				2.4					
				2.4					
				2.4					
				2.4					
				2.4					
Achieved									
B		1	BL1-0.4	2.4	0.48	120	58	115	55
				2.4					
				2.4					
				2.4					
				2.4					
				2.4					
Achieved							58		55
C		2	BLP-0.9	2.4	1.6	145	232	145	232
		3	SP1	2.4	1.2	100	120	100	120
		4	BLG-1.2	2.4	3.6	150	540	130	468
				2.4					
				2.4					
				2.4					
Achieved							892		820
D		5	GS1a-2.4	2.4	2.4	75	180	65	156
		6	BL1a	2.4	1.8	130	234	115	207
				2.4					
				2.4					
				2.4					
				2.4					
Achieved							414		363
E		7	BLP-0.9	2.4	2.7	145	392	145	392
		7a	BL1-0.6	2.4	0.6	125	75	115	69
		7b	BL1-0.6	2.4	0.6	125	75	115	69
		8	BLP-0.6	2.4	0.6	145	87	135	81
		8a	BL1-0.6	2.4	0.6	125	75	115	69
				2.4					
Achieved							704		680
F				2.4					
				2.4					
				2.4					
				2.4					
				2.4					
Achieved									
	Total Achieved.						**2067**		**1918**
	Total Required.						*1899*		*697*

Bracing Design

ACROSS - Walls Lower Storey

Label	Min. Bu's	No.	Brace Type	Height Lm	Length Lm	WIND Rating	WIND B.U.'s Achieved	E/QUAKE Rating	E/QUAKE B.U.'s Achieved
L		9	BLP-0.6	2.4	0.6	145	87	135	81
		10	BLP-0.6	2.4	0.6	145	87	135	81
		11	BL1-0.4	2.4	0.4	120	48	115	46
				2.4					
				2.4					
				2.4					
Achieved							222		208
M		12	BLP-0.6	2.4	0.6	145	87	135	81
		13	BLP-0.6	2.4	0.6	145	87	135	81
		14	BLG-0.6	2.4	0.6	145	87	130	78
		15	BLG-0.6	2.4	0.6	145	87	130	78
				2.4					
				2.4					
Achieved							348		318
N		16	BL1a	2.4	1.8	130	234	115	207
				2.4					
		17	BL1-0.6	2.4	1	125	125	115	115
				2.4					
				2.4					
				2.4					
Achieved							359		322
O		18	BLP-0.9	2.4	1.8	145	261	145	261
		19	BL1-0.4	2.4	0.4	120	48	115	46
				2.4					
				2.4					
				2.4					
				2.4					
Achieved							309		307
P		20	BLP-0.9	2.4	1.2	145	174	145	174
		21	BLP-0.9	2.4	1.2	145	174	145	174
		22	SP1	2.4	1.2	100	120	100	120
				2.4					
				2.4					
				2.4					
Achieved							468		468
Q				2.4					
				2.4					
				2.4					
				2.4					
				2.4					
Achieved									
	Total Achieved.						**1706**		**1623**
	Total Required.						1632		697

Bracing Design

Storey.	upper of 2
Foundation Type	Slab
Wind Zone.	high

UPPER LEVEL

Attic space	no
Earhquake Zone.	C

Location	From PIM
Region	
Terrain	
Exposure	
Topography	
TopoGraphic Zone	

FOR EARTHQUAKE.

Roof Weight.	light				
Roof Pitch.	0 - 25 deg				
Cladding	light	Walls	E=	3.3	BUs/m2

FOR WIND.

Building Height.	8	m
Roof Height.	3	m
Stud Height.	2.4	m

walls across	=	78	BUs/m2
walls along	=	78	BUs/m2

ROOF or BUILDING LENGTH.	BL =	10.6 m
ROOF or BUILDING WIDTH.	BW =	9.33 m
GROSS ROOF or BUILDING PLAN AREA.	GPA =	83 m2

Earthquake Load. (Walls)		E x GPA =	3.3	x	83	=	**274** BUs
Wind - Across.	Walls	W x BL =	78	x	10.6	=	**827** BUs
Wind - Along.	Walls	W x BW =	78	x	9.33	=	**728** BUs

Bracing Design

ALONG - Walls Upper Storey

Label	Min. Bu's	No.	Brace Type	Height (m)	Length (m)	WIND Rating	WIND B.U.'s Achieved	E/QUAKE Rating	E/QUAKE B.U.'s Achieved
A		23	BL1-0.6	2.4	1.4	125	175	115	161
				2.4					
				2.4					
				2.4					
				2.4					
				2.4					
Achieved							175		161
B		24	GS1a-2.4	2.4	2.4	75	180	65	156
		25	SP1	2.4	1.2	100	120	100	120
				2.4					
				2.4					
				2.4					
				2.4					
Achieved							300		276
C		26	GS2-2.4	2.4	3	90	270	80	240
				2.4					
				2.4					
				2.4					
				2.4					
				2.4					
Achieved							270		240
D		27	BL1-0.6	2.4	0.6	125	75	115	69
		28	BL1-0.6	2.4	0.6	125	75	115	69
		29	BL1-0.6	2.4	0.6	125	75	115	69
				2.4					
				2.4					
				2.4					
Achieved							225		207
E				2.4					
				2.4					
				2.4					
				2.4					
				2.4					
				2.4					
Achieved									
F				2.4					
				2.4					
				2.4					
				2.4					
				2.4					
Achieved									
	Total Achieved.						970		884
	Total Required.						728		274

Bracing Design

ACROSS - Walls Upper Storey

Label	Min. Bu's	No.	Brace Type	Height Lm	Length Lm	WIND Rating	WIND B.U.'s Achieved	E/QUAKE Rating	E/QUAKE B.U.'s Achieved
L		30	BL1-0.6	2.4	0.6	125	75	115	69
		31	BL1-0.6	2.4	0.6	125	75	115	69
				2.4					
				2.4					
				2.4					
				2.4					
Achieved							150		138
M		32	GS1a-1.8	2.4	1.8	65	117	55	99
		33	GS1a-1.8	2.4	1.8	65	117	55	99
				2.4					
				2.4					
				2.4					
				2.4					
Achieved							234		198
N		34	BL1-0.6	2.4	1.8	125	225	115	207
		35	GS2-2.4	2.4	2.4	90	216	80	192
				2.4					
				2.4					
				2.4					
				2.4					
Achieved							441		399
O		36	BL1-0.6	2.4	0.6	125	75	115	69
		37	BL1-0.4	2.4	0.4	120	48	115	46
				2.4					
				2.4					
				2.4					
				2.4					
Achieved							123		115
P				2.4					
				2.4					
				2.4					
				2.4					
				2.4					
				2.4					
Achieved									
Q				2.4					
				2.4					
				2.4					
				2.4					
				2.4					
Achieved									
	Total Achieved.						**948**		**850**
	Total Required.						827		274

Design Steps 4 and 5 – Bracing Units Achieved (Wind and Earthquake)

TABLE 1: Bracing Unit Ratings for 10mm GIB® Standard Plasterboard and any other 10mm and 13mm GIB® plasterboard.

TYPE	LENGTH (m)	LINING REQUIREMENT	OTHER REQUIREMENTS	BU PER METRE	
	MINIMUM		DIAGONAL BRACE	WIND	EARTHQUAKE
GS1a	1.8	10mm GIB® Standard Plasterboard one face fixed horizontal or vertical	yes	65	55
	2.4			75	65
GS2	1.2	10mm GIB® Standard Plasterboard both sides fixed horizontal or vertical[1]	no	70	60
	1.8			80	70
	2.4			90	80

TABLE 2: Bracing Unit Ratings for 10mm GIB Braceline®, 10mm GIB Noiseline® and 10mm GIB Toughline® (fixed with GIB Braceline® screws or GIB Braceline® nails)

TYPE	LENGTH (m)	LINING REQUIREMENT	OTHER REQUIREMENTS		BU PER METRE	
	MINIMUM		DIAGONAL BRACE	HOLD-DOWNS	WIND	EARTHQUAKE
BL1	0.4	GIB Braceline® one face fixed horizontal or vertical[2]	no	yes	120	115
	0.6		no	yes	125	115
BL1a	1.8	GIB Braceline® one face fixed horizontal or vertical[2]	yes	yes	130	115
BLP	0.6	GIB Braceline® one face fixed horizontal or vertical, 7mm D-D plywood on the other[1,2]	no	yes	145	135
	0.9				145	145
BLG	0.6	GIB Braceline® one face, 10mm GIB® Standard on the other face, linings fixed horizontal or vertical[1,2]	no	yes	145	130
	1.2				150[3]	130

Notes:

1) Where linings are specified on both faces, each face must be fastened as a bracing element.
2) GIB Aqualine® can be used in place of GIB Braceline® in bracing elements 900mm or longer, provided the perimeter of the element is fixed with GIB Braceline® nails or screws spaced at 100mm centres generally, using the GIB Braceline® corner fixing pattern.
3) A maximum of 150 BU/m is recommended for any bracing system used with NZS 3604:1999 construction. Higher ratings generate loads beyond the capacity of NZS 3604:1999 timber foundation and slab details. If ratings exceed 150 BU/m, hold downs and foundations must be the subject of specific structural engineering design.

In order for GIB® systems to perform as tested, all components must be installed exactly as prescribed. Substituting components produces an entirely different system and may seriously compromise performance. Follow system specifications.

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GIB® Bracing Systems, March 2006

Winstone Wallboards Ltd accepts no liability if GIB® Bracing Systems are not used in accordance with instructions contained in this publication.

Use Only the Current Specification

This publication may be superseded by a new publication. Winstone Wallboards Ltd accepts no liability for reliance upon publications that have been superseded. Before using this publication check whether this is the current publication, simply call the GIB® Helpline on 0800 100 442 or visit www.gib.co.nz

Substitution

GIB® Bracing Systems are not generic. Where specified, GIB® branded components must be used when specifying and installing GIB® Bracing Systems. Substitution is not in accordance with the instructions contained in this publication.

Copyright

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Acknowledgements

WIND and EARTHQUAKE design Tables and Figures were reproduced from NZS 3604:1999 with kind permission from Standards New Zealand (SNZ).

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Assistance was provided by BRANZ with the design of the procedure for determination of the WIND ZONE.

BRANZ APPRAISED
SPECIFY WITH CONFIDENCE

BRANZ Appraisal Certificate No. 294 (2006)

GIB® Bracing Systems, 2006

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MARCH 2006

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Changes to GIB® Bracing Systems

MARCH 2006

GIB® Bracing Systems Changes

GIB® Bracing Systems have undergone a thorough review as part of Winstone Wallboards ongoing programme to make GIB® systems simpler, easier and faster for customers to use. Users of the previous systems will notice some significant changes. Please review this technical literature in detail to make yourself aware of these changes.

The key differences are as follows:

- The new EzyBrace™ Specification Numbering System is designed to make specification, installation and identification of GIB® Bracing Systems easier.
- A rationalised number of bracing element types and a more consistent construction method.
- Fasteners must not be placed closer than 18mm to a sheet end or a cut edge or no closer than 12mm to the tapered (paper bound) machine edge of the GIB® plasterboard sheets.
- Some hold down details and corner fastening details have changed.
- A new 35mm GIB Braceline® Nail replaces the 32mm GIB Braceline® Nail in GIB Braceline® bracing elements.
- GIB® plasterboard sheets used in GIB® Bracing Systems March 2006 must have a manufacturing date after 16 January 2006.
- No additional framing is required for narrow panels.
- Introduction of a shorter 0.4m bracing element.
- Ability to substitute GIB Aqualine® for GIB Braceline® with modified fastener patterns.

Note: The bracing systems in the GIB® Bracing Systems 1999-2003 technical literature will remain valid, however, transfer to the systems contained in this publication is recommended for new designs for the benefits these systems offer.

Introduction

MARCH 2006

Scope of Use

This document is a guide to wall bracing of buildings constructed in accordance with NZS 3604:1999, Standard for Timber Framed Buildings not requiring specific design.

It is for owners, architects, engineers, draftsmen and builders, and designed to help the user to determine a building's wall bracing needs. It explains how to use GIB® Bracing Systems to resist **wind** and **earthquake** forces.

The information contained in this document is believed to be correct and accurate. However, all due care should be exercised by those who use it. If necessary, appropriate advice should be sought. Winstone Wallboards Ltd accepts no liability if the system is not used in accordance with instructions contained in this literature.

Compliance with the New Zealand Building Code (NZBC)

GIB® Bracing Systems comply with the requirements of NZS 3604:1999, when designed and installed in accordance with this brochure. NZS 3604:1999 is an Acceptable Solution to NZBC Clause B1 Structure.

Under normal conditions of dry internal use GIB® Bracing Systems have a service life in excess of 50 years and satisfy the requirements of NZBC Clause B2 Durability.

Appraisal

The document entitled GIB® Bracing Systems has been appraised by BRANZ Ltd. BRANZ Appraisal Certificate No. 294 (2006).

Limitations

GIB® plasterboard must be stacked flat and protected from the weather.

GIB® plasterboard must be handled as a finishing material.

GIB® plasterboard in use must not be exposed to liquid water or be installed in situations where extended exposures to humidities above 90% RH can reasonably be expected.

GIB® Bracing Systems must not be used in showers or shower over bath situations.

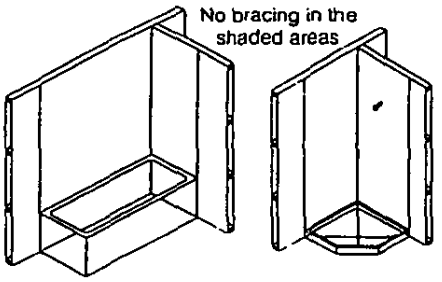
It is highly recommended not to install GIB® plasterboard in any situation where external claddings are not in place or the property is not adequately protected from the elements. If GIB® plasterboard is installed under these conditions, the risk of surface defects such as peaking or cracking is greatly increased.

GIB® Bracing Systems in Water-Splash Areas

When GIB® plasterboard is installed in locations likely to be frequently exposed to liquid water it must have an impervious finish. Examples are adhesive fixed acrylic shower linings over GIB Aqualine® with an approved waterproof membrane as a substrate for ceramic tiles.

The NZBC requires 15 years durability in these situations. Bracing elements are required to have a durability of 50 years. Winstone Wallboards recommends that bracing elements are not located in shower cubicles or behind baths because of durability requirements, the likelihood of renovation, and practical issues associated with fixing bracing elements to perimeter framing members.

Otherwise GIB® Bracing Systems can be used in water-splash areas as defined by NZBC Clause E3, provided these are maintained impervious for the life of the building.



Renovation

When relining walls during the process of renovation, ensure that bracing elements are reinstated (check the building plans).

How to use this Document

This document will guide you through the process of designing a bracing system and filling out a bracing schedule in accordance with NZS 3604:1999 step by step. Where reference is made to the GIB® Site Guide, use the latest version.

External forces (Bracing Units (BUs) required or demand)

Step 1: Work out the required number of **BUs** for **wind**

↓

Step 2: Work out the required number of **BUs** for **earthquake**

The structure's resistance (Bracing Units (BUs) achieved or capacity)

Step 3: Ensure adequate distribution of **wall bracing elements**

↓

Step 4: Work out the achieved number of **BUs** for **wind**

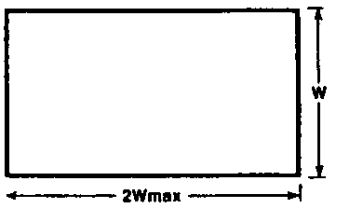
↓

Step 5: Work out the achieved number of **BUs** for **earthquake**

Ceiling Diaphragms

MARCH 2006

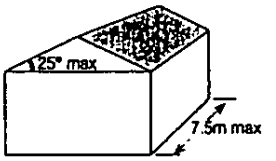
GIB® ceiling diaphragms are strong and stiff horizontal bracing elements which effectively transfer loads over large distances. They are used to space bracing lines further apart than 5 metres (single top plate), or 6 metres (double top plate).
A ceiling diaphragm shall be square or rectangular. Its length shall not exceed twice its width. The width being measured horizontally between supporting walls. Ceiling diaphragms under light and heavy roofs are required to comply with NZS3604:1999.



Limitations for 10mm or 13mm GIB® Standard Plasterboard Ceiling Diaphragms

- Diaphragms not steeper than 25 degrees to the horizontal shall not exceed 7.5 metres in length.
- 10mm or 13mm GIB® Standard Plasterboard is fastened at 150mm centres to the boundary members around the entire perimeter of the diaphragm.

  Fasteners – 32mm x 6g GIB® Grabber® Drywall Screws or 30mm x 2.8mm GIB® Nails.

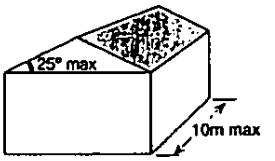


GIB® Standard Plasterboard Diaphragms

Limitations for GIB Ultraline® Ceiling Diaphragms

- Diaphragms not steeper than 25 degrees to the horizontal shall not exceed 10 metres in length.
- GIB Ultraline® is fastened at 150mm centres to the boundary members around the entire perimeter of the diaphragm.

  Fasteners – 32mm x 6g GIB® Grabber® Drywall Screws or 30mm x 2.8mm GIB® Nails.

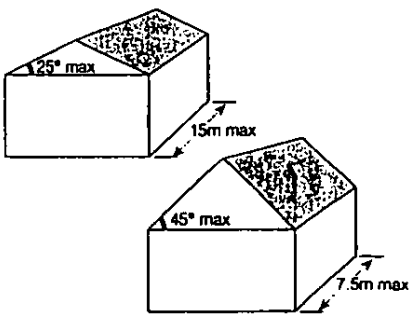


GIB Ultraline® Diaphragms

GIB Braceline® Ceiling Diaphragms

- Diaphragms not steeper than 25 degrees to the horizontal shall not exceed 15 metres in length.
- Diaphragms not steeper than 45 degrees to the horizontal shall not exceed 7.5 metres in length.
- GIB Braceline® is fastened at 150mm centres to the boundary members around the entire perimeter of the diaphragm.

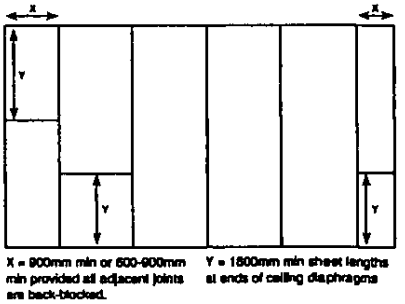
  Fasteners – 32mm x 7g GIB Braceline® Drywall Screws or 35mm GIB Braceline® Nails.



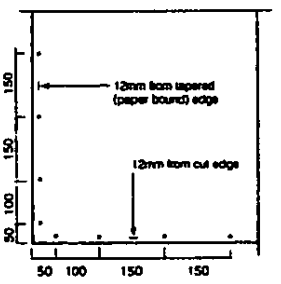
GIB Braceline® Ceiling Diaphragms

General Fixing Requirements for GIB® Ceiling Diaphragms

- Linings shall be installed over the entire area of the diaphragm.
- Fastening shall be no less than 12mm from sheet edges.
- Sheets shall be supported by framing members (e.g., ceiling battens) spaced at no more than 450mm centres for 10mm GIB® plasterboard and at no more than 600mm centres for 13mm GIB® plasterboard.
- Sheets within the diaphragm area may be fastened and finished conventionally in accordance with the publication entitled, "GIB® Site Guide". All joints shall be paper tape reinforced and stopped. It is recommended that sheet butt joints are formed off framing and back-blocked (see "GIB® Site Guide").
- Use full width sheets where possible. At least 900mm wide sheets with a length not less than 1800mm shall be used. Sheets less than 900mm wide but no less than 600mm may be used provided all joints with adjacent sheets are back-blocked (see "GIB® Site Guide").
- Openings are allowed within the middle third of the diaphragm's length and width. Fixing of sheet material to opening trimmers shall be at 150mm centres. Neither opening dimension shall exceed a third of the diaphragm width. Larger openings, or openings in other locations, require specific engineering design. Refer "Openings in Bracing Elements" page 27.
- Fasteners are placed at 150mm centres around the ceiling diaphragm starting at 50mm and 150mm from the sheet corners.



Sheet Widths and Lengths in Ceiling Diaphragms



Fastening pattern for ceiling diaphragms

In order for GIB® systems to perform as tested, all components must be installed exactly as prescribed. Substituting components produces an entirely different system and may seriously compromise performance. Follow system specifications.

Construction Details

MARCH 2006

GIB® Bracing Systems Changes

GIB® Bracing Systems have undergone a thorough review as part of Winstone Wallboards ongoing programme to make GIB® systems simpler, easier and faster for customers to use. Users of the previous systems will notice some significant changes. Please review this technical literature in detail to make yourself aware of these changes. The key differences are as follows:

- The new EzyBrace™ Specification Numbering System is designed to make specification, installation and identification of GIB® Bracing Systems easier.
- A rationalised number of bracing element types and a more consistent construction method.
- Fasteners must not be placed closer than 18mm to a sheet end or a cut edge or no closer than 12mm to the tapered (paper bound) machine edge of the GIB® plasterboard sheets.
- Some hold down details and corner fastening details have changed.
- A new 35mm GIB Braceline® Nail replaces the 32mm GIB Braceline® Nail in GIB Braceline® bracing elements.
- GIB® plasterboard sheets used in GIB® Bracing Systems March 2006 must have a manufacturing date after 16 January 2006.
- No additional framing is required for narrow panels.
- Introduction of a shorter 0.4m bracing element.
- Ability to substitute GIB Aqualine® for GIB Braceline® with modified fastener patterns.

Note: The bracing systems in the GIB® Bracing Systems 1999-2003 technical literature will remain valid, however, transfer to the systems contained in this publication is recommended for new designs for the benefits these systems offer.

Framing

General framing requirements such as grade, spacings and installation shall comply with the provisions of NZS 3604:1999. Winstone Wallboards Ltd recommends the use of kiln-dried machine stress graded framing (KD MSG). To achieve the published bracing performance the minimum actual framing dimensions are 90 x 35mm for external walls and 70 x 35mm for internal walls.
Wall bracing tests on GIB® Bracing Systems were undertaken without nogs. Nogs are not considered to add to the bracing performance of the wall.

Fastening GIB® plasterboard Linings

GIB® Standard Plasterboard bracing systems must be fastened using minimum length 32mm x 6g GIB® Grabber® Drywall Screws or 30 x 2.8mm GIB® Nails. GIB Braceline® bracing systems must be fastened with 32mm x 7g GIB Braceline® screws, or 35mm GIB Braceline® nails.
GIB® plasterboard linings for designated bracing elements are fastened at 150mm centres around the perimeter of the bracing element. For GIB® Standard bracing elements fasteners are placed at 50 and 150mm from the sheet corner (see page 30). For GIB Braceline® bracing elements fasteners start at 50, 100 and 150mm from the sheet corner (see page 31). Fasteners must be placed 12mm from the tapered edge (paper bound) and 18mm from the cut edge.
Fastening in the field of the bracing element is conventional and the screw and glue method is recommended as outlined in the "GIB® Site Guide".
When fixing part sheets of GIB® plasterboard, a minimum width of 300mm applies for bracing elements.
Horizontal fixing is recommended. If fixing vertically, full height sheets shall be used where possible. Where sheet end butt joints are unavoidable they must be formed over nogs or over the studs and fastened at 200mm centres. Alternatively, the sheet end butt joints may be back-blocked.

Plywood

'Plywood' specified in BLP is grade D-D 7mm construction plywood manufactured to AS/NZS 2269:2004, fixed with 30 x 2.8mm flat head nails at 150mm centres around the perimeter of the bracing element and at 300mm centres to intermediate framing.

Fire Resistance and Noise Ratings

10mm GIB Braceline®, 10mm GIB Aqualine®, 10mm GIB Noiseline®, 10mm and 13mm GIB Ultraline® and 10mm GIB Toughline® may be substituted for 10mm GIB Fyreline® in fire rated constructions. 10mm GIB Braceline® and 10mm GIB Toughline® may be substituted for 10mm GIB Noiseline® in GIB® Noise Control Systems.The fastener length for the fire rated system applies. The field of the braced element must also be fastened in accordance with the fire rated specification (adhesive not permitted).

Jointing and Stopping

All sheet joints must be paper tape reinforced and stopped in accordance with the publication entitled "GIB® Site Guide".

Fastening the Bracing Element to Timber Floors

Fastening the bottom plate of a GIB® wall bracing element to a timber framed floor must be in accordance with NZS3604:1999 with pairs of 100 x 3.75mm hand driven nails or three 90 x 3.15mm power driven nails at 600mm centres. In addition panel hold-downs, as detailed on page 29, must be installed when specified for the particular bracing element type (BL1, BL1a, BLG and BLP).

Fastening the Bracing Element to Concrete Slabs

Fastening the bottom plate of an external wall for bracing element GS1a is in accordance with NZS 3604:1999. On internal bracing lines, the bottom plate of wall bracing elements GS1a and GS2 may be fixed using minimum 65mm x 3.8mm shot fired fasteners fitted with 16mm discs, spaced at 150mm and 300mm from the end studs and thereafter at 600mm centres. Wall bracing elements BL1, BL1a, BLG and BLP installed on both external and internal walls require a panel hold-down connection at each end of the bracing element (see page 29). Within the length of the bracing element bottom plates are fixed in accordance with NZS 3604:1999.

In order for GIB® systems to perform as tested, all components must be installed exactly as prescribed. Substituting components produces an entirely different system and may seriously compromise performance. Follow system specifications.

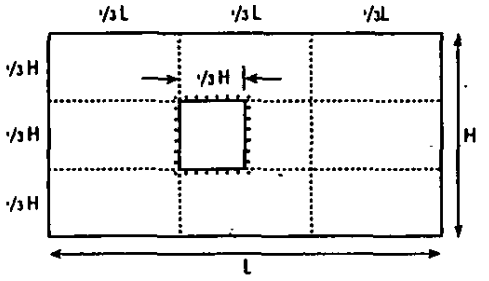
Construction Details

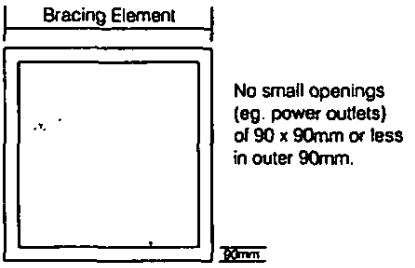
Panel Hold-Down Details

GIB® Standard Bracing Systems GS1a and GS2 do not require specific connections at the bracing element ends.
GIB Braceline® Bracing Systems BL1, BL1a, BLP and BLG all have panel hold-down connections at each end of the bracing element. Refer to page 29 for construction details.

Openings in Bracing Elements

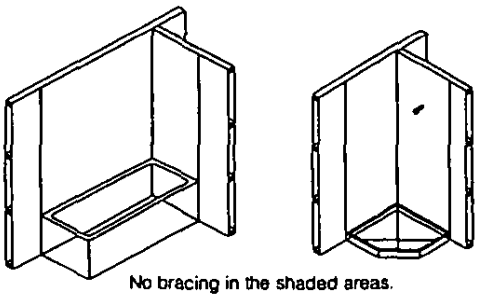
Openings are allowed within the middle third of a wall bracing element's length and height. Neither opening dimension shall be more than one third of the element height. Wall linings are fixed to opening trimmers at 150mm centres. Small openings (e.g. power outlets) of 90 x 90mm or less may be placed no closer than 90mm to the edge of the braced element.





GIB® Bracing in Water-Splash Areas

Bracing elements are required to have a durability of 50 years. Winstone Wallboards recommends that bracing elements are not located in shower cubicles or behind baths because of durability requirements, the likelihood of renovation, and practical issues associated with fixing bracing elements to perimeter framing members.
Otherwise GIB® Bracing Systems can be used in water-splash areas as defined by NZBC Clause E3, provided these are maintained impervious for the life of the building.
GIB Aqualine® can be used in place of GIB® Standard in bracing elements.
GIB Aqualine® can be used in place of GIB Braceline® in bracing elements 900mm or longer, provided the perimeter of the element is fixed with GIB Braceline® nails or screws at 100mm centres generally, using the GIB *Braceline® corner fixing pattern.*



No bracing in the shaded areas.

Renovation

When relining walls during the process of renovation, ensure that bracing elements are reinstated (check the building plans).

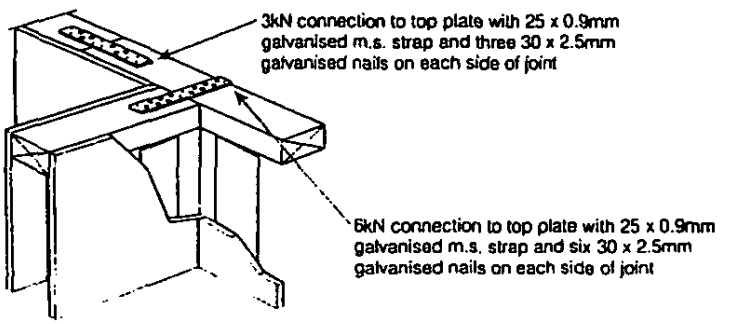
Angle Braces

Angle braces serve to keep frames square during transport and construction. They also act as part of the temporary bracing of a building under construction.
Where specified, metal angle braces must be placed at an angle no steeper than 55 degrees, and within the designated length of the bracing element. For elements longer than 3.6 metres, pairs of angle braces (in opposite directions) are required. Fixing of angle braces is with three 30 x 2.8mm galvanised flat head nails to top and bottom plates, and two 30 x 2.8mm nails to intermediate framing.

Top Plate Connections

The top plate of a wall that contains one or more wall bracing elements shall be jointed according to the rating of the highest-rated individual wall bracing element as follows:

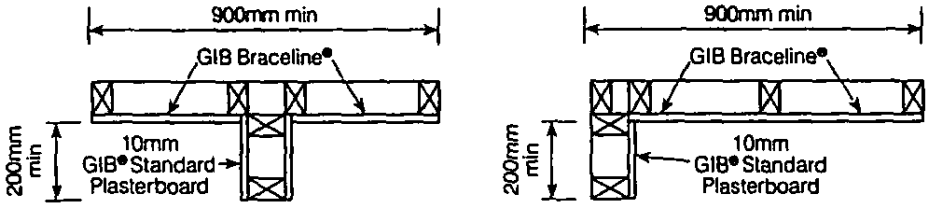
(a) Rating not exceeding 100 bracing units: A 3kN connection as shown or by an alternative fixing of 3kN capacity in tension or compression along the plate;
(b) Rating exceeding 100 bracing units: A 6kN connection as shown or by an alternative fixing of 6kN capacity tension or compression along the plate.



Construction Details

Guidelines for Intersecting Walls

GIB® Bracing Elements may have intersecting walls with a minimum length of 200mm. Bracing element sheets shall be fixed and jointed as given on pages 30 and 31. Fasteners are required around the perimeter of the bracing element. Vertical joints at T-junctions (illustrated below) shall be fixed and jointed as specified for intermediate sheet joints. **The bracing element length must be no less than 900mm.**



Where a Wall Bracing Element is interrupted by a T or L junction the element is deemed to be continuous for the whole length (900mm in the example illustrated above).

Fixing the Perimeter of a Bracing Element

A bracing element can consist of a part sheet (such as in a 600 mm long BL1 element), or multiple sheets (such as in a 2.4 metre or longer GS1a element). The critical fasteners are located around the perimeter of a bracing element as outlined on the fastener layout pages. The perimeter of a bracing element must be connected to a continuous member such as studs or plates. Connection to a row of nogs is not acceptable.

Fixing in the Field of the Bracing Element

Fixing in the field of a bracing element is conventional and for GIB® wall bracing elements this means that adhesive fixing is recommended, eliminating the need for mechanical fasteners in the body of the sheets.

For GIB® ceiling diaphragms the screw and glue method is recommended resulting in a minimum number of mechanical fasteners along the centre line in the body of the sheets.

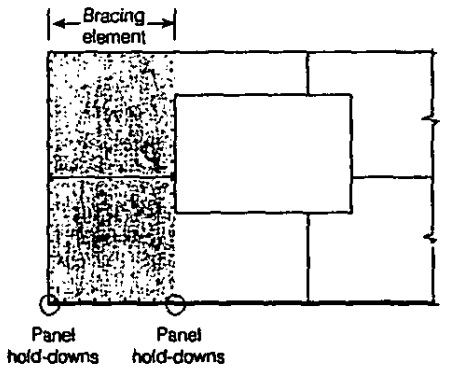
When applied correctly, paper-tape and stopped joints within the bracing element are strong enough to transfer loads within the element and conventional fixing of intermediate sheet joints to framing is sufficient.

Any sheet end butt joints within the field of the bracing element must be back-blocked in accordance with the "GIB® Site Guide".

Consult the "GIB® Site Guide" for further details on recommended fixing details.

Horizontal Fixing

GIB Braceline® linings may be fixed horizontally when linings extend under/over door or window openings. GIB Braceline® fasteners are provided around the perimeter of the bracing element.



GIB® Bracing Systems – EzyBrace™ Specification Numbering System

The EzyBrace™ Specification Numbering System is designed to make specification of GIB® Bracing Systems by designers and identification on site by builders and building officials more transparent. Note: the EzyBrace™ Specification Numbering System (and sub-components thereof) are protected by copyright.

GS = GIB® Standard Plasterboard
BL = GIB Braceline®
BLP = GIB Braceline® / Plywood
BLG = GIB Braceline® / GIB® Standard Plasterboard

1 = lined one side
2 = lined both sides
a = angle brace

Therefore,
GS1a = GIB® Standard Plasterboard one side with an angle brace
GS2 = GIB® Standard Plasterboard both sides
BL1 = GIB Braceline® one side
BL1a = GIB Braceline® one side with an angle brace
BLP = GIB Braceline® one side, Plywood on the other
BLG = GIB Braceline® one side, GIB® Standard Plasterboard on the other

In order for GIB® systems to perform as tested, all components must be installed exactly as prescribed. Substituting components produces an entirely different system and may seriously compromise performance. Follow system specifications.

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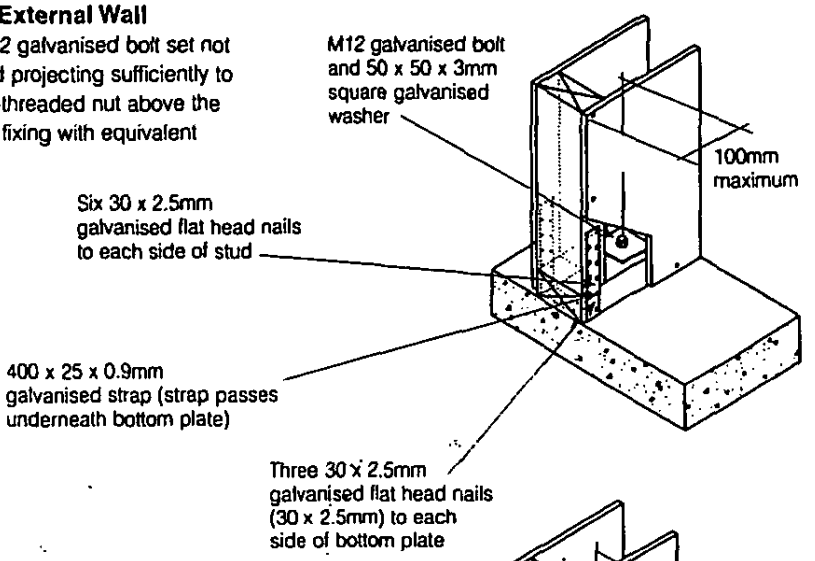
Panel Hold-down Details

MARCH 2006

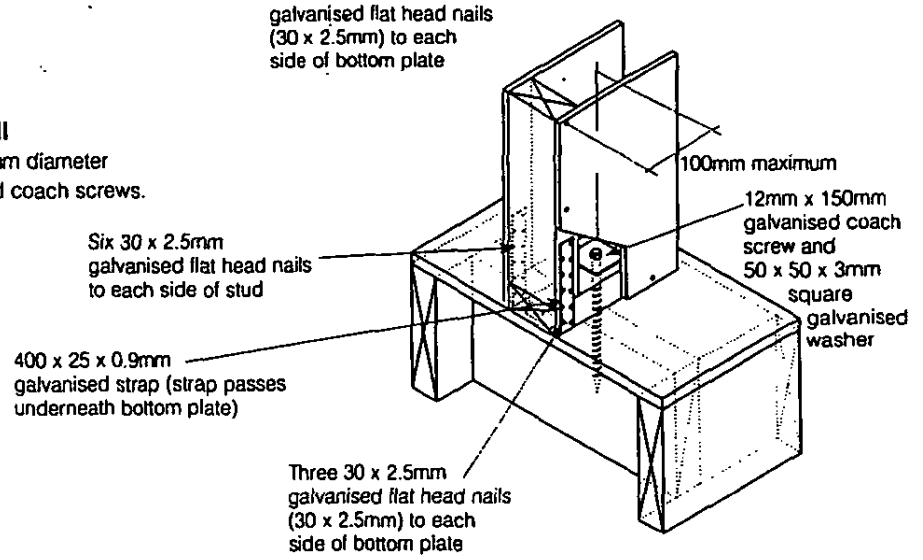
Concrete Floor – Internal / External Wall

Bottom plate is fixed using an M12 galvanised bolt set not less than 75mm into concrete and projecting sufficiently to allow for a 3mm washer and fully-threaded nut above the timber. Alternatively a proprietary fixing with equivalent capacity may be used.



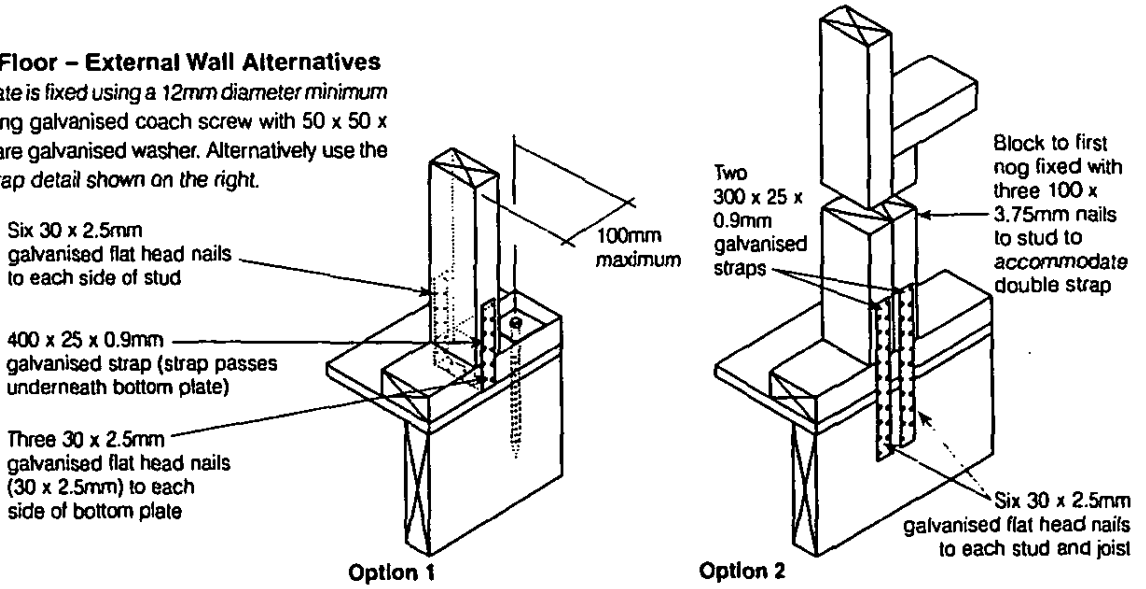
Timber Floor – Internal Wall

Bottom plate is fixed using a 12mm diameter minimum 150mm long galvanised coach screws.



Timber Floor – External Wall Alternatives

Bottom plate is fixed using a 12mm diameter minimum 150mm long galvanised coach screw with 50 x 50 x 3mm square galvanised washer. Alternatively use the *double strap detail shown on the right.*



Notes:

Additional thickness and/or corrosion protection is required in exposed and sheltered applications. (Consult NZS 3604:1999).
To maintain a flush surface for the wall linings, it is recommended that hold down straps are checked into the framing.

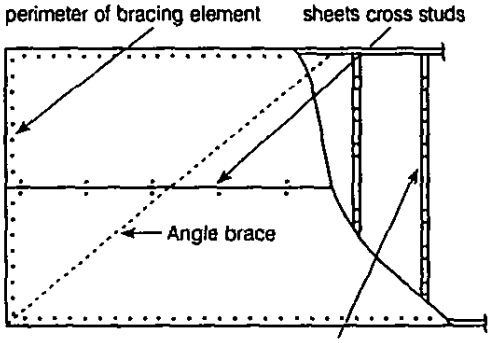
In order for GIB® systems to perform as tested, all components must be installed exactly as prescribed. Substituting components produces an entirely different system and may seriously compromise performance. Follow system specifications.

Fastener Layouts – GIB® Standard Bracing Elements MARCH 2006

For 10mm GIB® Standard Plasterboard and any other 10mm and 13mm GIB® plasterboard

32mm x 6g GIB® Grabber® Drywall Screws or 30mm GIB® Nails at 150mm centres to perimeter of bracing element

Single 32mm x 6g GIB® Grabber® Drywall Screws or 30mm GIB® Nails where sheets cross studs

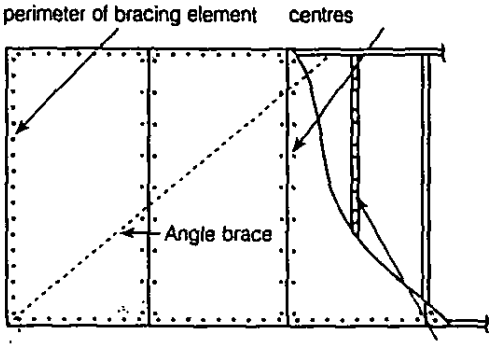


GS1a (lined one side) (Horizontal Fixing)

Daub of GIBFix® adhesive at 300mm centres to intermediate studs

32mm x 6g GIB® Grabber® Drywall Screws or 30mm GIB® Nails at 150mm centres to perimeter of bracing element

Single 32mm x 6g GIB® Grabber® Drywall Screws or 30mm GIB® Nails at 300mm centres

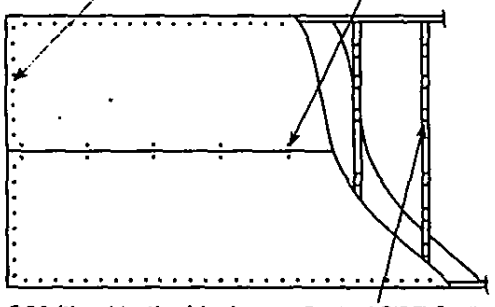


GS1a (lined one side) (Vertical Fixing)

Daub of GIBFix® adhesive at 300mm centres to intermediate studs and nogs

32mm x 6g GIB® Grabber® Drywall Screws or 30mm GIB® Nails at 150mm centres to perimeter of bracing element

Single 32mm x 6g GIB® Grabber® Drywall Screws or 30mm GIB® Nails where sheets cross studs

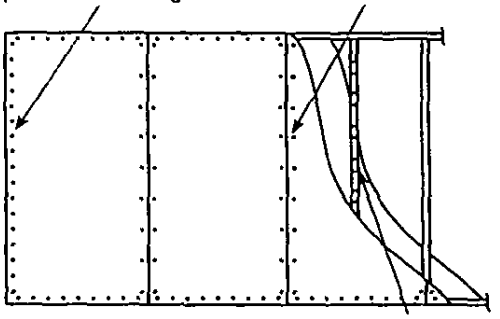


GS2 (lined both sides) (Horizontal Fixing)

Daub of GIBFix® adhesive at 300mm centres to intermediate studs

32mm x 6g GIB® Grabber® Drywall Screws or 30mm GIB® Nails at 150mm centres to perimeter of bracing element

Single 32mm x 6g GIB® Grabber® Drywall Screws or 30mm GIB® Nails at 300mm centres



GS2 (lined both sides) (Vertical Fixing)

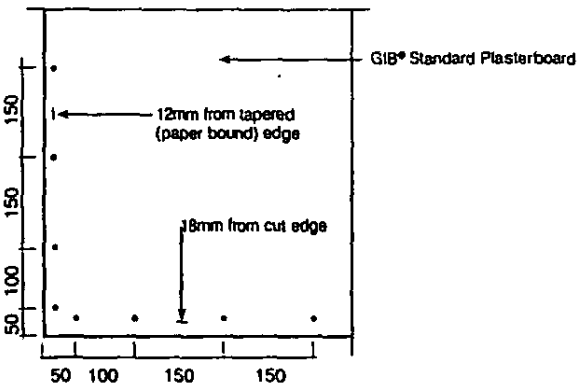
Daub of GIBFix® adhesive at 300mm centres to intermediate studs and nogs

Fixing the perimeter of a GIB® Standard Plasterboard bracing element

Fasteners are placed no closer than 12mm to the tapered (paper bound) machine edge of the GIB® plasterboard sheets. Fasteners are placed no closer than 18mm to a sheet end or a cut sheet edge.

For GIB® Standard bracing elements fasteners are placed at 150mm centres around the bracing element perimeter, starting at 50 and 150mm from the sheet corners.

Fastening pattern for GIB® Standard bracing elements



In order for GIB® systems to perform as tested, all components must be installed exactly as prescribed. Substituting components produces an entirely different system and may seriously compromise performance. Follow system specifications.

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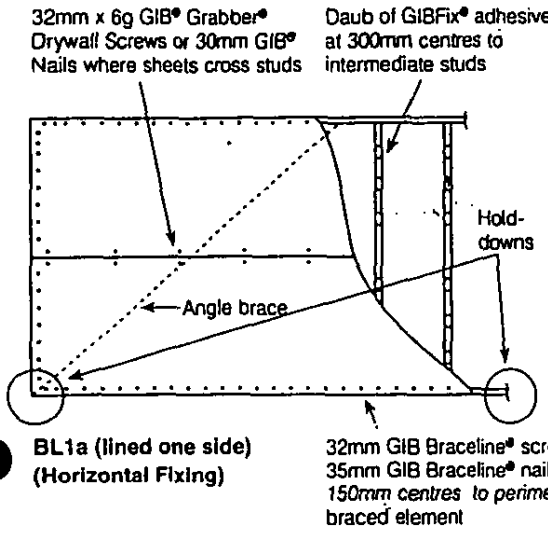
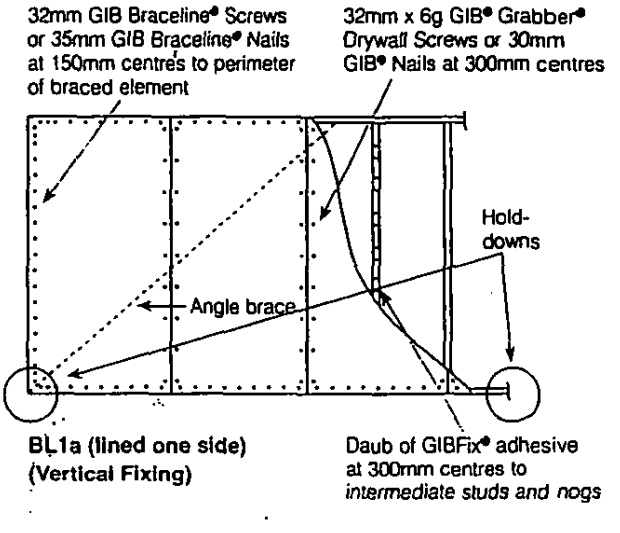
Fastener Layouts – GIB Braceline® Bracing Elements MARCH 2006

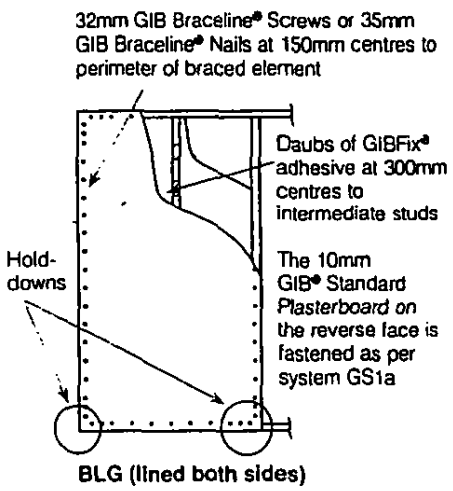
For 10mm GIB Braceline®, 10mm GIB Noiseline® and 10mm GIB Toughline®



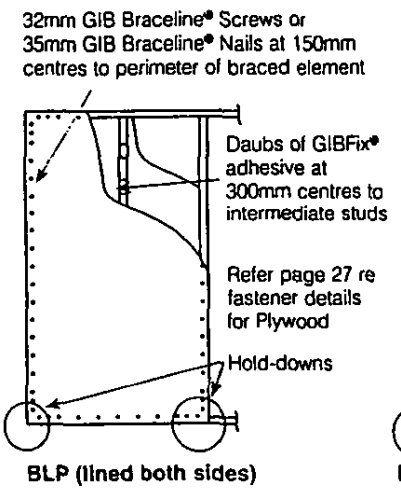
BL1a (lined one side) (Horizontal Fixing)



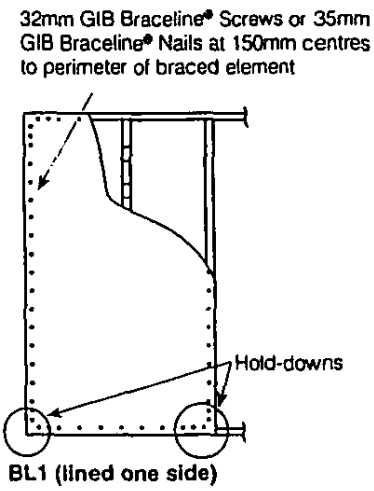
BL1a (lined one side) (Vertical Fixing)



BLG (lined both sides)



BLP (lined both sides)



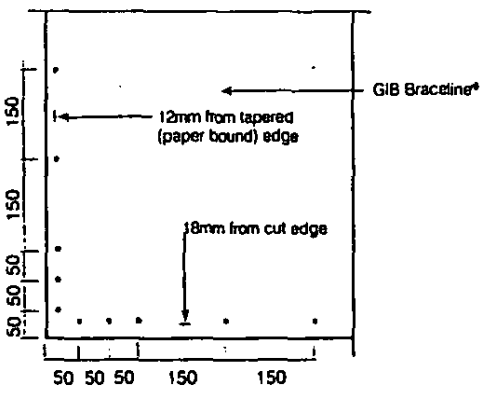
BL1 (lined one side)

Fixing the perimeter of a GIB Braceline® bracing element

Fasteners are placed no closer than 12mm to the tapered (paper bound) machine edge of the GIB® plasterboard sheets. Fasteners are placed no closer than 18mm to a sheet end or a cut sheet edge.

For GIB Braceline® systems, fasteners are placed at 150mm centres around the bracing element perimeter, starting at 50, 100 and 150mm from the sheet corners.

Fastening pattern for GIB Braceline® bracing elements



In order for GIB® systems to perform as tested, all components must be installed exactly as prescribed. Substituting components produces an entirely different system and may seriously compromise performance. Follow system specifications

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GIB® Bracing System Installation Checklist

MARCH 2006

Contract ID	
Site Address	
Specifier	
Building Contractor	
Plasterboard Installer	
Check carried out by	
Date	

Reference Material: GIB® Bracing Systems, GIB® Site Guide (Edition current at time of installation).

PRE LINING	Y	N	CHECKED BY	DATE
Bracing element position corresponds with the bracing plan				
Hold-down straps correctly positioned and installed *(systems incorporating "BL")*				
Hold-down straps checked in flush with framing				
Hold-down bolts correctly positioned and installed				
No power points or light switch outlets situated within 90mm of the edge of the element. *Easier to move now than later.*				
Any opening larger than 90 x 90mm is positioned in the middle third of the element both vertically and horizontally				
Braces extend from top to bottom plates. Angle braces installed correctly				
No bracing elements situated within a shower cubicle or above a bath				
POST LINING	**Y**	**N**	**CHECKED BY**	**DATE**
Correct corner fastening pattern has been used for the specified system				
Perimeter fastenings are correctly spaced for the system being used				
Correct fasteners have been used. *32mm GIB® Grabber® or GIB® Nails for all GS systems and 32mm GIB Braceline® screws or 35mm GIB Braceline® nails for BL systems.*				
Sheet end butt joints within the bracing element are back-blocked				
CEILING DIAPHRAGMS	**Y**	**N**	**CHECKED BY**	**DATE**
Steel battens are directly fixed to framing. *Clip system cannot be used in ceiling diaphragm applications.*				
Perimeter of the diaphragm is fixed to a single continuous member along each edge				
No sheets shorter than 1800mm used in diaphragm				
End sheets are a minimum of 600mm wide x 1800mm long				
Longitudinal joint adjacent to end sheet is back-blocked if end sheet is between 600mm and 900mm wide				
Corner fastenings correct				
Sheet end butt joints back-blocked				

ble 2. Ratings for 2.4m high Panelbrace wall bracing elements

ese ratings apply to walls detailed in accordance with NZS 3604 and this leaflet. The hold-down value determines which details should used.

ıe 6kN hold-down is a dropped panel detail with no steel straps or a single strap at each end of the wall.

ıe 12kN hold-down (Type D) is two straps at each end of the wall.

Wall Type	Minimum wall length (m)	Minimum Plywood thickness(mm)	Nail* Spacing (mm)	Hold down (kN)	Stud spacing (mm)	Bracing units/m (20 bracing units = 1kN) Wind	Earthquake	
			Ratings for plywood component only					
SP4	0.45	7	75	6	450	70	85	
SP	0.6	7	150	6	600	85	85	
SP1	0.9	7	150	6	450 or 600	100	100	
SPST1	1.2	7	150	-	600	90	80	
SP6	0.9	12	150	6	450 or 600	115	110	
SP8D	0.9	7	150	12	450	125	135	
SP5D	1.2	7	75	12	600	130	135	
SP10	1.8	7	75	6	450	135	135	
			Ratings for plywood one side and additional sheathing on the other					
								additional sheathing
SP2G	0.6	7	150	6	600	95	95	Gib Board®
SP1G	0.9	7	150	6	450 or 600	100	100	Gib Board®
SP11G	1.8	7	150	6	450 or 600	140	120	Gib Board®
BP	0.9	7	150	6	450 or 600	145	145	Braceline®
SP	0.9	12	150	6	450 or 600	120	110	Gib Board®
SP6GD	0.9	12	150	12	450 or 600	145	135	Gib Board®

ːe these spacings at all edges and ends of sheets. Within the sheet, spacings may be double that specified.

ˀmm plywood use 30 x 2.5mm galvanised flathead nails.

ɪm Plywood use 50mm x 2.8mm or larger galvanised flathead nails.

Steel Framing

Use SPST1 for plywood on light steel frames. Use button head self drilling, self tapping screws for Panelbrace and standard plywood and counter sunk stainless steel self drilling, self tapping screws for cladding applications. Refer Carter Holt Harvey Plywood Technical Note "Plywood on steel frame" for more detail.

STUD TO TOP PLATE FIXING SCHEDULE

(ALTERNATIVE TO NZS 3604:1999 TABLE 8.18)

NOTE

All fixings are designed for vertical loads only. Dead loads include the roof weight and standard ceiling weight of 0.20kPa. Refer to table 8.19, NZS3604:1999 for nailing schedule to resist horizontal loads.

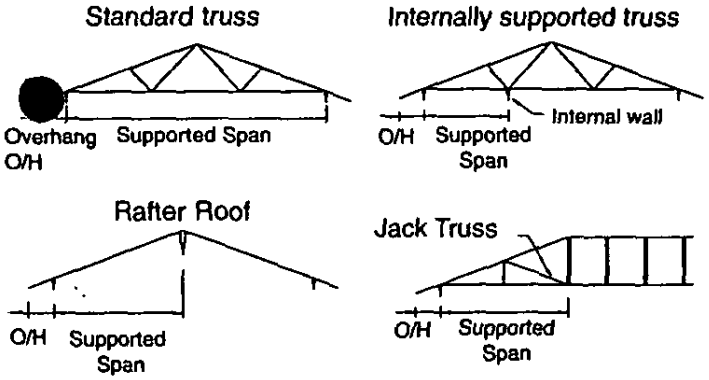
These fixings assume the correct choice of rafter/truss to top plate connections have been made. Refer to the **LUMBERLOK®** Truss Fixing Chart.

Gable end wall top plate/stud connections require only 2x90x3.33 nails driven vertically into stud through top plate.

All Fixings assume top plate thickness of 45mm maximum.

Wall framing arrangements under girder trusses are not covered in this schedule.

LOADED DIMENSION DEFINITION



$$\text{LOADED DIMENSION} = \frac{\text{SUPPORTED SPAN}}{2} + \text{OVERHANG}$$

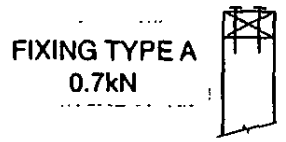
SELECTION CHART FOR FIXING LOADS - TOP PLATE TO STUD

Loaded Dimension	Light Roof Wind Zone				Heavy Roof Wind Zone			
	L	M	H	VH	L	M	H	VH
1.5	A	A			A	A		
2.0	A			C	A	A		
2.5	A		C	C	A	A		C
3.0			C	D	A	A		C
3.5			C	D	A	A		D
4.0		C	D	D	A	A	C	D
4.5		C	D	D	A		C	D
5.0		C	D	D	A		C	D
5.5		C	D	D	A		C	D
6.0		C	D	-	A		D	D

- All studs at 600 crs.
- For studs at 400 crs decrease loaded dimension by 33%.
- All trusses at 900 crs.
- For trusses at 1200 crs increase loaded dimension by 33%.

FIXING TYPES

FIXING TYPE A
0.7kN



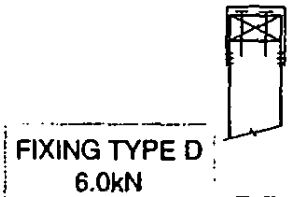
2/90x3.33 plain steel wire nails driven vertically into stud.

2/90x3.33 plain steel wire nails driven vertically into stud, plus single **TYLOK 2T4** plate.

FIXING TYPE C
2.7kN

2/90x3.33 plain steel wire nails driven vertically into stud, plus pair **TYLOK 2T4** plates.

FIXING TYPE D
6.0kN

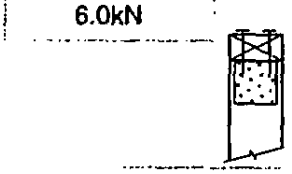


2/90x3.33 plain steel wire nails driven vertically into stud, plus **TYLOK Stud tie.**

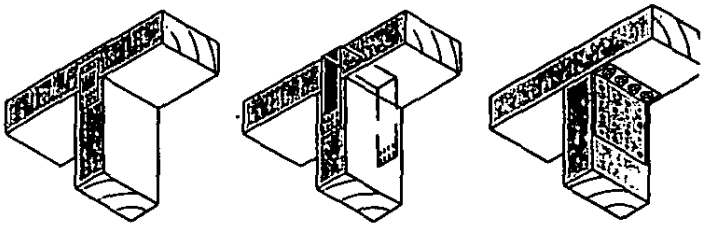
OR

Sheet brace strap 400 with 6/30x3.15 nails each stud face.

OR



2/90x3.33 plain steel wire nails driven vertically into stud, plus **6kN Stud Anchor.**



TYLOK 2T4 | **TYLOK STUD TIE OR SHEET BRACE STRAP 400** | **6kN STUD ANCHOR**

MiTek New Zealand Ltd.

AUCKLAND
PO Box 58-014, Greenmount
Phone: (09) 274 7109
Fax: (09) 274 7100

CHRISTCHURCH
PO Box 8387, Riccarton
Phone: (03) 348 8691
Fax: (03) 348 0314

www.miteknz.co.nz

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HOME OF GANG-NAIL® BUILDING SYSTEMS

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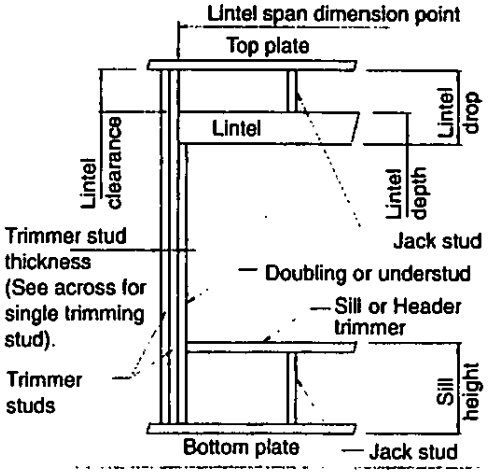
LINTEL FIXING SCHEDULE

(ALTERNATIVE TO NZS 3604:1999 TABLE 8.14 & FIGURE 8.12)

DEFINITIONS



SELECTION CHART FOR LINTEL FIXING

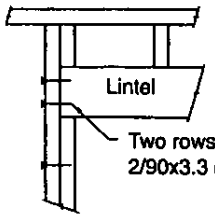
Lintel Span	Loaded Dimension *See reverse side	Light Roof Wind Zone L	M	H	VH	Heavy Roof Wind Zone L	M	H	VH
1.5	2.0	A	A			A	A		
	3.0	A			C	A	A		
	4.0	A		C	C	A	A		C
	5.0			C	C	A	A	C	C
	6.0			C	D	A	A	C	C
2.0	2.0	A			C	A	A		
	3.0	A		C	C	A	A		C
	4.0			C	C	A	A	C	C
	5.0		C	C	D	A	A	C	C
	6.0		C	C	D	A		C	D
2.4	2.0	A			C	A	A		
	3.0			C	C	A	A	C	C
	4.0		C	C	D	A	A	C	C
	5.0		C	C	D	A		C	D
	6.0		C	D	D	A		C	D
3.0	2.0	A		C	C	A	A		C
	3.0			C	D	A	A	C	C
	4.0		C	C	D	A		C	D
	5.0		C	D	D	A		C	D
	6.0	C	C	D	-	A		D	D
3.6	2.0			C	C	A	A		C
	3.0		C	C	D	A		C	C
	4.0		C	D	D	A		C	D
	5.0	C	C	D	-	A		D	D
	6.0	C	D	D	-	A		D	-
4.2	2.0			C	C	A	A	C	C
	3.0		C	D	D	A		C	D
	4.0	C	C	D	-	A		D	D
	5.0	C	D	D	-	A		D	-
	6.0	C	D	-	-	A	C	D	-
4.8	2.0		C	C	D	A	A	C	C
	3.0		C	D	D	A		C	D
	4.0	C	C	D	-	A		D	D
	5.0	C	D	-	-	A		D	-
	6.0	C	D	-	-	A	C	D	-

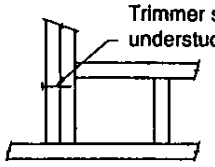
NOTES:

* Lintels accepting Girder trusses for ALL load cases use:
Fixing type C where contributary area = 10m²
Fixing type D where contributary area = 20m²
All cases outside this require specific design

LINTEL FIXING TYPES

TYPE A
1.4kN





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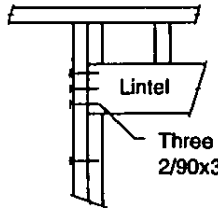
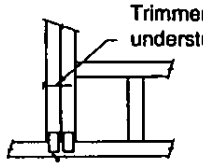
TYPE B
2.4kN

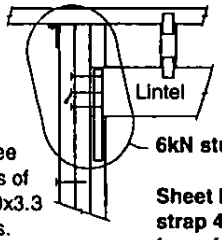




"All other nailing as Table 8.19"

Fixing of jack stud to lintel & top plate, as per top plate schedule, see reverse side.

TYPE C
7.5kN



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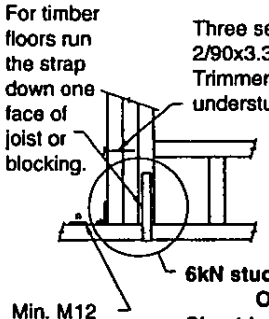
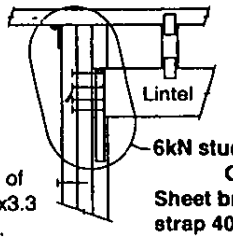


TYPE D
13.5kN



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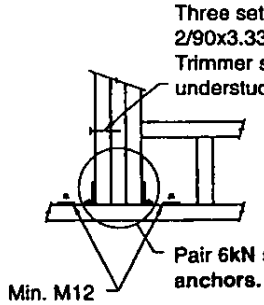

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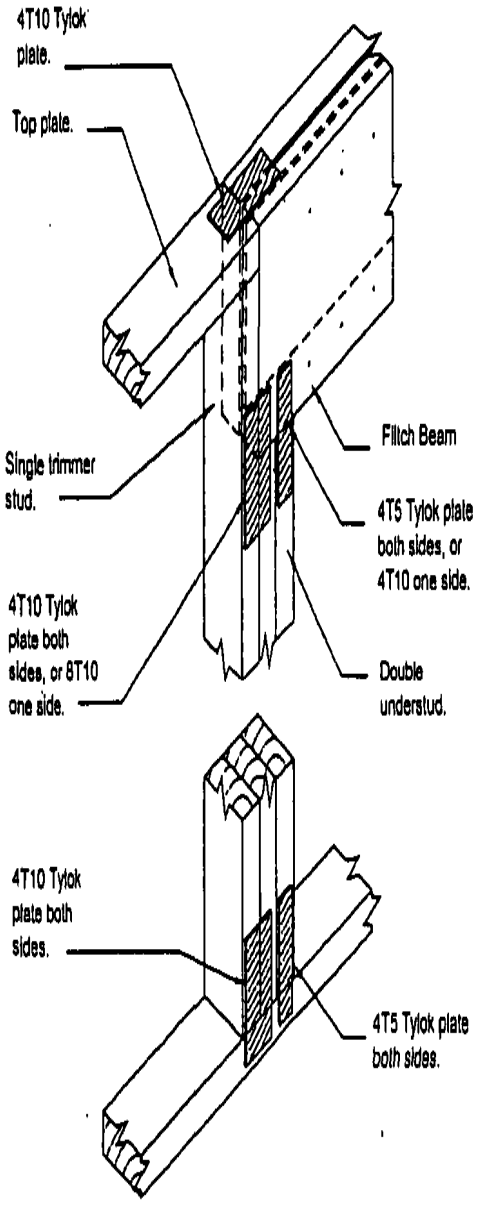
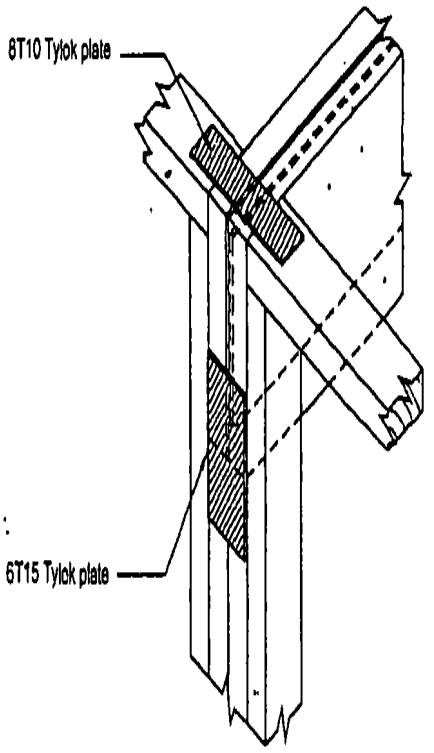
FLITCH BEAM

Fixing And Support Details



Simply Supported Beam



Beam Pocket

Babbage®
CONSULTANTS

West Coast Road (No.423-429), Housing Development Stage 1

for

New Zealand Housing Foundation

Earthworks Completion Report

Ref: 42608/GE
October 2007

Architects Consulting Engineers Surveyors Project Managers

Client: New Zealand Housing Foundation

Project: West Coast Road

Job Number: 42608

Report Title: Earthworks Completion Report

Document Reference: BDOC03675709

Report Date: October 2007

Issue	Date	Status	Prepared By	Reviewed By
-	15/10/07	First Issue	W E Campton / R Allison	N.S. Luxford

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Appendix A : Drawings

Site Location Plan	Drawing No. 42608 G01
Cut and Fill Isopac As Built Plan	Drawing No. 42608 AB05
Fill Test Location Plan	Drawing No. 42608 G06
Wetland & Detention Basin 1	Drawing No 42608 C17
Retaining Wall Plan	Drawing No. 42608 C50
Retaining Wall Detail	Drawing No. 42608 C52

Appendix B : In Situ Test Results

Fill Test Result Summary Table

Appendix B : In Situ Test Results

Statement of Professional Opinion

1.0 INTRODUCTION

Babbage Consultants Ltd (Babbage) were engaged by New Zealand Housing Foundation to monitor the construction of earthworks and retaining walls for the West Coast Road Subdivision carried out in the 2006/2007 earthworks season.

The development covers Lots 2 & 3 DP 339810, 423 – 429 West Coast Road, Henderson, as shown on the Site Location Plan in Appendix A. The site is bound to the south by West Coast Road and to the east by Woodbank Drive and associated residential development. Most of the western boundary is generally marked by Parrs Stream that flows northwards into the Waikumete Stream that flows approximately parallel to the northern boundary. However, in the south west the boundary extends westward of Parrs Stream to the existing residential development off Albionvale Road.

A walkover survey of the site was undertaken as part of our geotechnical investigation prior to development. No apparent signs of previous slope instability were observed.

The site covers an area of approximately 5.7ha and the subdivision will result in the creation of 61 residential lots to be developed in three stages. Lots 1 to 61 inclusive are building platforms, and Lots 62 to 71 are drainage and road reserves. The majority of the proposed residential dwellings are understood to comprise two-storey structures. In addition a new stormwater pond and a footbridge link to the neighbouring subdivision to the west were developed.

This report presents the results of the work carried out by Babbage to verify the Stage 1 earthworks and construction of the associated ponds and retaining walls. Stage 1 comprises Lots 1 to 35 and Lots 65 to 71, as shown on Drawing 42608 AB05 in Appendix A. However, Lots 19 to 22 will be subject to a supplementary report since they were occupied by the contractors site offices and a topsoil stockpile.

2.0 CONSTRUCTION SEQUENCE SUMMARY

The contractor, Earthco Civil, was engaged to commence earthworks on site in December 2006 and began with the construction of the permanent stormwater pond on the northern portion of the site. An earth crossing was needed over the main gas line that bisects the site to allow heavy machinery to access the stormwater pond area without damaging the pipeline. This had been completed by early January 2007, and topsoil was stripped from the mid and northern slopes (Stage 1). Material was then cut off the higher ridge and placed along the northeastern edge of Parrs Creek to build up land along this boundary. The road carriageways on Stage 1 were cut down at this time, and building platforms along the eastern boundary were formed with minor cut to fill operations.

Access to the site was formed from Titch Place, and the lower portion of Woodbank Drive.

A localised area of the site at the southern end of Lot 23 where the topsoil was found to be contaminated with pesticides from previous land use and zinc from neighbouring buildings was remediated during the earthworks. Pesticide affected soils were removed from site and samples taken to confirm that all materials had been removed. This work is reported separately by Babbage in the Site Validation Report dated March 2007 (BDOC03434211).

3.0 CONSTRUCTION MONITORING AND TESTING

3.1 GENERAL

The stripped gullies in all fill areas were inspected by Babbage during earthworks construction. Underfill drainage was placed and observed during these regular inspections. Approval was given to commence filling once we were satisfied that all deleterious material had been removed from the fill areas, and vegetation had been removed.

The specification for placement of earthworks fill material was prepared by Babbage. The specification required that the fill be placed in layers up to

200mm thick and compacted by at least 6 passes of a 10 ton self-propelled or a towed tamping type steel wheeled roller. We understand that a total of approximately 10,000m^3 of material was placed in all fill areas in the 2006/2007 earthworks season, with approximately 5,600m^3 in Stage 1.

The relative compaction, determined by comparing the in-situ density with that of a sample compacted in the laboratory accordance with Test 4.1.1 of NZS4402:1986, was to be greater than 95%. The specification also required that the maximum in situ air voids of the fill was to be 8%. The minimum average in situ shear strength of the fill was required to be greater than 120kPa with no individual value less than 100kPa.

The in situ density of the fill material has been determined using a nuclear densometer. The nuclear densometer has been calibrated in accordance with NZS4407:1991, Test 4.2.3 by using three density blocks in an accredited testing workshop. The in situ moisture content has been determined by testing a sample recovered from the test site in our laboratory in accordance with NZS4402:1986, Test 2.1. The in situ dry density and air voids have been calculated using the laboratory moisture content. The in situ shear strength of the fill was measured using a hand held Pilcon Shear Vane. Areas of fill that failed to meet the specified criteria were reworked and retested or observed by a Babbage representative and identified as being satisfactorily compacted.

The site was visited by Babbage to undertake fill testing on 9 days during the 2007 construction season. A total of 31 in situ density tests were completed during these visits, of which 8 were carried out on the fill in Stage 1.

The location of in situ density tests are shown on Drawing No. 42608 G06 in Appendix A. The dates that the fill testing has been undertaken and results of the fill testing are presented on the Fill Test Result Summary included in Appendix B.

3.2 ROAD SUBGRADES

The specifications for pavement design under roads called for 250mm of basecourse on top of lime stabilised subgrade. An alternative design of 200mm sub-basecourse and 150mm basecourse was considered if lime stabilisation did not improve the subgrade. Scala penetrometer readings were taken on all road

subgrades after lime stabilisation and these confirmed that substantial improvement had occurred.

3.3 BUILDING FOUNDATIONS

The near surface materials exposed in the cut areas are typically stiff to very stiff and support the passage of construction plant when dry.

Lots 4, 5, 6 and 7 along the eastern boundary were developed early on and had minor cut to fill operations to create level building platforms. These fill areas were tested once platforms were completed. Most other platforms were either entirely in cut, or controlled fill areas. We understand that most units will be two-storey buildings, with waffle-slab floors. It is recommended that footings for these units should extend at least 600mm below finished level to accommodate the potential affects of shrinkage and swelling.

3.4 STORMWATER POND

The stormwater pond was constructed in accordance with the details as shown on Drawing 42608 C17 in Appendix A. An initial request was made by Watercare Services Ltd for the placement of a 1m thick clay liner on the base of the pond to prevent stormwater from leaking into the adjacent underground utility trenches. However, since the natural soils encountered in the base of the pond were already fully saturated, it was agreed with Merv Popham of Watercare that such a liner was not required and therefore not installed.

3.5 RETAINING WALLS

A number of site visits were made to inspect the post holes for the timber pole retaining walls. The hole diameters, spacing and embedment depths confirmed to be all in accordance with the minimum requirements for the specified wall types.

Hand shear vane tests were carried out within selected post holes and the results generally indicated the natural in situ soils to have a minimum undrained shear strength of 80kPa.

4.0 SUMMARY AND RECOMMENDATIONS

4.1 GENERAL

In our opinion, based on our site observations and testing, the fill materials on Stage 1 of West Coast Road (Nos. 423 – 429) as shown on Drawing 42608 AB05, including those associated with stormwater pond construction have generally been placed in accordance with the Specification and NZS4431:1989 Code of Practice for Earthfill for Residential Development, except that the minimum requirement for the peak in situ shear strength of the fill materials are as detailed in Sections 3.1 of this report. In our opinion there is no evidence to indicate that land formed on this part of the subdivision will be subject to any instability unless future earthworks create such instability.

Any dwellings created under the normal items of NZS3604:1999 within the normal building envelope will in our opinion be within stable land in the lots.

Our geotechnical assessment of the subdivision classified most soils as Class M from AS2870:1996. We have not undertaken any testing to confirm this. However our fill testing and observations during earthworks lead us to recommend that strip footings be taken to 600mm depth to allow for shrinkage – swell movements. This will not restrict uplift of "waffle-slab" foundations constructed from polystyrene packed concrete. As such we recommend that any such proposed foundation be placed after thoroughly wetting up of the soil to minimise the risk of swelling and that the perimeter of each slab is extended to a minimum depth of 600mm below finished ground level or piled to minimise the affects of shrinkage and swell. Prior to construction it is recommended that the subgrade is inspected by a Geotechnical Engineer to confirm the shrinkage/swell potential.

4.2 SUITABILITY OF EARTHFILL

In our opinion, based on our site observations and testing, the fill materials as shown on Drawing 42608 AB05, are generally suitable for the development of light timber framed buildings designed in accordance with NZS3604:1999. We recommend that combined floor loads be less than 15kPa, including the weight of any proposed slab and fill.

We note that footings should be taken to at least 600mm below finished ground level to minimise the effects of shrinkage / swell movements. This includes the perimeter footings of waffle-slabs.

In the case of structures located on the fill adjacent to the 100 year flood level, shallow foundations at a minimum depth of 600mm are considered suitable for structures located no closer than 1.2m from the crest of the 1(v) to 2(h) batter slope. This is to ensure that the foundation is located no closer than a line at a gradient of 1(v) to 3(h) from the toe of the batter and therefore minimise the risk of loss of support should localised frittering / minor creep and movement of the batter slope occur.

Where structures are located closer than 1.2m to the crest of the 1(v) to 2(h) batter along the 100 year flood level, the use of piled foundations is recommended in order to minimise the risk of loss of support should localised frittering and slumping of the batter slope occur.

4.3 RETAINING WALLS

Retaining walls adjacent to vehicle accessways have been designed and constructed to support a 5kPa surcharge. All other walls have not been designed and constructed to support a surcharge and therefore it is recommended that no additional fill or structure is located at the top of such walls within a minimum horizontal distance equal to the retained height of the wall.

4.4 ROAD SUBGRADES

Testing of road subgrades after lime stabilisation confirmed that the design CBR criteria was met in both cut and fill areas. Roads were constructed using basecourse at the specified metal depths.

4.5 STORMWATER PONDS

The stormwater pond was constructed in accordance with the details as shown on Drawing 42608 C17 in Appendix A.

5.0 LIMITATIONS

5.1 RESTRICTION OF INTENDED PURPOSE

This report has been prepared solely for the benefit of New Zealand Housing Foundation as our client with respect to the brief and the benefit of the Waitakere City Council. The reliance by other parties on the information or opinions contained in the report shall, without our prior review and agreement in writing, be at such party's sole risk.

5.2 LEGAL INTERPRETATION

Opinions and judgements expressed herein are based on our understanding and interpretation of current regulatory standards, and should not be construed as legal opinions. Where opinions or judgements are to be relied on they should be independently verified with appropriate legal advice.

5.3 RELIABILITY OF INFORMATION

Recommendations and opinions in this report are based on data from our Investigation and control testing on this site. As we were not on site full time during earthworks, the nature and continuity of subsoil conditions could vary from the assumed model.

During excavation and construction the site should be examined by an Engineer or Engineering Geologist competent to judge whether the exposed subsoils are compatible with inferred conditions.

Babbage Consultants would be pleased to provide this service and believe that the development would benefit from this continuity. In any event it is essential that Babbage Consultants Ltd be contacted if there is any significant variation in subsoil conditions from those described in this report.

This report has been prepared by Wayne Campton and Russell Allison and reviewed by N.S. (Paddy) Luxford.

Respectfully submitted
Babbage Consultants Limited

Russell Allison
Senior Geotechnical Engineer

Appendix A

Drawings

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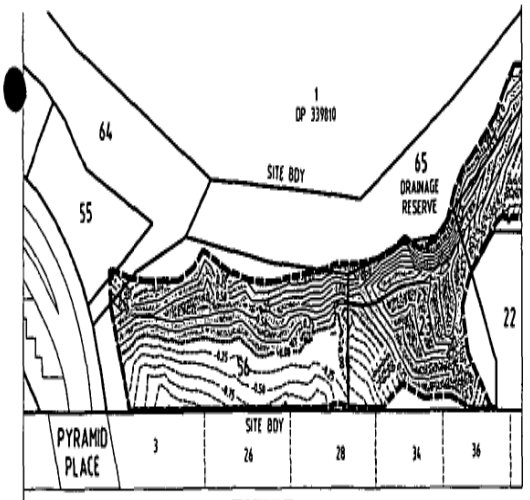


INSERT
SCALE 1:500(A1)

KEY

- CUT CONTOURS
- FILL CONTOURS
- ZERO CUT/FILL
- EXTENT OF EARTHWORKS

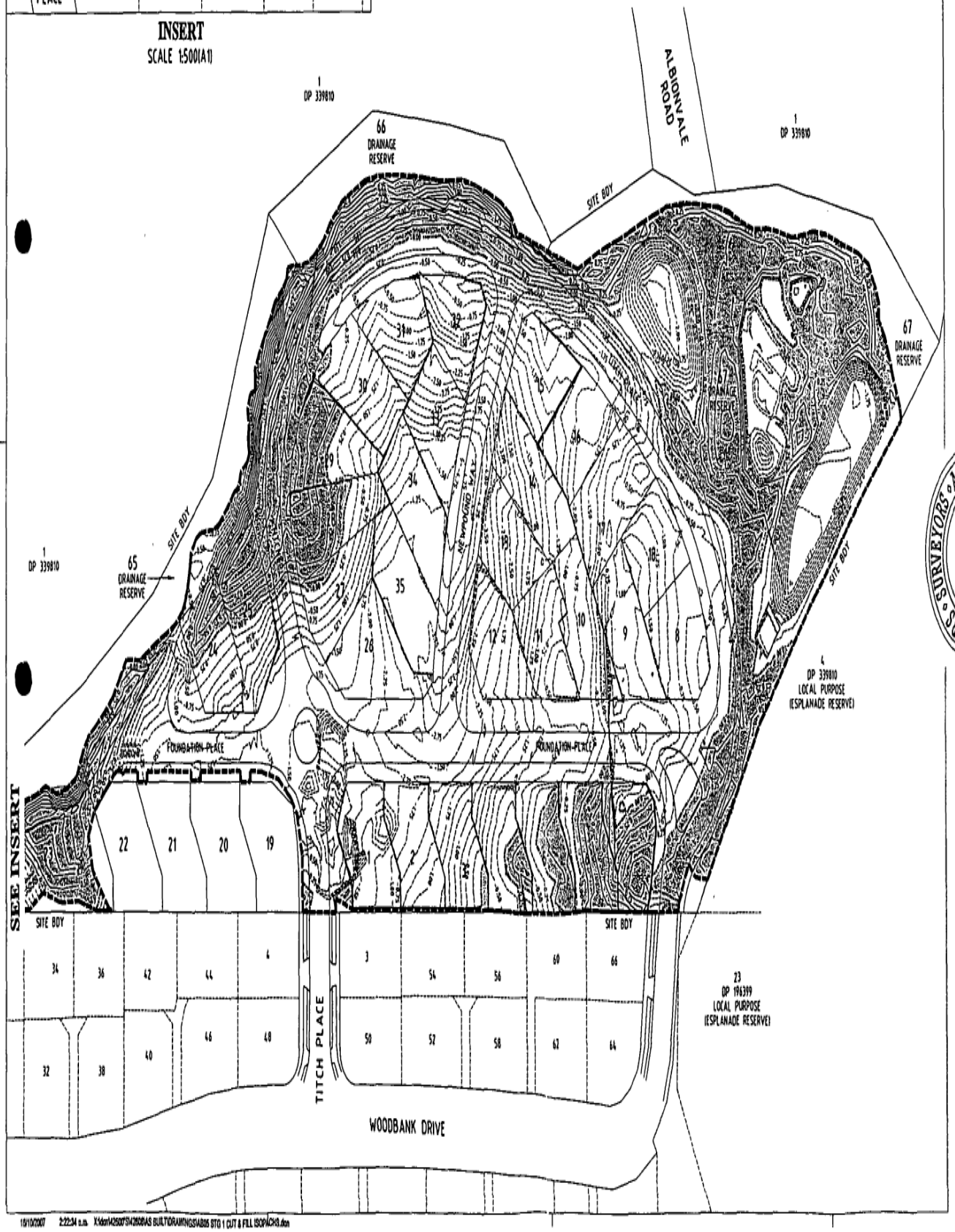
NOTES

1. FILL AREAS ARE SHOWN SHADED
2. CONTOURS SHOWN ARE AT 0.25m INTERVALS.
3. LEVEL DATUM - LANDS AND SURVEY LEVEL DATUM 1946.

I KEVIN RAYMOND MERKLE, LICENSED SURVEYOR, HEREBY CERTIFY THAT ALL AS BUILT DATA SHOWN ON THIS PLAN IS ACCURATELY PLOTTED IN RELATION TO LOT BOUNDARIES, IS IN TERMS OF GEODETIC DATUM 2000 (MT. EDEN CIRCUIT) AND LANDS AND SURVEY LEVEL DATUM 1946.

DATE: 30/10/07

K.R. MERKLE
LICENSED SURVEYOR



REV	DATE	DESCRIPTION	DRAWN	CHECK

DRAWING REVISIONS

Babbage CONSULTANTS
ENGINEERS • SURVEYORS • ARCHITECTS
109 FANSHAWE STREET
PO BOX 302
AUCKLAND 1 · NEW ZEALAND
PHONE 09-379 1880 · FAX 09-377 117
admin@babbage.co.n

CLIENT / PROJECT

423 - 429 WEST COAST ROAD
HOUSING DEVELOPMENT
FOR
NZ HOUSING FOUNDATION

DRAWING TITLE

STAGE ONE
CUT AND FILL
ISOPACH AS BUILT

	DATE	INITIAL
DESIGNED		
DRAWN	OCT 2007	MJD
CHECKED		
APPROVED		

SCALE (A1)

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JOB NUMBER	DRAWING NUMBER	REVISION
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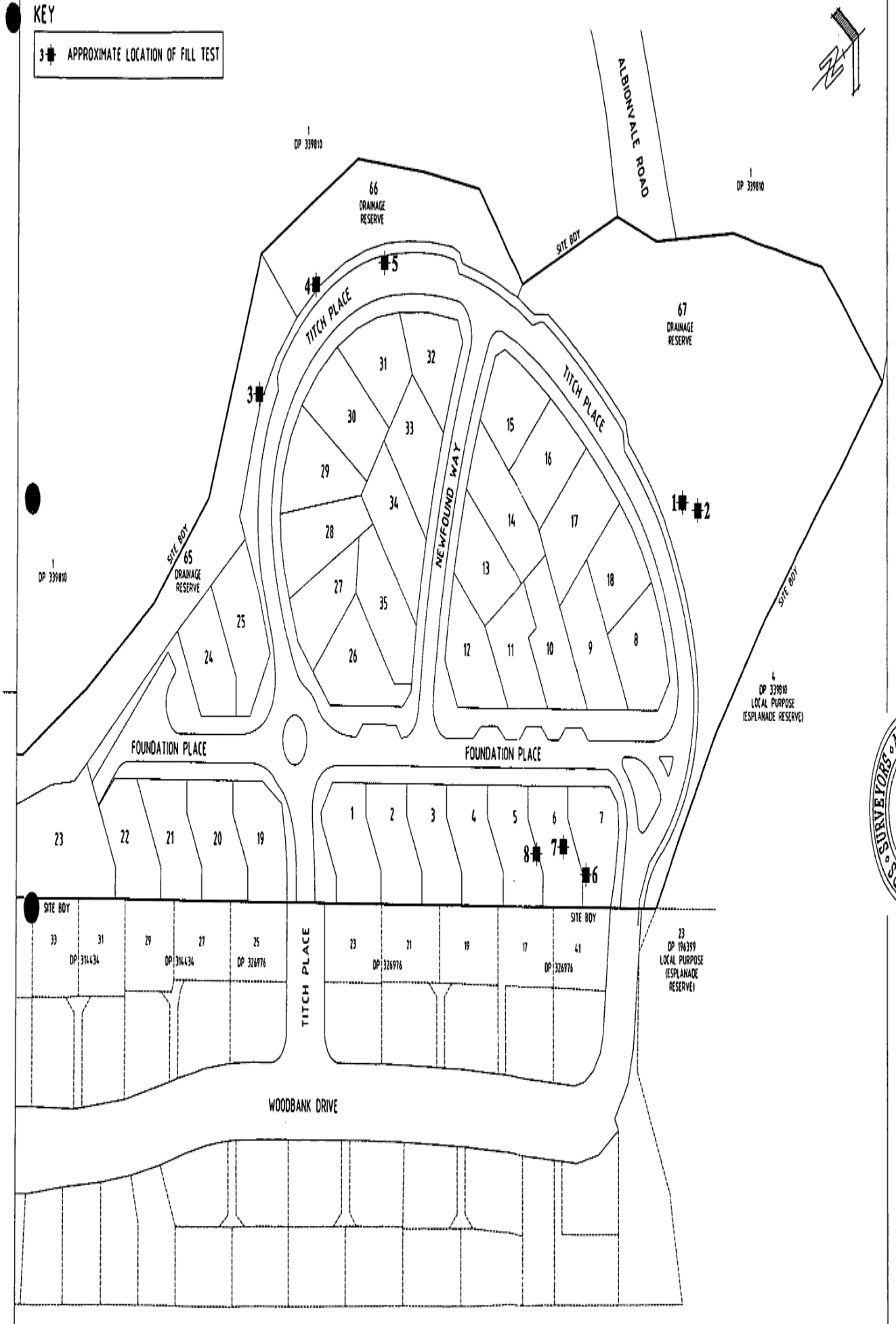
KEY

3 APPROXIMATE LOCATION OF FILL TEST



REV	DATE	DESCRIPTION	DRAWN	CHKD

DRAWING REVISIONS

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admin@babbage.co.nz

CLIENT / PROJECT

WEST COAST ROAD HOUSING DEVELOPMENT

FOR

NZ HOUSING FOUNDATION

DRAWING TITLE

FILL TEST LOCATION PLAN

	DATE	INITIAL
DESIGNED		
DRAWN	AUGUST 2007	MSO
CHECKED	AUGUST 2007	RA
APPROVED		

SCALE (A1)

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JOB NUMBER	DRAWING NUMBER	REVISION
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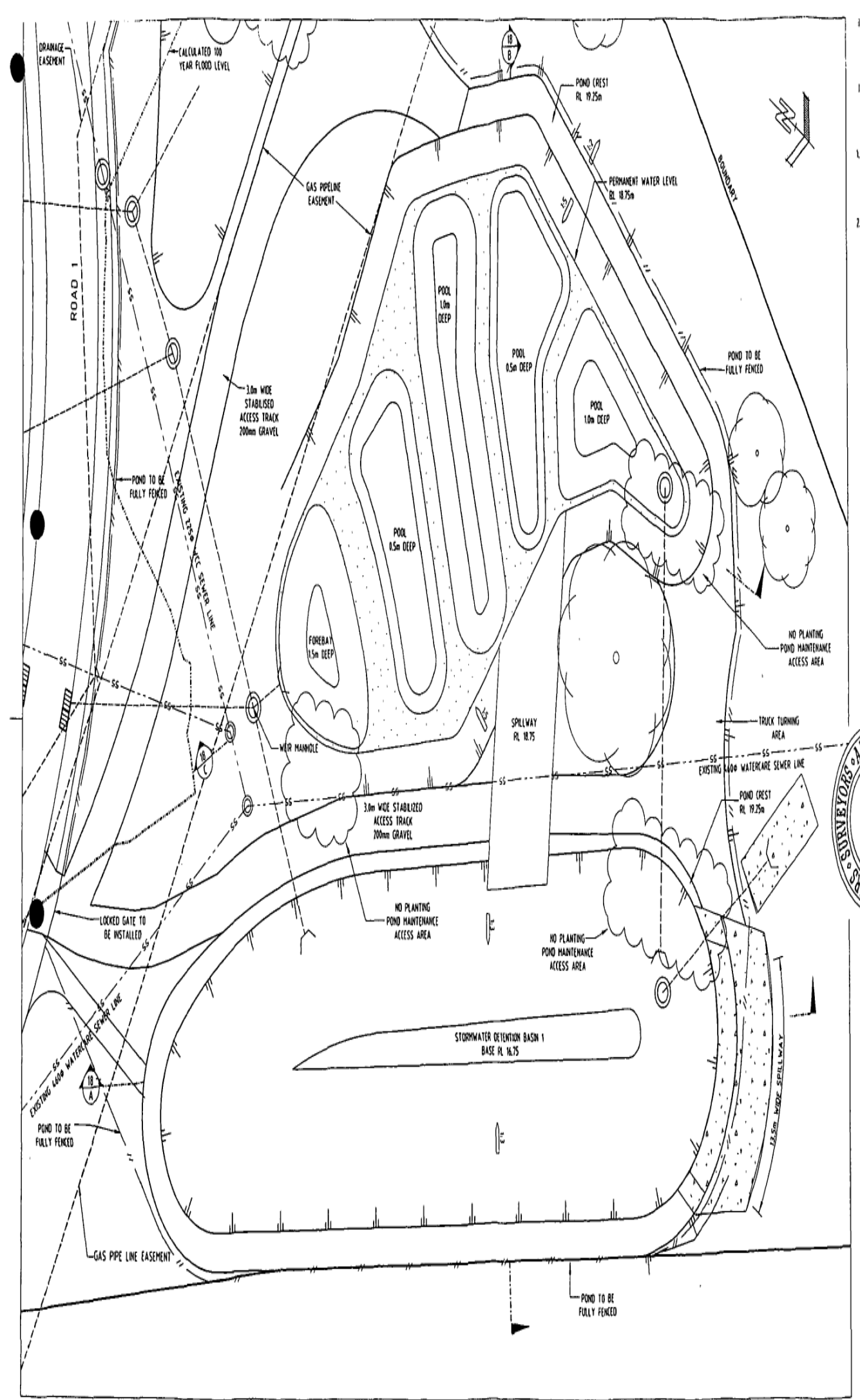

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DRAWING NOTES

1. ALL WORKS TO BE IN ACCORDANCE WITH WAITAKERE CITY COUNCIL'S (WCC) CODE OF PRACTICE FOR CITY INFRASTRUCTURE AND LAND DEVELOPMENT.
2. SAFETY SIGNS TO BE ERECTED AS WCC STANDARD DRAWING SD 4.22.

REV	DATE	DESCRIPTION	DRAWN	CHECK
C	220607	WETLAND AMENDED	FK	
B	020607	VARIOUS AMENDMENTS	FK	
A	0606	VARIOUS AMENDMENTS	FK	

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PHONE 09 - 379 9990 · FAX 09 - 377 1170
admin@babbage.co.nz

CLIENT / PROJECT

WEST COAST ROAD HOUSING DEVELOPMENT

FOR

NZ HOUSING FOUNDATION

DRAWING TITLE

WETLAND & DETENTION BASIN 1 LAYOUT

	DATE	INITIAL
DESIGNED	JUNE 2006	DMR
DRAWN	JUNE 2006	GW
CHECKED		
APPROVED		

SCALE (A1)

1:125

JOB NUMBER	DRAWING NUMBER	REVISION
42608	C17	C

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DRAWING NOTES

KEY

- RETAINING WALL
- 31 — LOT NUMBER
- BEGINNING/END OF RETAINING WALL SECTION
- S — LONGSECTION START POINT (0 CHAINAGE)
- RETAINING WALL RELIEF DRAIN
- ST — SILT TRAP
- PROPOSED STORMWATER LINE
- PROPOSED SANITARY SEWER LINE
- SS — EXISTING STORMWATER LINE
- SW — EXISTING SANITARY SEWER LINE

NOTES:

1. ALL WORKS TO COMPLY WITH WAITAKERE CITY COUNCIL STANDARDS.
2. FINAL LOCATION OF RETAINING WALLS TO BE DETERMINED ON SITE AT TIME OF CONSTRUCTION.
3. RETAINING WALL LONGSECTION - BOTTOM OF WALL LEVELS ARE FINISHED PAVEMENT/GROUND LEVEL.

PROPOSED DETENTION BASIN 2 REFER TO SHEET C19.

PROPOSED WETLAND AND DETENTION BASIN REFER SHEET C17

ROAD 1

ROAD 2

ROAD 4

ROAD 5

TITCH PLACE

WOODBANK DRIVE

PIPE CROSSING SS 300Ø IL 23.35

PIPE CROSSING SW 225Ø IL 27.45

PIPE CROSSING SS 150Ø IL 25.01

PIPE CROSSING SW 500Ø IL 25.27

REV	DATE	DESCRIPTION	DRAWN	CHECK
D	28/4/07	RW'S AMENDED	FK	
C	3/10/07	RELIEF DRAINS AND SILT TRAPS ADDED	FK	
B	15/09/07	HOUSE PLATFORMS SHOWN	FK	
A	01/07	RW AMENDMENTS	FK	

DRAWING REVISIONS

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admin@babbage.co.nz

CLIENT / PROJECT

WEST COAST ROAD HOUSING DEVELOPMENT

FOR

NZ HOUSING FOUNDATION

DRAWING TITLE

RETAINING WALL PLAN (SHEET 1)

	DATE	INITIAL
DESIGNED	JUNE 2006	FK
DRAWN	JUNE 2006	FK
CHECKED		
APPROVED		

SCALE (A1)

1:500

JOB NUMBER	DRAWING NUMBER	REVISION
42608	C50	D

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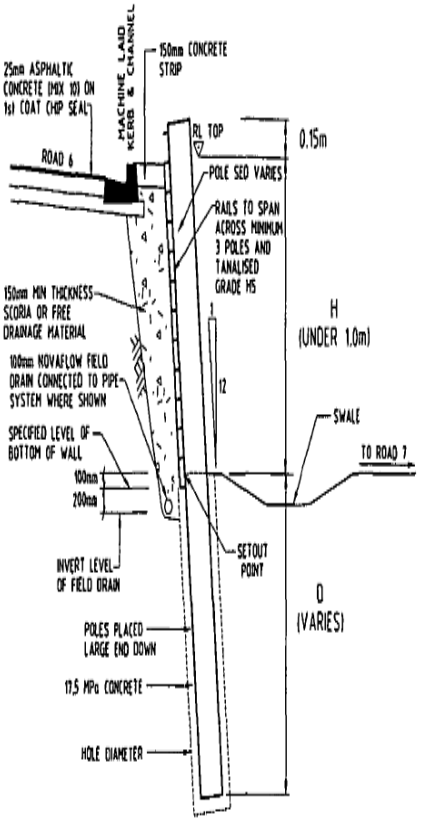
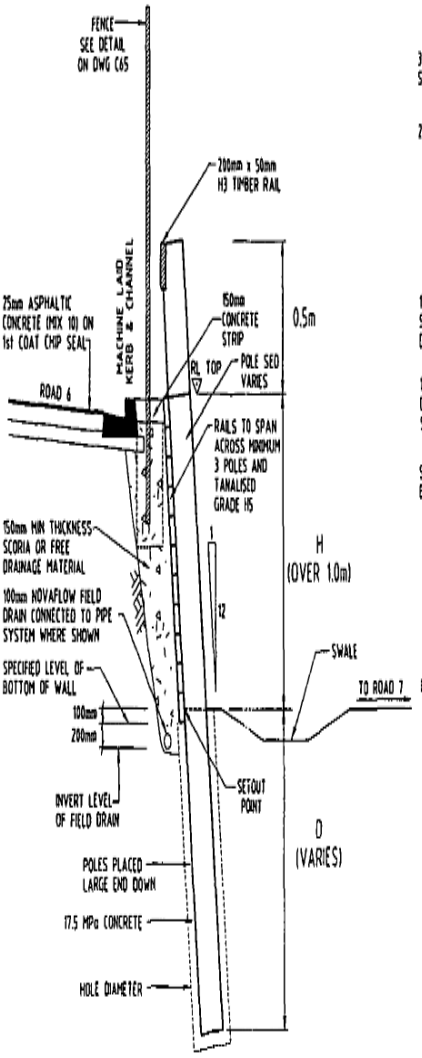


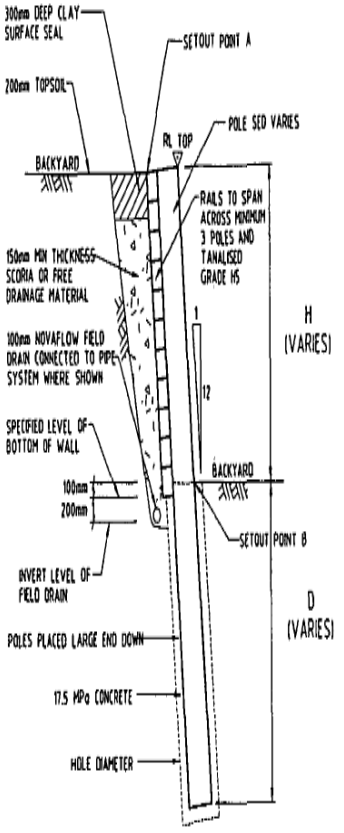
TYPICAL SECTION OF POLE RETAINING WALL UNDER 1.0m HIGH BETWEEN ROAD 6 AND SWALE

(NOT TO SCALE)



TYPICAL SECTION OF POLE RETAINING WALL OVER 1.0m HIGH BETWEEN ROAD 6 AND SWALE

(NOT TO SCALE)



TYPICAL SECTION OF POLE RETAINING WALL BETWEEN BACKYARDS

(NOT TO SCALE)

NOTES:

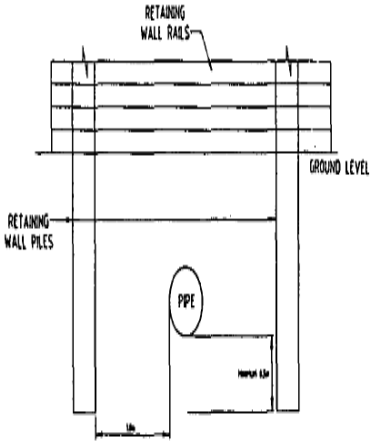
1. ALL WORKS TO COMPLY WITH WAITAKERE CITY COUNCIL STANDARDS.
2. ALL RETAINING WALL POLES TO BE HIGH DENSITY.
3. FINAL LOCATION OF RETAINING WALLS TO BE DETERMINED ON SITE AT TIME OF CONSTRUCTION.
4. RETAINING WALL LONGSECTION - BOTTOM OF WALL LEVELS ARE FINISHED PAVEMENT/GROUND LEVEL.
5. ALL TIMBER POLE RETAINING WALLS ARE TYPE A EXCEPT RETAINING WALL 50, WHICH IS TYPE B.
6. ALL PILE HOLES ARE TO BE PREDRILLED.

TYPE A (NO SURCHARGE)
(ALL POLE RETAINING WALLS EXCEPT RETAINING WALL 50)

MAXIMUM RETAINED HEIGHT (m)	POLE SIZE SED (mm)	HOLE DIAMETER (mm)	POLE SPACING (m)	EMBEDMENT DEPTH (m)	RAIL THICKNESS (mm)
0.00-1.00	100	300	1.0	1.0	45
1.00-1.50	150	350	1.0	1.5	45
1.50-2.00	200	400	1.0	2.0	45
2.00-2.50	250	450	1.0	2.5	90
2.50-3.00	300	600	1.0	3.0	90
3.00-3.50	350	600	1.0	3.5	90

TYPE B (5kPa SURCHARGE) (POLE RETAINING WALL 50)

MAXIMUM RETAINED HEIGHT (m)	POLE SIZE SED (mm)	HOLE DIAMETER (mm)	POLE SPACING (m)	EMBEDMENT DEPTH (m)	RAIL THICKNESS (mm)
0.00-0.80	100	300	1.0	1.0	45
0.80-1.30	150	350	1.0	1.3	45
1.30-1.80	200	450	1.0	1.8	45
1.80-2.30	250	450	1.0	2.3	50
2.30-2.70	300	500	1.0	2.7	50



TYPICAL CROSS SECTION DETAIL FOR PIPE CLEARANCE FROM PILES

(NOT TO SCALE)

NOTE:

SETOUT POINT A - SET OUT POINT BETWEEN HOUSE LOT BOUNDARIES
SETOUT POINT B - SET OUT POINT BETWEEN HOUSE LOT BOUNDARY AND ROAD RESERVE

REV	DATE	DESCRIPTION	DRAWN	CHECK
G	300807	TYPICAL CRASH BARRIER REVISION ADDED	MSO	PK
F	270707	TYPE B TABLE AMENDED	PK	
E	250607	TYPE B TABLE AMENDED	PK	
D	050607	PIPE CLEARANCE FROM PILES DETAIL ADDED	PK	
C	130107	VARIES AMENDMENTS	PK	
B	090107	VARIES AMENDMENTS	PK	
A	210606	TABLES ADDED	PK	DMR

DRAWING REVISIONS

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admin@babbage.co.nz

CLIENT / PROJECT

WEST COAST ROAD HOUSING DEVELOPMENT

FOR

NZ HOUSING FOUNDATION

DRAWING TITLE

RETAINING WALL DETAILS

	DATE	INITIAL
DESIGNED		
DRAWN	19.07.06	GMB
CHECKED		
APPROVED		

SCALE (A1)

NTS

JOB NUMBER	DRAWING NUMBER	REVISION
42808	C52	G

Appendix B

In Situ Test Results

Job Number: 42608/GE	Project: 423 - 429 West Coast Road, Henderson	FILL TEST RESULT SUMMARY

Test No.	Test Data (Report No.)	Bulk Density (t/m³)	Dry Density (t/m³)	Moisture Content (%)	Air Voids (%)	Field Shear Strength (kPa)	Relative Compaction (%)	Pass / Fail	Comments
1	11/12/06 (DFT1)	1.892	1.52	24.0	6.2	4 X UTP	-	pass	Testing of crossing over gas pipeline easement.
2		1.886	1.52	23.6	6.8	4 X UTP	-	pass	
3	15/1/07 (DFT2)	1.826	1.42	28.4	6.3	124, 134, 163, >225	-	pass	
4		1.785	1.32	35.1	4.1	121, 124, 141, 173	-	pass	
5		1.845	1.46	26.7	6.6	134, 140, 146, 148	-	pass	
6		1.819	1.26	44.7	0	111, 114, 121, 124	-	pass	
7	17/1/07 (DFT3)	1.772	1.32	35.0	4.9	124, 139, 194, UTP	-	pass	
8		1.853	1.46	26.9	6.0	226, 3 X UTP	-	pass	

Appendix C

Statement of Professional Opinion

To:	Waitakere City Council Private Bag 93 109 Henderson Waitakere City 1231

STATEMENT OF PROFESSIONAL OPINION AS TO SUITABILITY OF LAND FOR RESIDENTIAL DEVELOPMENT

Subdivision: **423-429 West Coast Road, Stage 1**
Lots 2 & 3 DP.339810

Owner/Developer: **New Zealand Housing Foundation**

Location: **Henderson**

I, **N S Luxford** of **Babbage Consultants Ltd**, hereby confirm that:

1. I am a Chartered Professional Engineer experienced in the field of geotechnical engineering and was retained by **New Zealand Housing Foundation** as the Geotechnical Engineer on the above subdivision.

2. The extent of my inspections, and the results of all tests carried out during construction, are described in my report entitled **"West Coast Road (No.423-429), Housing Development Stage 1 Earthworks Completion Report", Ref. 42608/GE, October 2007**.

3. In my professional opinion, not to be construed as a guarantee, I consider that:

   (a) The earth fills shown on **Drawing 42608/AB05** attached to the above referenced Earthworks Completion Report, except for Lots 19 to 22, have generally been placed in compliance with **NZS4431:1989 Code of Practice for Earthfill for Residential Developments.**

   (b) The completed works give due regard to land slope and foundation stability considerations.

   (c) The filled ground, except the fill on Lot 121, is suitable for the development of residential buildings, designed in accordance with NZS3604:1999, provided combined floor loads are less than 15kPa, including the weight of the slab and fill.

   (d) The original ground not affected by filling is suitable for the development of residential structures designed in accordance with NZS3604:1999, provided combined floor loads are less than 15kPa, including the weight of the slab and fill.

   (e) The earthworks associated with the roads and reserves have been carried out in a manner appropriate for their intended purpose.

   (f) The following special limitations should be observed:

      (i) The cut and fill platforms for Lots 19 to 22 have not been subject to specific inspection or density testing. Future development in these lots will require inspection by a suitably qualified geotechnical engineer and the fill to be certified.

      (ii) Any building foundation constructed above a gradient line of 1v to 3h from the toe of the fill slope should be the subject to specific design by a suitably qualified geotechnical engineer.

(iii) The excavations for foundations in natural materials should be inspected by a suitably qualified engineer to confirm the ground conditions and design parameters are as assumed in the Babbage supplementary geotechnical assessment report, dated November 2006.

(iv) The minimum depth of all perimeter foundations for future buildings, are to be 600mm below finished ground level to minimise the effects of shrinkage swell movements on the structure.

4. This professional opinion is furnished to the **Waitakere City Council and New Zealand Housing Foundation** for their purposes alone on the express condition that it will not be relied upon by any other person and does not remove the necessity for the normal inspection of foundation conditions at the time of erection of any dwelling.

Signed: ..... Date: **16 October 2007**

N S Luxford
Chartered Professional Engineer (CPEng No 41147)

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PLEASE REFER ALL QUERIES TO
BABBAGE CONSULTANTS LIMITED

DRAWING NOTES

EXISTING EASEMENTS IN GROSS

PURPOSE	SERVIENT TENEMENT	CREATED BY	GRANTEE
OIL AND GAS SUPPLY	LOT 2 DP 339810	B344219.1	NATURAL GAS CORPORATION OF NEW ZEALAND LTD.
DRAINAGE	LOTS 2 AND 3 DP 339810	6135712.4	WAITAKERE CITY COUNCIL
STORMWATER DETENTION AND DRAINAGE	LOT 3 DP 339810	6870221.2	
RIGHT OF WAY	LOT 3 DP 339810	6870221.1	

PROPOSED EASEMENTS

PURPOSE	SHOWN	SERVIENT TENEMENT	DOMINANT TENEMENT
RIGHT OF WAY RIGHT TO SUPPLY TELECOM, WATER, ELECTRICITY AND GAS	(A)	LOT 61 HEREON	LOTS 57, 58, 59 AND 60 HEREON

PROPOSED EASEMENTS IN GROSS

PURPOSE	SHOWN	GRANTEE
RIGHT OF WAY	(A) (B)	WAITAKERE CITY COUNCIL

AREA SCHEDULE

LOTS 1 - 61 INCL.	RESIDENTIAL	2.8682ha
LOTS 62 AND 64 - 67 INCL.	LOCAL PURPOSE (DRAINAGE) RESERVE TO VEST	1.6040ha
LOTS 63 AND 68 - 71 INCL.	ROAD TO VEST	1.2449ha
	TOTAL	5.3171ha

IMPORTA NOTICE

All Building conse kept on site during cor Unless the siting of certified by a registe pegs are to be flagge A fence on or establis the boundary on the w all neighbours

cument must be ... required building le ... survey of boundary ... work commencing. ... shall be taken as ... proposed ...

PLANS AND SPECIFICATIONS
APPROVED
SUBJECT TO CONDITIONS ENDORSED
ON BUILDING CONSENT

SIGNED _____ DATE _____
AUTHORISED OFFICER

KEY

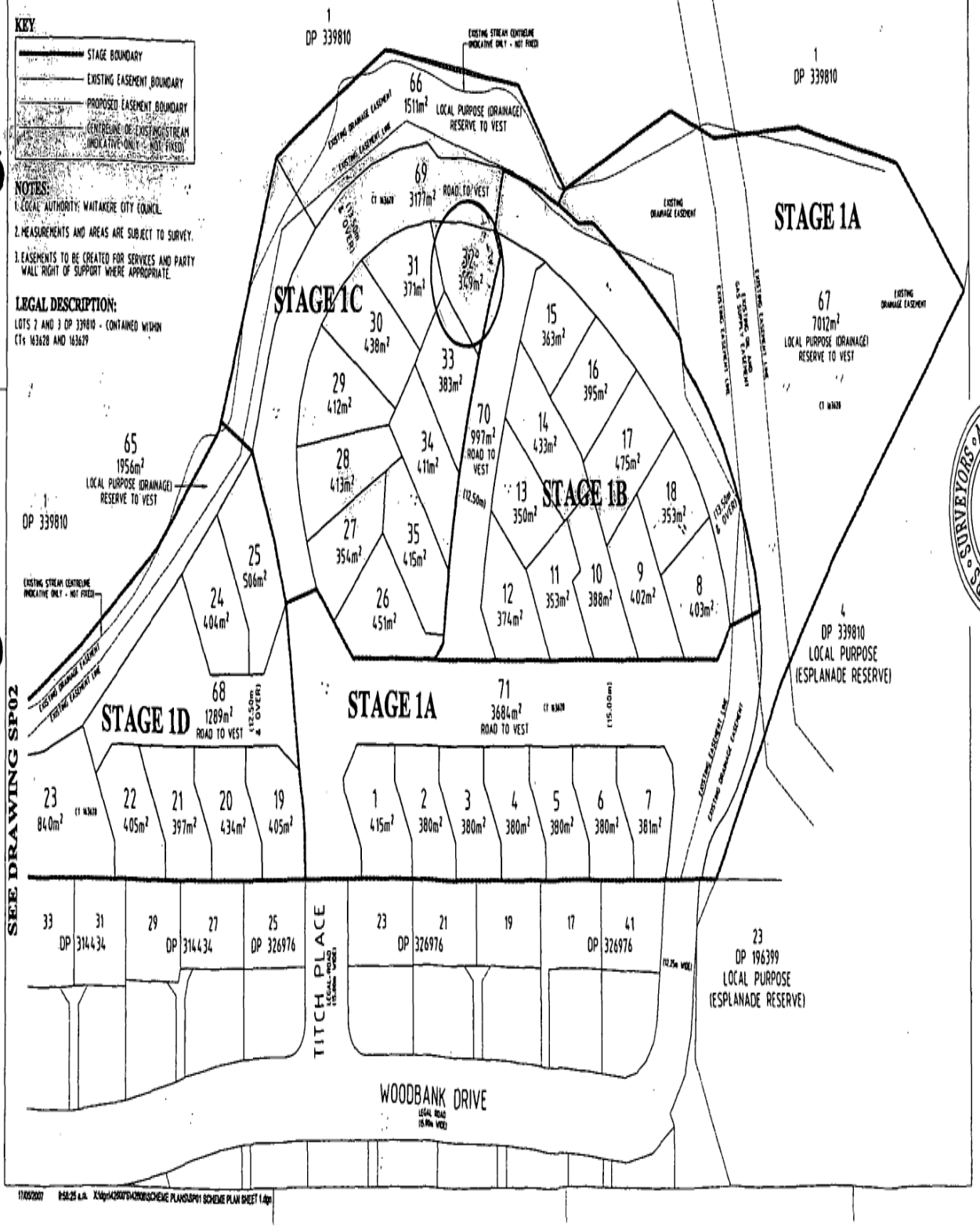
- STAGE BOUNDARY
- EXISTING EASEMENT BOUNDARY
- PROPOSED EASEMENT BOUNDARY
- CENTRELINE OF EXISTING STREAM (INDICATIVE ONLY - NOT FIXED)

NOTES:

1. LOCAL AUTHORITY: WAITAKERE CITY COUNCIL
2. MEASUREMENTS AND AREAS ARE SUBJECT TO SURVEY.
3. EASEMENTS TO BE CREATED FOR SERVICES AND Pparty WALL RIGHT OF SUPPORT WHERE APPROPRIATE.

LEGAL DESCRIPTION:

LOTS 2 AND 3 DP 339810 - CONTAINED WITHIN CTs 163628 AND 163629



REV	DATE	DESCRIPTION	DRAWN	CHECK

DRAWING REVISIONS

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PO BOX 2027
AUCKLAND 1 · NEW ZEALAND
PHONE 09 - 379 8890 · FAX 09 - 377 1170
admin@babbage.co.nz

CLIENT / PROJECT

WEST COAST ROAD HOUSING DEVELOPMENT
FOR
NZ HOUSING FOUNDATION

DRAWING TITLE

PROPOSED SUBDIVISION OF LOTS 2 AND 3 DP 339810 (SHEET 1 OF 2)

	DATE	INITIAL
DESIGNED	JUNE 2008	JA
DRAWN	JUNE 2008	MJD
CHECKED		
APPROVED		

SCALE (A1)
1:500

JOB NUMBER	DRAWING NUMBER	REVISION
42608	SP01	H

17/09/2007 9:58:25 a.m. X:\dgn\42608\SHEETS\42608SCHEME PLANS\SP01 SCHEME PLAN SHEET 1.dgn

Babbage®
CONSULTANTS

WEST COAST ROAD
WAITAKERE CITY
HOUSING DEVELOPMENT

for

NZ HOUSING FOUNDATION

SUPPLEMENTARY GEOTECHNICAL ASSESSMENT REPORT

Ref: 42608
November 2006

Architects · Consulting Engineers · Surveyors · Project Managers

Client: **NZ Housing Foundation**

Project: **West Coast Road Housing Development**

Job Number: **42608**

Report Title: **Supplementary Geotechnical Assessment**

Document Reference: **BDOC03004368**

Report Date: **November 2006**

Issue	Date	Status	Prepared By	Reviewed By
-	27/11/06	First Issue	R J Allison	M J D Stapleton

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Appendix A: Drawings

Site Location Plan — Drawing No. 42608/G01
Borehole Location Plan (Sheet 1) — Drawing No. 42608/G02
Borehole Location Plan (Sheet 2) — Drawing No. 42608/G03
Preliminary Cut and Fill Isopac Plan (Sheet 1) — Drawing No. 42608/G04
Preliminary Cut and Fill Isopac Plan (Sheet 2) — Drawing No. 42608/G05

Appendix B: Geotechnical Investigations

Summaries of Soil Profile and Testing
Explanation of Terms and Symbols

Appendix C: Laboratory Testing

Geotechnical Test Reports

Appendix D: Slope Stability Analysis

Summary of Graphical Output from G Slope Analysis

1.0 INTRODUCTION

Babbage Consultants Ltd (Babbage) were appointed by NZ Housing Foundation to carry out a geotechnical investigation to support subdivision and earthworks consent applications for the proposed residential development at 423 to 429 West Coast Road, Glen Eden in Waitakere City.

The results of the geotechnical investigation and recommendations for the development of the site were presented in a report by Babbage dated June 2006 (Ref: BDOC02880325). The recommendations included that an additional geotechnical investigation should be carried out to support detailed design of the earthworks in the vicinity of the proposed fill batter adjacent to the 100 year flood level. In particular, to determine the consolidation characteristics of the soils beneath the proposed fill batter within the Stage 2 development.

This report presents the results of the supplementary geotechnical investigation and provides recommendations for detailed design of the earthworks.

2.0 SITE DESCRIPTION

2.1 LOCATION AND TOPOGRAPHY

The site is located at 423-429 West Coast Road, Glen Eden in Waitakere City, as shown on the Site Location Plan in Appendix A.

The site covers an area of approximately 5.7 hectares and is bound to the south by West Coast Road and to the east by Woodbank Drive and associated residential development. Most of the western boundary is generally marked by Parrs Stream that flows northwards into the Waikumete Stream that flows approximately parallel to the northern boundary. However, in the south west the boundary extends westward of Parrs Stream to the existing residential development off Albionvale Road.

The site generally comprises rough grassland with areas of scrubby bush and exotic trees in the vicinity of the stream with small localised areas of thicker

bush in the southern and northern parts of the site. A line of mature pine trees trend east west across the southern part of the site. A stormwater pond is located in the south western part of the site to the west of Parrs Stream.

The land generally slopes gently downwards towards Parrs Stream. The existing ground levels in the southern part of the site reduce from approximately RL32m in the south east to approximately RL24m in the vicinity of the stream. Over the southern and central part of the site the existing slope gradients are typically between 1(v) in 3.5(h) to 1(v) in 6(h).

In the northern part of the site the ground level generally reduces from approximately RL29m close to Titch Place on the eastern boundary to approximately RL18m adjacent to the northern boundary.

From the walkover survey there are no apparent signs of significant previous slope instability, although much of the site is heavily vegetated with grass and bush and therefore this may mask such features as shallow scarps.

2.2 AERIAL PHOTOGRAPHS

To assess possible previous areas of fill placement on the site, aerial photographs from 1940, 1959 and 2001 were viewed. The photographs indicate the site has remained largely unchanged, with the exception of some minor residential development in the south eastern part of the site and the construction of the stormwater pond in approximately 2001. The residential development appears to have comprised a single dwelling in 1940 with additional outbuildings being evident in 1959. These buildings are not evident in 2001.

Minor areas of fill appear to have been placed in the vicinity of the eastern boundaries in the central and northern part of the site, associated with the construction of the residential dwellings along Woodbank Drive. Fill also appears to have been placed to form the eastern side of the existing stormwater pond.

No significant signs of instability were identified in the air photos reviewed for this report.

3.0 PROPOSED DEVELOPMENT

The proposed development is for a residential subdivision of approximately 60 lots, to be constructed in three stages. Stage 1 includes the northern part of the site, Stage 2 the south eastern and Stage 3 the south western. In addition it is proposed to replace the existing stormwater pond in the south western part of the site with swales and construct a new stormwater pond in the north western corner of the site.

A footbridge is also to proposed to link the Stage 1 area to the land to the west of Parr's Stream.

A preliminary development layout is shown on the Borehole Location Plans (Sheets 1 and 2) in Appendix A.

The majority of the proposed residential dwellings are understood to comprise two storey structures, although Stage 3 is understood to comprise two and three storey structures with basement level parking although the parking space may not be enclosed.

Significant earthworks are to be carried out to develop the site to form a series of building platforms rising from the 100 year flood level adjacent to the stream. In Stage 1, preliminary earthworks design indicate cut depths of approximately 4.5m over the central part of the site and the placement of up to 1.5m of fill adjacent to the 100 year flood level along the margins of the stream.

In Stage 2, it is proposed to construct a significant fill platform above the 100 year flood level between a new access road and the stream. The proposed fill heights range from approximately 1.5m in the southern end to 3.5m in the northern end of the fill. Some cut of the land adjacent to the eastern boundary is proposed, with the depth of cut ranging from approximately 2.75m in the south east corner to 1m in the north west corner.

In Stage 3, maximum cut depths are anticipated to be approximately 3.0m with maximum fill heights of approximately 2.0m.

It is understood that no retaining structures are permitted to be constructed immediately adjacent to the flood plain and therefore fill batters are proposed along the 100 year flood level. Remote from the flood plain, retaining structures are proposed to support areas of cut and fill where significant changes in ground level occur between the various building platforms and access roads.

The preliminary earthworks plan is shown on Drawing No's 42608/G04 and G05 in Appendix A.

4.0 SITE INVESTIGATION

The initial fieldwork was carried out between the 22nd and 25th May 2006 and comprised 23 No hand auger boreholes to depths of between 0.8m and 3.15m below ground level (bgl), designated HA1 to HA23.

The additional fieldwork was carried out between the 18th and 25th July 2006 and comprised 4 No machine boreholes to depths of between 9m and 14m bgl , designated BH1 to BH4. The approximate location of the boreholes is shown on the Borehole Location Plan (Drawing No's 42608/G02 and G03) included in Appendix A.

The machine boreholes were sunk using rotary open barrel techniques with water flush. Undisturbed tube samples were taken at selected depths within the machine boreholes. The soil and core recovered from the boreholes was logged by a Babbage Engineering Geologist. The core and bagged disturbed samples recovered from the machine boreholes were returned to the Babbage Geotechnical Laboratory for inspection and testing.

In situ testing in the boreholes consisted of standard penetration tests (SPT) at selected intervals. In addition, the in situ shear strength of the materials encountered in the boreholes was measured at selected depths using a hand-held Pilcon Shear Vane. The stratigraphy encountered in the boreholes and the

results of the in situ tests are presented in the Borehole Summaries in Appendix B.

5.0 LABORATORY TESTING

The following tests were carried out on samples recovered from the boreholes:

- Moisture Content 22 No
- Plasticity Index 3 No
- Quick Undrained Triaxial Compression 2 No
- One Dimensional Consolidation 3 No

The results of the above tests are presented in the Babbage Geotechnical Laboratory Report in Appendix C. In addition, the results of the moisture content and plasticity indices are included on the Summaries of Soil Profile and Testing in Appendix B.

6.0 GEOLOGY AND STRATIGRAPHY

6.1 GEOLOGY

The IGNS's Geological Map of the Auckland Urban Area, 1:50,000, Sheet R11, 1992 indicates the geology at the site to generally comprise deposits of the Puketoka Formation comprising pumiceous muds, sands and gravels with muddy peat and lignite.

6.2 STRATIGRAPHY

The ground conditions, as indicated in the machine boreholes, generally confirm the anticipated geology, and generally comprise a sequence of clays with organic horizons, interbedded with silt and sand horizons.

In BH1 and BH4 the clay is generally firm / firm to stiff between approximately 2m to 3m and 5m to 6m below ground level (bgl). These clays are generally

highly plastic and range in colour from light brownish grey and orange to blue grey. In BH2 and BH3 the results of the vane shear tests do not indicate a similar reduction in peak undrained shear strength, the clays generally being stiff / stiff to very stiff in consistency.

A 0.6m to 0.9m thick layer of fine to medium grained sand was encountered in boreholes BH2, BH3 and BH4 at depths of between 3.2m and 8.0m bgl. The results of Standard Penetration Tests (SPT's) carried out within the sands indicates them to be loose to medium dense.

7.0 GROUNDWATER CONDITIONS

Groundwater strikes were not recorded in the boreholes since water flush was used in the drilling process which masked any seepages. However, groundwater seepages were recorded in the previous adjacent hand auger boreholes at depths of between 0.1m and 1.6m bgl during the fieldwork.

No long term monitoring of the local groundwater regime was carried out.

8.0 DISCUSSION

8.1 GENERAL

Previous discussion and recommendations is included in our Geotechnical Assessment Report dated June 2006 referenced in Section 1 and should be read in conjunction with this report.

8.2 STABILITY

From a previous review of aerial photographs and observations made during the walkover survey, there do not appear to be any signs of significant instability on the site.

The proposed fill embankments along the 100 year flood level are indicated to be at gradients of 1(v) to 2(h) and range in height from approximately 1.5m to

3.0m. The findings of the machine boreholes indicate the soft to firm material previously encountered in boreholes HA7, HA11 and HA12 between approximately 1m and 2m bgl appears to be localised. In BH1 the clays were generally firm to stiff / stiff to 2.5m depth and firm from 2.5m to 5.5m bgl, with no soft material being encountered. However, the result of a single triaxial compression test carried out on a sample of clay from BH1 at 1.5m bgl indicates the undrained shear strength to be 27kPa. This is approximately half the value measured with the hand shear vane at the same depth and may be partly attributed to sample disturbance. However, the result does correlate with the values obtained at similar depths from the hand shear vanes carried out within boreholes HA11 and HA12.

In boreholes BH2 and BH3 the clays were generally stiff / stiff to very stiff in consistency.

Preliminary stability assessments using G Slope software have been carried out to assess / infer a factor of safety of the existing slope (Section AA on Drawing G03) and of the proposed embankment (Section BB on Drawing G03). Section AA was selected since it represents a steeper part of the site with an underlying layer of soft to firm clay, as indicated from the hand auger boreholes. Section BB was selected to represent a typical section through a higher part of the proposed embankment. Whilst the soft to firm layer of clay was not encountered in borehole BH2, it has been included to represent a "worst case" scenario.

The Bishop simplified method of analysis for circular failure has been used in the analysis. The soil parameters used in the analysis were based on our previous experience in similar soils and considered to be moderately conservative. They are summarised in the following table:

Soil Type	Unit Weight (kN/m^3)	Effective Cohesion c' (kPa)	Effective Friction Angle Ø' (degrees)
FILL	17	5	30
CLAY Soft to Firm	18	2	27
CLAY Stiff	18	5	30
CLAY Very Stiff	20	7	32

The results of the stability analyses indicate that the factor of safety against failure for the existing slope (Section AA') is greater than 1.5 for a partially saturated slope, which is considered to represent moderately conservative conditions. For a fully saturated slope the factor of safety is indicated to reduce to approximately 1.1. This is considered satisfactory since a fully saturated slope, in our opinion, represents worst credible conditions.

In the case of Section BB', the results of the stability analysis indicate the factor of safety against failure of the proposed embankment batter, assuming unsaturated conditions, is approximately 1.8. However, for a groundwater surface at the base of the fill, approximately coincident with the existing ground surface, the factor of safety reduces to approximately 1.4. Since the findings of the boreholes indicate the layer of soft to firm clay modelled in the analysis is not continuous beneath the proposed embankment, we consider that this represents worst credible conditions. It is therefore our opinion that the indicated factor of safety against failure is satisfactory.

A summary of the graphical output from the G Slope analysis is included in Appendix D.

In order to minimise surface erosion of the embankment batter from surface runoff and consequential frittering and localised surface creep and shallow slumping, we consider that a vegetative cover should be developed over the slope of the embankment. To protect the embankment surface until vegetative cover is established and aid the development of the vegetative cover we consider a biodegradable mat should be installed on the slope rather than a thick layer of mulch and / or topsoil. Both mulch and topsoil can, prior to the

establishment of a well rooted vegetative cover, cause surface saturation and near surface movement. We consider the use of matting to reduce infiltration should assist in short term protection of the slope.

In addition, overland flow over the slope will need to be controlled. Rather than permit sheet flow over the slope it is recommended that the flow is directed into drains at selected intervals along the slope. The base of the drains should be formed from low permeable material to prevent erosion of the underlying soil and their discharge should be directed away from the base of the slope.

8.3 EARTHWORKS

As discussed in Section 3, significant earthworks are proposed on site to achieve the required platform levels for the proposed structures and access roads. The maximum depth of cut is approximately 4.5m in the central part of the Stage 1 area whilst the maximum thickness of fill is approximately 3.5m along the 100 year flood level in the Stage 2 area.

In the case of the proposed fill batters to be constructed along the 100 year flood level, the placement of between 2m and 3.5m of fill will result in consolidation settlement of the underlying soils. The magnitude of this consolidation settlement and the rate at which it occurs will be largely controlled by the compressibility and permeability of the underlying soils. The findings of the hand auger boreholes indicate that in the Stage 1 area, the soils are likely to comprise stiff to very stiff sandy clays of moderate plasticity. However, in the Stage 2 area, the clays are indicated to be soft to firm, organic and of high plasticity. The results of laboratory consolidation tests carried out on samples recovered from the machine boreholes indicate the clays to be medium to high compressibility.

Based on the above, it is our opinion that whilst consolidation settlement beneath the proposed fill batters in the Stage 1 may generally be less than 25mm, assuming medium compressibility clays are present, in the Stage 2 area, preliminary calculations indicate consolidation settlement of approximately 50mm to 100mm may result beneath parts of the fill batters. The time period for 50% and 90% of this consolidation settlement to occur, is indicated from the

laboratory tests to be approximately 6 months and 30 months respectively. Therefore, it is anticipated that additional drainage will be required to reduce the drainage path and thereby reduce the period over which 90% consolidation occurs. Preliminary analysis indicates that for a drainage path of approximately 3m the period for 90% consolidation to occur may be reduced to approximately 12 months. Pre-loading the area would increase the rate of settlement and reduce the period over which 90% consolidation occurs.

In order to minimise the effect of consolidation settlement on the proposed structures, we consider that the fill in the Stage 2 area should be placed during the initial stages of development and subsequent construction delayed for a minimum period of 6 months. The settlement of the fill should be monitored during this period to confirm the rate and amount of settlement taking place, thereby providing confidence in the assessment of likely settlement after development to ensure that it is within acceptable limits.

The placement of up to 3.5m of fill and any additional preload, on the soft to firm clays will require to be carried out under strict control in order to avoid potential bearing capacity failure of the underlying clays. The clay is indicated to have an undrained shear strength of 18kPa at 1m bgl in HA11 0.2m below the underside of topsoil in that location. We note this strength will not support conventional construction plant and the topsoil would also require removal using a hydraulic excavator rather than a motorscraper. This soft to firm soil is susceptible to bearing capacity failure for applied bearing pressures in excess of approximately 35kPa. If the full height of fill is placed over a short period of time and no drainage is installed within the underlying clays, it is our opinion that localised bearing capacity failure of the soft to firm clays may occur.

In order to minimise the risk of bearing capacity failure beneath the fill batter it is recommended that additional vertical drainage is installed beneath the area of fill and the rate of filling is strictly controlled to permit the dissipation of excess pore pressures within the underlying clays. This may be achieved by installing vertical "wick" drains and a drainage blanket prior to filling. Alternatively, consideration may be given to installing counterfort drains or stone columns instead of "wick" drains. These would have the advantage of providing additional vertical support to the fill batter. In the case of counterfort drains, the

presence of shallow groundwater and low strength clays may make excavation of trenches to depths of between 3m and 4m problematic.

Preliminary analysis indicate counterfort drains should be installed at a maximum lateral spacing of 6m and be a minimum depth of 3m. They should be excavated parallel to the slope and extend 1m to 2m beyond the toe and crest of the slope batter. The drainage aggregate will require to be sufficiently graded to prevent clogging and maintain adequate flow and therefore a 20/7 aggregate is likely to be suitable. The arisings from the excavation are anticipated to largely comprise saturated highly plastic clays with organics and therefore be largely unsuitable for re-use. As such, the majority of this material may require to be disposed of off site.

Prior to the placement of fill it is expected that some form of subsoil drainage will be installed to ensure that groundwater seepage is not impeded by the placement of the fill.

Testing and certification of all fill will be required where the thickness exceeds 0.6m or where structures or roads are to be located on the fill.

8.4 FOUNDATIONS

8.4.1 *Shallow Foundations*

Based on the findings of the investigation it is considered that the foundations for the majority of the proposed structures may be designed in accordance with NZS 3604:1999 "Timber Framed Buildings". This recommendation applies only to foundations within in situ soil or certified fill and no foundations should be founded in topsoil or uncertified fill.

In the case of structures located on the fill adjacent to the 100 year flood level, shallow foundations at a minimum depth of 600mm are considered suitable for structures located no closer than 1.2m from the crest of the 1(v) to 2(h) batter slope. This is to ensure that the foundation is located no closer than a line at a gradient of 1(v) to 3(h) from the toe of the batter and therefore minimise the risk of loss of support should localised frittering / minor creep and movement of the batter slope occur.

In order to minimise differential and total settlements as a result of the variation in thickness of the fill material, it is recommended that strict control is placed on the quality and compaction of the fill beneath the proposed structures. In addition, it is recommended that a serviceability limit state bearing strength of 100kPa is not exceeded for strip or pad foundations constructed within the fill material and that pad sizes should not exceed 1.0m x 1.0m in plan and strip foundations not exceed 1m width. The timing of final development over the fill in the Stage 2 area will however be dependant on consolidation of the materials beneath the fill rather than the strength of the fill itself. Monitoring of the fill should confirm when development is appropriate.

In the case of the proposed structures to be located on Lot 61 to the west of the stream, we understand they are to be two and three storey structures with additional basement car parking. The building platforms for the structures are indicated to be in areas of cut ranging in depth from 0.5m to 3.0m, as shown on Drawing G05 in Appendix A.

The findings of boreholes HA3, HA4 and BH4 indicate the ground conditions in the vicinity of the proposed structures to comprise a 0.3m to 0.9m thick layer of topsoil and / or fill overlying a sequence of stiff and very stiff moderately plastic clays. The results of the hand shear vanes carried out within the uppermost 3m indicate the average undrained shear strength to be approximately 90kPa. However, at approximately 3m to 3.5m bgl the clays are indicated to become locally firm and highly plastic.

Based on the above, it is considered the stiff to very stiff clays are a suitable founding stratum for shallow foundations. However, in areas of proposed deep cut, the firm highly plastic clays may be encountered, and it is our opinion that shallow foundations constructed within these soils may be subject to unacceptable vertical movement post construction. As such measures are likely to be required to mitigate this potentially adverse movement. These measures may include limiting the width of the foundations and applied foundation loads and/or removing the firm clay and replacing with hardfill. Alternatively, the use of pile foundations may be considered.

In the case of shallow foundations founded within the stiff to very stiff clays, it is recommended that a serviceability limit state bearing strength of 100kPa is not exceeded for strip or pad foundations and that pad sizes should not exceed 0.8m x 0.8m in plan and strip foundations not exceed 0.6m width. To minimise the effect of shrinkage and swelling, it is recommended that shallow foundations are founded at least 450mm below finished ground level. Where highly plastic clays occur, the founding depth should be increased to 600mm. However, it is recommended that once formation levels are reached the surface is inspected by a Geotechnical Engineer familiar with this report to confirm the founding depths.

8.4.2 Pile Foundations

Where structures are located closer than 1.2m to the crest of the 1(v) to 2(h) batter along the 100 year flood level, the use of piled foundations is recommended in order to minimise the risk of loss of support should localised frittering and slumping of the batter slope occur. From the preliminary layouts included on Drawings G04 and G05 it is anticipated that Lots 23, 46, 47, 52 to 55, 57 and 60 will require piled foundations. The design of the piles should consider loss of lateral support from the batter slope below / downslope of the piles, as well as lateral loads that may be imposed from the fill and structure. As such, it is recommended that the total length of pile is at least equivalent to twice the combined unsupported length of pile and depth of fill and that the head of the pile is suitably restrained.

The findings of the boreholes indicate the soils at approximately 3m below the base of the proposed fill embankment generally comprise stiff or very stiff clays and silts / medium dense sands. However, in the case of Lots 46 and 47, the findings of BH1 indicate the presence of firm clay from approximately 2m to 6m bgl.

Based on the above, preliminary calculations to determine the ultimate vertical strength of a single timber pile installed within the firm clay and stiff clay have been carried out and are summarised in the table below:

Founding Stratum	Pile Diameter (mm)	Embedment Depth (m)	Ultimate Vertical Strength (kN)
Firm Clay	300	3.0	120
Firm Clay	300	6.0	215
Stiff Clay	300	3.0	190

The embedment depth above is the length of pile within the natural soils beneath the base of the proposed embankment. It is assumed that no skin friction is mobilised along the shaft of the pile within the fill.

The method of installation of the piles should consider the presence of shallow groundwater and low strength clays and silts, as well as the drainage blanket and vertical / counterfort drains. Collapse of bored piles within the natural soils is considered likely and as such, it is anticipated that pre-boring through the fill embankment and then driving into the underlying natural soils may prove suitable.

If driven piles are adopted then it is recommended the pile capacity is assessed in the field by using Hiley's pile driving formula. For bored piles, a static load test could be carried out.

9.0 CONCLUSIONS

Based on the fieldwork covered by this investigation it is considered that the site is suitable for residential subdivision in accordance with the proposed earthworks and subject to the recommendations contained within this report.

10.0 RECOMMENDATIONS

10.1 It is recommended that all fill be certified beneath areas where development takes place (e.g. beneath buildings, roads etc). In the case of the fill along the 100 year flood level in Stage 2, it is recommended that development planning allows for a delay between completion of earthworks and building development of at least 6 months in order to permit resulting consolidation settlement of the underlying clays. In order to increase the rate of consolidation settlement and minimise the risk of bearing capacity failure beneath the fill batter it is recommended that additional vertical drainage is installed beneath the area of fill and the rate of filling is strictly controlled to permit the dissipation of excess pore pressures within the underlying clays. The vertical drainage may include "wick" drains, counterfort drains or stone columns. The method of installation should consider the presence of low strength clays and high groundwater level..

10.2 It is recommended that subsoil drainage is installed beneath areas of fill and in particular to the rear of retaining structures. In addition, the results of the groundwater monitoring indicate that groundwater may be encountered at shallow depth within cut areas and therefore adequate provision for drainage will require to be made in these areas.

10.3 It is recommended that a biodegradable mat is installed on the slope batter in order to minimise surface erosion of the embankment batter and to promote a vegetative cover. In addition, overland flow over the slope should be controlled by the installation of drains at selected intervals along the slope. The base of the drains should be formed from low permeable material to prevent erosion of the underlying soil and their discharge should be directed away from the base of the slope.

10.4 It is recommended that the foundations for residential dwellings are designed in accordance with NZS 3604:1999, with the exception of those for Lots 23, 46, 47, 52 to 55, 57 and 60 and the two to three storey structures in Stage 3, where specific design will be required. It is recommended that a serviceability limit state bearing strength of 100kPa is not exceeded for strip or pad foundations constructed within the fill material and that pad sizes should not exceed 1.0m x 1.0m in plan and strip foundations not exceed 1m width. It is recommended

that the foundations are founded at least 450mm below finished ground level to take into account possible shrinkage swell affects. Where highly plastic clay forms the founding material then this depth should be increased to 600mm. It is recommended that once formation levels are reached the surface is inspected by a Geotechnical Engineer familiar with this report to confirm the founding depths.

10.5 Where structures are located closer than 1.2m to the crest of the 1(v) to 2(h) batter along the 100 year flood level, the use of piled foundations is recommended. The design of the piles should consider loss of lateral support from the batter slope, as well as lateral loads that may be imposed from the fill and structure. As such, it is recommended that the total length of pile is at least equivalent to twice the sum of the unsupported length of pile and depth of fill and that the head of the pile is suitably restrained.

10.6 It is recommended that shallow foundations for the proposed two and three storey structures on Lot 61 are founded within the stiff to very stiff clays and designed using a serviceability limit state bearing strength not exceeding 100kPa and that pad sizes should not exceed 0.8m x 0.8m in plan and strip foundations not exceed 0.6m width. We recommend however that once formation levels are reached the surface is inspected by a Geotechnical Engineer familiar with this report to confirm the founding depths.

11.0 LIMITATIONS

11.1 RESTRICTION OF INTENDED PURPOSE

This report has been prepared solely for the benefit of our client NZ Housing Foundation with respect to the proposed redevelopment of the site, as described in Section 3. The reliance by other parties on the information or opinions contained in the report shall, without our prior review and agreement in writing, be at such party's sole risk.

11.2 LEGAL INTERPRETATION

Opinions and judgements expressed herein are based on our understanding and interpretation of current regulatory standards, and should not be construed as legal opinions. Where opinions or judgements are to be relied on they should be independently verified with appropriate legal advice.

11.3 RELIABILITY OF INFORMATION

Recommendations and opinions in this report are based on data from the boreholes described in Section 6 of this report. The nature and continuity of subsoil conditions away from the boreholes are inferred and it must be appreciated that actual conditions could vary considerably from the assumed model.

During excavation and construction the site should be examined by a *Geotechnical Engineer competent to judge whether the exposed subsoils are* compatible with the inferred conditions on which the report has been based. It is possible that the nature of the exposed subsoils may require further investigation and the modification of the design based upon this report.

Babbage would be pleased to provide this service and believe that the project would benefit from such continuity. In any event, it is essential Babbage be advised if there is any variation in subsoil conditions from those described in the report as it may affect the design parameters recommended in the report.

This report has been prepared by Russell Allison and reviewed by Malcolm Stapleton.

Respectfully submitted
Babbage Consultants Limited

Russell Allison
Senior Geotechnical Engineer
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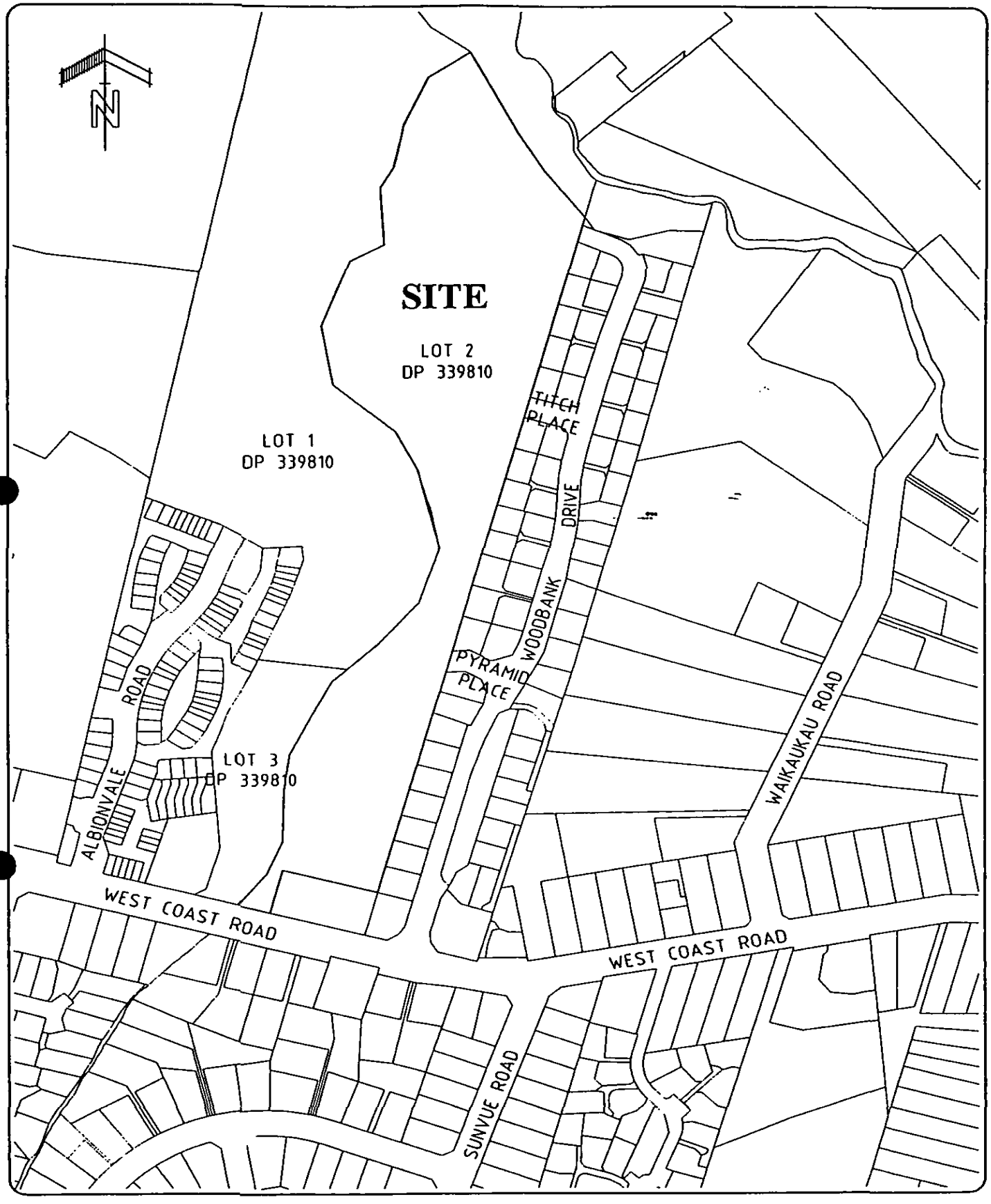
e-mail: russella@babbage.co.nz

Appendix A

Drawings



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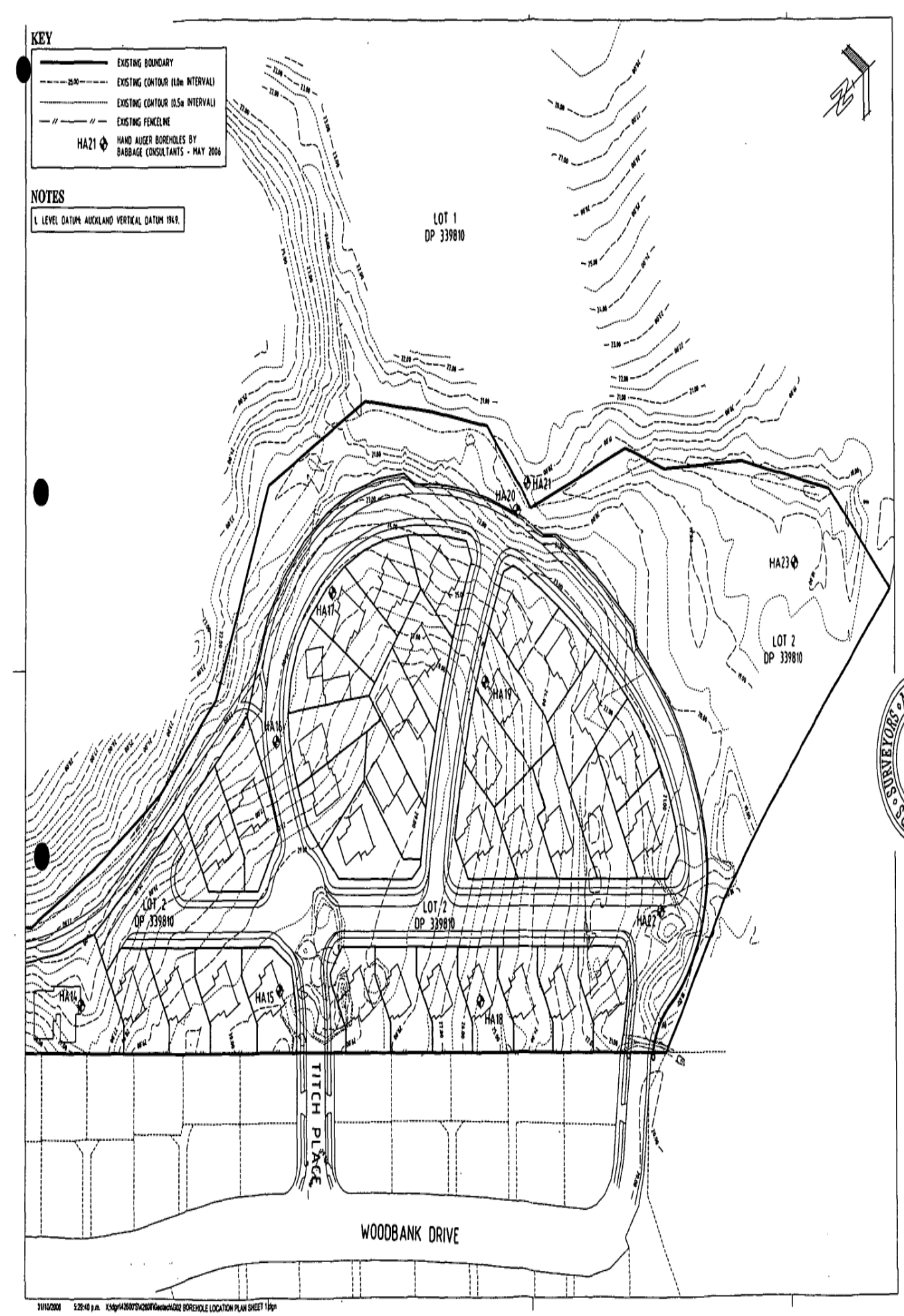
WEST COAST ROAD HOUSING DEVELOPMENT FOR NZ HOUSING FOUNDATION

JOB NO:	42608
TITLE:	SITE LOCALITY PLAN
SCALE:	NOT TO SCALE
DRAWING:	G01



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DRAWING NOTES

REV	DATE	DESCRIPTION	DRAWN	CHECK
A	30.10.06	HAND AUGER DESCRIPTIONS AMENDED	MJD	RA

DRAWING REVISIONS

SURVEYORS • ARCHITECTS • ENGINEERS
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CLIENT / PROJECT

WEST COAST ROAD HOUSING DEVELOPMENT

FOR

NZ HOUSING FOUNDATION

DRAWING TITLE

BOREHOLE LOCATION PLAN (SHEET 1)

	DATE	INITIAL
DESIGNED		
DRAWN	JUNE 2006	GMB
CHECKED		
APPROVED		

SCALE (A1)

1:500

JOB NUMBER	DRAWING NUMBER	REVISION
42608	G02	A

31/10/2006 5:29:40 p.m. X:\dgn\42600's\42608\Geotech\G02 BOREHOLE LOCATION PLAN SHEET 1.dgn

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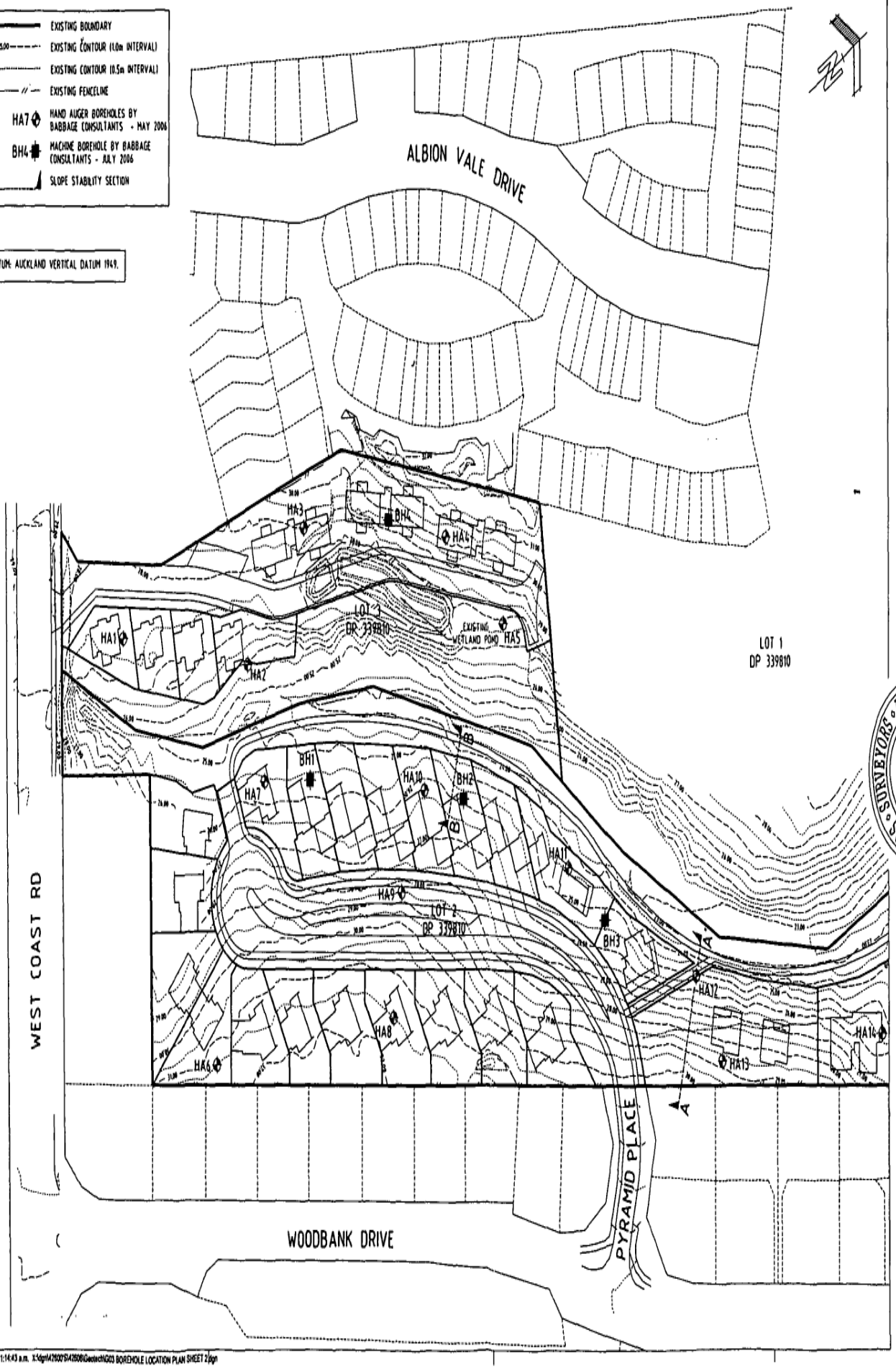
DRAWING NOTES

KEY

- EXISTING BOUNDARY
- 25.00 EXISTING CONTOUR (1.0m INTERVAL)
- EXISTING CONTOUR (0.5m INTERVAL)
- // EXISTING FENCELINE
- HA7 HAND AUGER BOREHOLES BY BABBAGE CONSULTANTS - MAY 2006
- BH4 MACHINE BOREHOLE BY BABBAGE CONSULTANTS - JULY 2006
- SLOPE STABILITY SECTION

NOTES

1. LEVEL DATUM: AUCKLAND VERTICAL DATUM 1949.



REV	DATE	DESCRIPTION	DRAWN	CHECD
A	30.10.06	MACHINE BOREHOLES AND SLOPE SECTIONS ADDED	MJD	RA

DRAWING REVISIONS

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CLIENT / PROJECT

WEST COAST ROAD HOUSING DEVELOPMENT

FOR

NZ HOUSING FOUNDATION

DRAWING TITLE

BOREHOLE LOCATION PLAN (SHEET 2)

	DATE	INITIAL
DESIGNED		
DRAWN	JUNE 2006	GMB
CHECKED		
APPROVED		

SCALE (A1)

1:500

JOB NUMBER	DRAWING NUMBER	REVISION
42508	G03	A

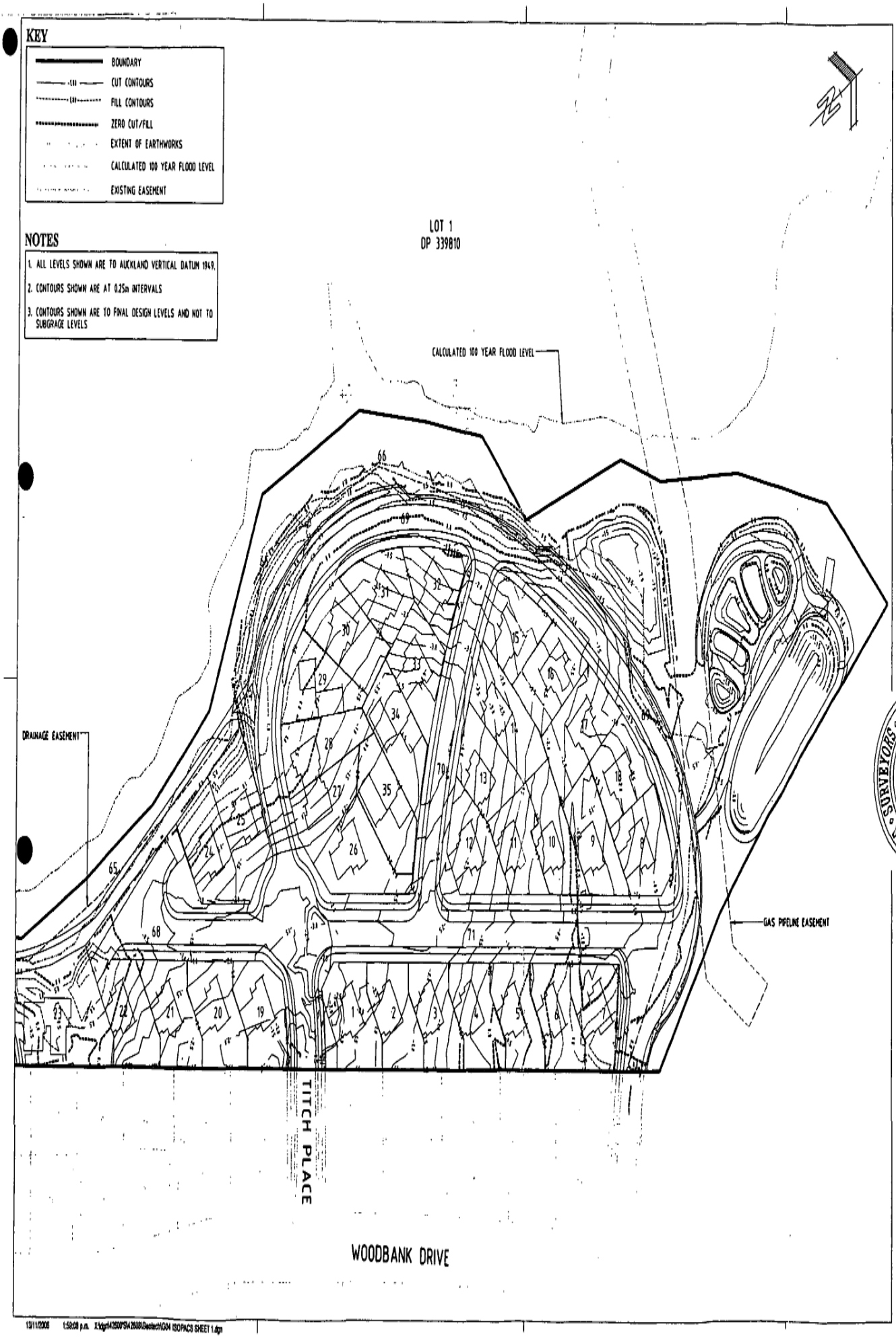
10/11/2006 11:14:43 a.m. X:\dgn\42500\S\42508\Geotech\G03 BOREHOLE LOCATION PLAN SHEET 2.dgn

KEY

- BOUNDARY
- CUT CONTOURS
- FILL CONTOURS
- ZERO CUT/FILL
- EXTENT OF EARTHWORKS
- CALCULATED 100 YEAR FLOOD LEVEL
- EXISTING EASEMENT

NOTES

1. ALL LEVELS SHOWN ARE TO AUCKLAND VERTICAL DATUM 1949.
2. CONTOURS SHOWN ARE AT 0.25m INTERVALS
3. CONTOURS SHOWN ARE TO FINAL DESIGN LEVELS AND NOT TO SUBGRADE LEVELS



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A	07.09.06	LEVELS AMENDED	FR	DaR

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CLIENT / PROJECT

WEST COAST ROAD
HOUSING DEVELOPMENT
FOR
NZ HOUSING FOUNDATION

DRAWING TITLE

CUT AND FILL
ISOPAC PLAN
(SHEET 1)

	DATE	INITIAL
DESIGNED		
DRAWN	JUNE 2006	GW
CHECKED		
APPROVED		

SCALE (A1)

1:500

JOB NUMBER	DRAWING NUMBER	REVISION
42608	G04	A

13/11/2006 1:59:08 p.m. X:\dgn\42500\42608\Geotech\G04 ISOPACS SHEET 1.dgn

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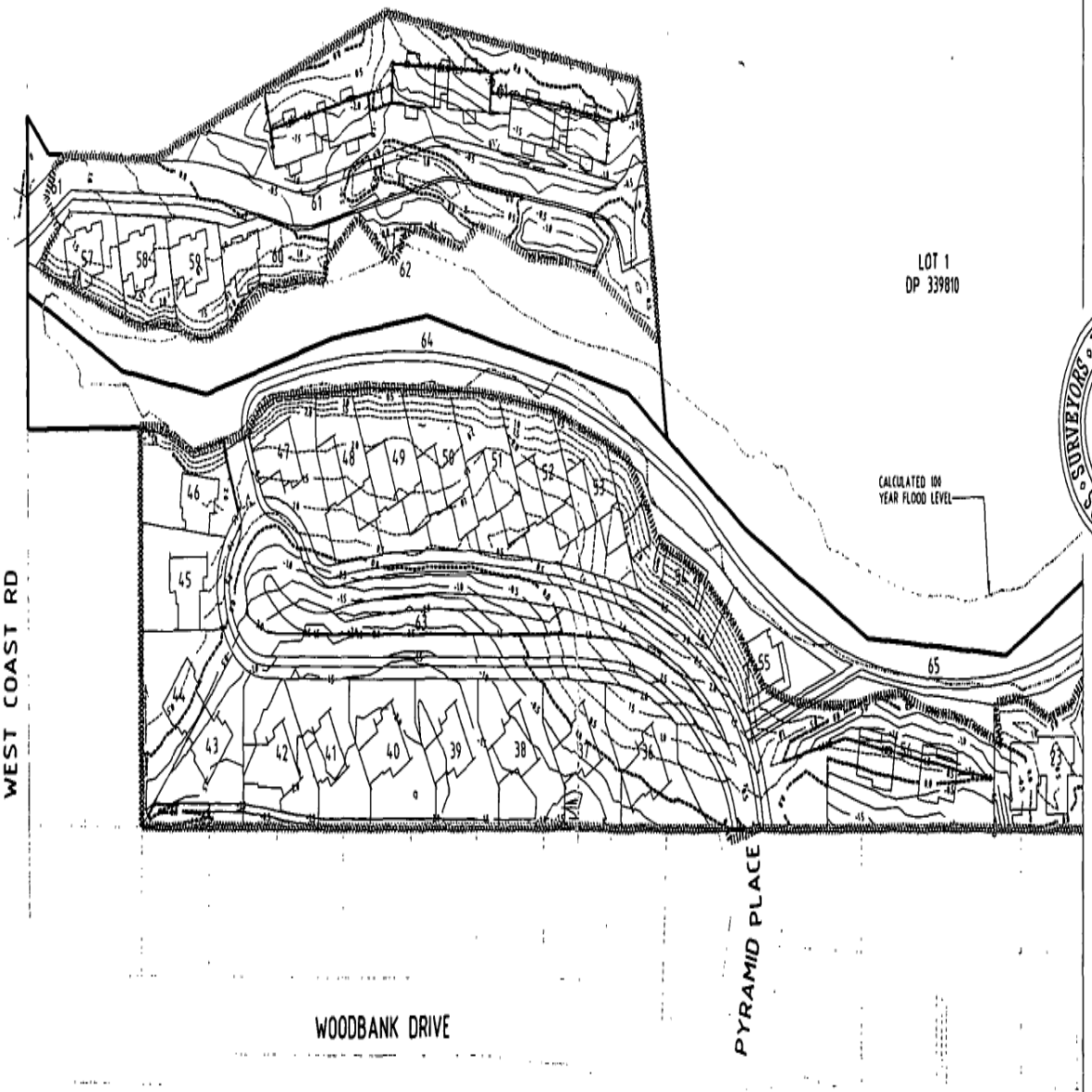
DRAWING NOTES

KEY

- BOUNDARY
- CUT CONTOURS
- FILL CONTOURS
- ZERO CUT/FILL
- EXTENT OF EARTHWORKS
- CALCULATED 100 YEAR FLOOD LEVEL
- EXISTING EASEMENT

NOTES

1. ALL LEVELS SHOWN ARE TO AUCKLAND VERTICAL DATUM 1949.
2. CONTOURS SHOWN ARE AT 0.25m INTERVALS
3. CONTOURS SHOWN ARE TO FINAL DESIGN LEVELS AND NOT TO SUBGRADE LEVELS



REV	DATE	DESCRIPTION	DRAWN	CHECK
A	07.09.08	LEVELS AMENDED	FK	DMR

DRAWING REVISIONS

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CLIENT / PROJECT

WEST COAST ROAD
HOUSING DEVELOPMENT
FOR
NZ HOUSING FOUNDATION

DRAWING TITLE

CUT AND FILL
ISOPAC PLAN
(SHEET 2)

	DATE	INITIAL
DESIGNED		
DRAWN	JUNE 2008	GW
CHECKED		
APPROVED		

SCALE (A1)

1:500

JOB NUMBER	DRAWING NUMBER	REVISION
42808	G05	A

Appendix B

Geotechnical Investigations

Babbage CONSULTANTS

SUMMARY OF SOIL PROFILE & TESTING

JOB No. 42608/GE

PROJECT: WEST COAST ROAD, HENDERSON

HOLE No. BH4

DATE STARTED: 25/07/2006	METHOD: OB/SPT/TU/WD	RIG: Kubota STV40 Tractor Rig	SHEET 1 of 3
DATE FINISHED: 25/07/2006	DRILLED BY: Prodrill (Auck) Ltd.	FLUID: water	LOGGED BY: J. Franklin

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

DEPTH (m)	SOIL SYMBOL	GEOLOGIC UNIT	GROUND WATER	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	MOISTURE CONTENTS = ● LIMITS: PLASTIC = X LIQUID = + (20 / 40 / 60) IN SITU VANE (kPa) = ✱ (50 / 100 / 150)	OTHER TESTS: Corrected Shear Vane Result ** U = peak / R = remoulded; SPT / Scala Penetrometer
		FILL	NR		...	OB	80			unable to penetrate
0.90										
1.00						OB	85			
1.60										
2.00		PUKETOKA FORMATION (TAURANGA FORMATION)			S1	SPT	100	5		81kPa (U) 32kPa (R) 1/2/3 N = 5
3.00						OB	55			
3.20										
3.60					S2	SPT	100	6		36kPa (U) 27kPa (R) 2/3/3 N = 6
4.00						OB	90			72kPa (U) 27kPa (R)

FILL: silt, clayey, very stiff, slightly to moderately plastic, dark brown with patches of orange clay, slightly moist.

Core slipped out of core barrel when being retrieved, so 0.5 - 1.0m run was taken to 1.5m. Core slipped again, so run was taken to 2.0m.

CLAY, silty, minor fine sand, very stiff, moderately plastic, mottled orange and bright orange, slightly moist, worm burrows infilled with fill material, roots.

CLAY, fine to medium sandy, minor silt, pumiceous, stiff, moderately plastic, mottled orange, bright orange, light grey, grey and white, moist.

Very sandy.

Mottled bright orange and grey.

CLAY, minor fine sand, minor silt, firm, highly plastic, brownish grey, very moist.

CLAY, trace fine sand, trace silt, stiff to very stiff, highly plastic, light grey with faint black mottles, slightly moist.

With black mottles, occasional organics, very moist.

4.45m: 2cm dark brown organic band.

Mottled grey and dark brownish grey.

4.7m: 2cm horizon of pumiceous sandy CLAY.

Remarks: The boundary between the Puketoka Formation and underlying Waitemata Group is very indistinct and is only approximate. IWGR = inferred Waitemata Group Rock.

** IN HOUSE METHOD BASED ON BS1377

SUMMARY OF SOIL PROFILE & TESTING

Babbage CONSULTANTS

PROJECT: WEST COAST ROAD, HENDERSON		JOB No.	42608/GE
		HOLE No.	BH4
DATE STARTED: 25/07/2006	METHOD: OB/SPT/TU/WD	RIG: Kubota STV40 Tractor Rig	SHEET 2 of 3
DATE FINISHED: 25/07/2006	DRILLED BY: Prodrill (Auck) Ltd.	FLUID: water	LOGGED BY: J. Franklin

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

DEPTH (m)	Description	GEOLOGIC UNIT
5.75	CLAY, with minor medium to coarse sand-sized lumps of cemented silt, very stiff, moderately plastic, dark grey with occasional white flecks, moist.	PUKETOKA FORMATION (TAURANGA FORMATION)
6.00	Assumed core loss.	
6.90	CLAY, trace fine sand, trace silt, stiff, highly plastic, light grey with occasional black mottles, moist, occasional organics.	
7.50	ORGANIC CLAY, minor fine sand, minor silt, firm, highly plastic, dark brown with black mottles, moist, organic fragments.	
7.70	CLAY, as at 6.9m	
8.05	SAND, fine to medium, some silt, minor clay, non-plastic, light grey, slightly moist.	
8.40	Very silty.	
8.75	ORGANIC CLAY, minor fine sand, minor silt, firm, highly plastic, dark brown with black mottles, moist, organic fragments.	
9.25	CLAY, trace fine sand, trace silt, very stiff, moderately plastic, light grey, slightly moist.	
10.00		

SAMPLES RECOVERED & TEST RESULTS

CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	MOISTURE CONTENTS = ● LIMITS: PLASTIC = × LIQUID = + (20 40 60) IN SITU VANE (kPa) = ✳ (50 100 150)	OTHER TESTS: Corrected Shear Vane Result ** U = peak / R = remoulded; SPT / Scala Penetrometer
	S3	SPT	100	4		1/2/2 N = 4
		WD	0			
	T1	TU	100			
		OB	55			66kPa (U) 18kPa (R)
						105kPa (U) 27kPa (R)
	S4	SPT	100	5	94.1	2/2/3 N = 5
		OB	100			
	T2	TU	100			
						170kPa (U) 32kPa (R)

Remarks: The boundary between the Puketoka Formation and underlying Waitemata Group is very indistinct and is only approximate. IWGR = inferred Waitemata Group Rock.

** IN HOUSE METHOD BASED ON BS1377

Babbage CONSULTANTS	SUMMARY OF SOIL PROFILE & TESTING	JOB No.	42608/GE
	PROJECT: WEST COAST ROAD, HENDERSON	HOLE No.	BH4

DATE STARTED: 25/07/2006	METHOD: OB/SPT/TU/WD	RIG: Kubota STV40 Tractor Rig	SHEET 3 of 3
DATE FINISHED: 25/07/2006	DRILLED BY: Prodrill (Auck) Ltd.	FLUID: water	LOGGED BY: J. Franklin

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

SAMPLES RECOVERED & TEST RESULTS

MOISTURE CONTENTS = ●
LIMITS: PLASTIC = X LIQUID = +
20 40 60
IN SITU VANE (kPa) = ✳
50 100 150

OTHER TESTS
Corrected Shear Vane Result **
U = peak / R = remoulded
SPT / Scala Penetrometer

DEPTH (m)	SOIL SYMBOL	GEOLOGIC UNIT	GROUND WATER	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	OTHER TESTS
		PUKETOKA FORMATION (TAURANGA FORMATION)				OB	100		Increasing fine sand. Minor fine sand.
					S5	SPT	100	13	Trace fine sand. 126kPa (U) 42kPa (R) 5/6/7 N = 13
						OB	67		Grey with thin bands of fine sandy CLAY. 91kPa (U) 44kPa (R)
12.00									116kPa (U) 31kPa (R) 4/5/7 N = 12
		WAITEMATA GROUP SOIL			S6	SPT	100	12	Grades to CLAY, trace fine sand, trace silt, very stiff, moderately plastic, dark grey, slightly moist, with regular bands of fine sandy CLAY.
12.50									
12.60						OB	100		unable to penetrate
13.20									
13.30									unable to penetrate
13.50		IWGR			S7	SPT	0		12 / 20 / 30 blows for 90mm penetration
13.89									Solid nose SPT at 13.5m
									End of Borehole at 13.89 m

Remarks: The boundary between the Puketoka Formation and underlying Waitemata Group is very indistinct and is only approximate. IWGR = Inferred Waitemata Group Rock.

** IN HOUSE METHOD BASED ON BS1377

Babbage CONSULTANTS

SUMMARY OF SOIL PROFILE & TESTING

JOB No.	42608/GE		
PROJECT: WEST COAST ROAD, HENDERSON	HOLE No.	BH3	
DATE STARTED: 19/07/2006	METHOD: OB/SPT/TT	RIG: track mounted excavator rig	SHEET 1 of 2
DATE FINISHED: 19/07/2006	DRILLED BY: Prodrill (Auck) Ltd.	FLUID: water	LOGGED BY: J. Franklin / H. Singh

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

SAMPLES RECOVERED & TEST RESULTS

MOISTURE CONTENTS = ●
LIMITS: PLASTIC = × LIQUID = +
IN SITU VANE (kPa) = ✳

OTHER TESTS
Corrected Shear Vane Result **
U = peak / R = remoulded
SPT / Scala Penetrometer

DEPTH (m)	SOIL SYMBOL	SOIL/ROCK DESCRIPTION	GEOLOGIC UNIT	GROUND WATER	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	OTHER TESTS
0.00		SILT, clayey, minor fine sand, stiff, moderately plastic, dark grey, very moist.	PUKETOKA FORMATION (TAURANGA FORMATION)	NR			OB	90		
0.35		SILT, clayey, some fine sand, very stiff, moderately plastic, mottled orange and light grey, moist.								69kPa (U) 24kPa (R)
0.70		Grades to CLAY, minor silt, minor fine sand, very stiff, moderately plastic, mottled orange and light grey, moist.					OB	60		
1.00		Brownish grey with faint orange mottles.								112kPa (U) 70kPa (R)
		Moderately to highly plastic, moist.					OB	50		
		Stiff.								84kPa (U) 48kPa (R) 1/1/2 N = 3
1.60		Becomes silty.				S1	SPT	100	3	
1.80		CLAY, minor silt, minor fine sand, firm to stiff, highly plastic, light greyish brown, very moist.								
2.00										
2.15		CLAY, minor silt, very stiff, moderately plastic, mottled grey, orange and bright orange, slightly moist.					OB	100		
2.45		CLAY, very stiff to hard, some silt, trace fine sand, slightly plastic, uniform grey, slightly moist.								110kPa (U) 32kPa (R)
							OB	100		
3.00										unable to penetrate 5/3/7 N = 10
3.25		SAND, fine to medium, some silt, non-plastic, grey, very moist to wet.				S2	SPT	100	10	
3.55		SAND, fine to medium, some silt, non-plastic, light grey, wet.								
3.85		ORGANIC CLAY, minor silt, very stiff, moderately to highly plastic, dark greyish brown with black mottles, slightly moist, wood fragments.								
4.00		CLAY, minor silt, trace fine sand, very stiff, moderately plastic, light grey, slightly moist.					OB	100		
										149kPa (U) 29kPa (R) 2/3/4 N = 7
						S3	SPT	100	7	
5.00										

Remarks:

** IN HOUSE METHOD BASED ON BS1377

Babbage CONSULTANTS

SUMMARY OF SOIL PROFILE & TESTING

JOB No.	42608/GE
PROJECT: WEST COAST ROAD, HENDERSON	
HOLE No.	BH3

DATE STARTED: 19/07/2006	METHOD: OB/SPT/TT	RIG: track mounted excavator rig	SHEET 2 of 2
DATE FINISHED: 19/07/2006	DRILLED BY: Prodrill (Auck) Ltd.	FLUID: water	LOGGED BY: J. Franklin / H. Singh

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

DEPTH (m)	SOIL SYMBOL	SOIL/ROCK DESCRIPTION	GEOLOGIC UNIT	GROUND WATER
		Minor fine sand.		
		Some fine sand.		
		Some fine to medium sand.		
6.00		Grades to CLAY, fine to medium sandy, minor silt, very stiff, moderately plastic, light grey with white flecks, slightly moist.	WAITEMATA GROUP SOIL	
6.70				
6.85		SILT, clayey, hard, slightly plastic, light grey, slightly moist, weakly cemented.		
7.00		SILTSTONE, very weak, completely weathered, grey to dark grey.	WAITEMATA GROUP ROCK	
7.10		SANDSTONE, fine, very weak, well cemented, completely weathered.		
7.30		SILTSTONE, very weak, completely weathered, grey to dark grey, some sub-vertical fractures.		
7.50		Solid nose SPT at 7.5m - material recovered in core barrel appeared to be siltstone.		
8.00				
8.20		SANDSTONE, fine, very weak to weak, very well cemented, highly weathered, grey, some sub-vertical white veins.		
9.00				
9.08		Solid nose SPT at 9.0m		
		End of Borehole at 9.075 m		

SAMPLES RECOVERED & TEST RESULTS

MOISTURE CONTENTS = ●
LIMITS: PLASTIC = X LIQUID = +
20 40 60
IN SITU VANE (kPa) = ✳
50 100 150

CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	OTHER TESTS: Corrected Shear Vane Result ** U = peak / R = remoulded; SPT / Scala Penetrometer
		OB	95		149kPa (U) 40kPa (R)
					110kPa (U) 36kPa (R)
	S4	SPT	100	9	2/4/5 N = 9
		OB	100		
	S5	SPT	0	23	10/11/12 N = 23
		TT	75		
	S6	SPT	0		50 blows for 75mm penetration

Remarks:

** IN HOUSE METHOD BASED ON BS1377

SUMMARY OF SOIL PROFILE & TESTING

Babbage CONSULTANTS

PROJECT: WEST COAST ROAD, HENDERSON		JOB No.	42608/GE
		HOLE No.	BH2
DATE STARTED: 18/07/2006	METHOD: OB/SPT/TU/WD	RIG: track mounted excavator rig	SHEET 1 of 2
DATE FINISHED: 18/07/2006	DRILLED BY: Prodrill (Auck) Ltd.	FLUID: water	LOGGED BY: J. Franklin / H. Singh

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

SAMPLES RECOVERED & TEST RESULTS

MOISTURE CONTENTS = ●
LIMITS: PLASTIC = X LIQUID = +
IN SITU VANE (kPa) = ✳

OTHER TESTS
Corrected Shear Vane Result **
U = peak / R = remoulded
SPT / Scala Penetrometer

DEPTH (m)	SOIL SYMBOL	SOIL/ROCK DESCRIPTION	GEOLOGIC UNIT	GROUND WATER	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	OTHER TESTS
0.00		SILT, fine sandy, some clay, stiff to very stiff, moderately plastic, dark brownish grey, moist.	PUKETOKA FORMATION (TAURANGA FORMATION)	NR						
0.20		SILT, fine sandy, clayey, stiff to very stiff, slightly to moderately plastic, banded orange and light grey, moist.					OB	90		102kPa (U) 15kPa (R)
0.60		CLAY, fine sandy, some silt, stiff, moderately plastic, mottled grey, light grey and orange, moist.					OB	100		
0.90										
1.00		CLAY, some fine sand, minor silt, stiff to very stiff, moderately plastic, mottled orange and light grey, slightly moist. Mottled light greyish brown and orange, moist.					OB	100		116kPa (U) 42kPa (R)
		Moderately to highly plastic.								
		Highly plastic.					OB	80		102kPa (U) 59kPa (R)
		Minor fine sand, mottled orange and light grey.								
2.00		Trace fine sand.					OB	80		91kPa (U) 52kPa (R)
2.90										
3.00		CLAY, some silt, minor fine sand, stiff, highly plastic, mid-grey with black flecks, very moist, trace organics.								60kPa (U) 22kPa (R)
3.25		CLAY, minor fine sand, minor silt, stiff, moderately plastic, light grey, moist.				T1	TU	100		
3.55										
3.70		CLAY, minor fine sand, minor silt, stiff, highly plastic, light brown with black mottles, moist, organics.								
		CLAY, minor fine sand, minor silt, stiff, moderately plastic, light grey, moist.								
3.95										
4.00		SAND, fine to medium, clayey, slightly plastic, light grey, moist.					OB	100		
4.25		SAND, fine to medium, some silt, non-plastic, light grey, moist.								
		Dark grey, very moist. Wet.				S1	SPT	100	7	5/5/2 N = 7
4.90										
5.00		ORGANIC CLAY, minor fine sand, minor silt.					WD	0		

Remarks:

** IN HOUSE METHOD BASED ON BS1377

Babbage CONSULTANTS	SUMMARY OF SOIL PROFILE & TESTING	JOB No.	42608/GE
	PROJECT: WEST COAST ROAD, HENDERSON	HOLE No.	BH2
DATE STARTED: 18/07/2006	METHOD: OB/SPT/TU/WD	RIG: track mounted excavator rig	SHEET 2 of 2
DATE FINISHED: 18/07/2006	DRILLED BY: Prodrill (Auck) Ltd.	FLUID: water	LOGGED BY: J. Franklin / H. Singh

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

SAMPLES RECOVERED & TEST RESULTS

MOISTURE CONTENTS = ●
LIMITS: PLASTIC = X LIQUID = +
20 40 60
IN SITU VANE (kPa) = ✳
50 100 150

OTHER TESTS
Corrected Shear Vane Result **
U = peak / R = remoulded
SPT / Scala Penetrometer

DEPTH (m)	SOIL SYMBOL	SOIL/ROCK DESCRIPTION	GEOLOGIC UNIT	GROUND WATER	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	OTHER TESTS
		abundant organics, highly plastic, dark brownish grey, moist.								
5.25		CLAY, minor silt, trace fine sand, stiff to very stiff, moderately plastic, light grey with occasional black mottles, moist.	PUKETOKA FORMATION (TAURANGA FORMATION)			T2	TU	100		
6.00		Moderately to highly plastic.					OB	100		162kPa (U) 48kPa (R)
		Highly plastic, very moist.				T3	TU	100		76kPa (U) 24kPa (R)
7.00		Moist.					OB	70		103kPa (U) 31kPa (R)
8.00		Minor fine sand, moderately plastic. Pocket of fine sandy clay.								81kPa (U) 24kPa (R)
		CLAY, fine sandy, minor silt, very stiff, moderately plastic, light grey with occasional green mottles, slightly moist.				S2	SPT	100	10	4/5/5 N = 10
		Mid-grey with white speckles.	WAITEMATA GROUP SOIL							
9.00		Fine to medium sandy, grades to dark grey.					OB	81		167kPa (U) 42kPa (R)
		10cm fine gravelly horizon (siltstone gravel) and carbonaceous material.								unable to penetrate 7/8/10 N = 18
						S3	SPT	100	18	
9.95		End of Borehole at 9.95 m								

Remarks:

** IN HOUSE METHOD BASED ON BS1377

Babbage CONSULTANTS

SUMMARY OF SOIL PROFILE & TESTING

JOB No.	42608/GE
HOLE No.	BH1

PROJECT: WEST COAST ROAD, HENDERSON

DATE STARTED: 18/07/2006	METHOD: OB/SPT/TU	RIG: track mounted excavator rig	SHEET 1 of 3
DATE FINISHED: 18/07/2006	DRILLED BY: Prodrill (Auck) Ltd.	FLUID: water	LOGGED BY: J. Franklin / H. Singh

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

DEPTH (m)	SOIL SYMBOL	DESCRIPTION	GEOLOGIC UNIT	GROUND WATER
0.15		TOPSOIL.	TS	NR
		SILT, clayey, minor fine sand, stiff, moderately plastic, dark grey, moist.	PUKETOKA FORMATION (TAURANGA FORMATION)	
0.85		CLAY, minor silt, minor fine sand, firm to stiff, moderately plastic, mottled orange and light grey, moist.		
1.00		Highly plastic, brown with orange mottles, very moist, fine to medium sand-sized organics.		
2.00		Roots and organics.		
2.05		CLAY, minor fine sand, stiff, highly plastic, light bluish grey, moist. Occasional bright orange mottles and white specks, occasional siltstone gravel. Root.		
		Becomes firm.		
3.00		Trace fine sand.		
4.00		Occasional faint black mottles.		
5.00				

SAMPLES RECOVERED & TEST RESULTS

CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE
		OB	80	
		OB	90	
		OB	100	
	T1	TU	100	
		OB	100	
	T2	TU	100	
		OB	100	
	S1	SPT	100	5

MOISTURE CONTENTS = ●
LIMITS: PLASTIC = X LIQUID = +
20 40 60
IN SITU VANE (kPa) = ✱
50 100 150

OTHER TESTS
Corrected Shear Vane Result **
U = peak / R = remoulded
SPT / Scala Penetrometer

66kPa (U)
18kPa (R)
91kPa (U)
52kPa (R)
52kPa (U)
26kPa (R)
48kPa (U)
7kPa (R)
48kPa (U)
17kPa (R)
60kPa (U)
27kPa (R)
45kPa (U)
18kPa (R)
1/2/3
N = 5

Remarks:

** IN HOUSE METHOD BASED ON BS1377

Babbage CONSULTANTS	SUMMARY OF SOIL PROFILE & TESTING	JOB No.	42608/GE
	PROJECT: WEST COAST ROAD, HENDERSON	HOLE No.	BH1
DATE STARTED: 18/07/2006	METHOD: OB/SPT/TU	RIG: track mounted excavator rig	SHEET 2 of 3
DATE FINISHED: 18/07/2006	DRILLED BY: Prodrill (Auck) Ltd.	FLUID: water	LOGGED BY: J. Franklin / H. Singh

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

DEPTH (m)	Description	GEOLOGIC UNIT
6.00	Grades to mid-grey with black specks, some fine sand.	
6.25	CLAY, some fine sand, minor silt, stiff becoming very stiff, moderately to highly plastic, light grey to mid-grey, moist.	WAITEMATA GROUP SOIL
7.00	Silty patches, mid-grey.	
8.00		
8.05	Band of fine sandy CLAY with some fine siltstone gravel.	
8.15	CLAY, some fine sand, minor silt, very stiff, moderately to highly plastic, light grey to mid-grey, moist.	
	Very stiff to hard, with white flecks.	
9.00		
9.60	CLAY, fine sandy, some silt, trace siltstone gravel, hard, moderately plastic, dark grey, slightly moist, with pockets of fine sand.	
10.00		

SAMPLES RECOVERED & TEST RESULTS

DEPTH (m)	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	MOISTURE CONTENTS = ● LIMITS: PLASTIC = × LIQUID = + (20 / 40 / 60) IN SITU VANE (kPa) = ✳ (50 / 100 / 150)	OTHER TESTS: Corrected Shear Vane Result ** U = peak / R = remoulded; SPT / Scala Penetrometer
6.00			OB	100		✳	42kPa (U) 11kPa (R)
6.25		T3	TU	100		✳	70kPa (U) 18kPa (R)
7.00			OB	100		✳	70kPa (U) 24kPa (R)
		S2	SPT	100	13	●	134kPa (U) 31kPa (R) 5/6/7 N = 13
8.00							
8.05							
8.15							
			OB	90			
9.00		S3	SPT	100	16	●	unable to penetrate 6/7/9 N = 16
9.60							
10.00			OB	100			

Remarks:

** IN HOUSE METHOD BASED ON BS1377

Babbage CONSULTANTS

SUMMARY OF SOIL PROFILE & TESTING

JOB No.	42608/GE
PROJECT: WEST COAST ROAD, HENDERSON	HOLE No. BH1

DATE STARTED: 18/07/2006	METHOD: OB/SPT/TU	RIG: track mounted excavator rig	SHEET 3 of 3
DATE FINISHED: 18/07/2006	DRILLED BY: Prodrill (Auck) Ltd.	FLUID: water	LOGGED BY: J. Franklin / H. Singh

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

SAMPLES RECOVERED & TEST RESULTS

MOISTURE CONTENTS = ●
LIMITS: PLASTIC = × LIQUID = +
IN SITU VANE (kPa) = ✱

OTHER TESTS
Corrected Shear Vane Result **
U = peak / R = remoulded
SPT / Scala Penetrometer

DEPTH (m)	SOIL SYMBOL	GEOLOGIC UNIT	GROUND WATER	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	20 / 40 / 60	50 / 100 / 150	OTHER TESTS
		WAITEMATA GROUP SOIL									7/10/15 N = 25
					S4	SPT	100	25		●	
10.95											
11.00											

Dark brown horizon, common sand patches, slightly plastic.

End of Borehole at 10.95 m

Remarks:

** IN HOUSE METHOD BASED ON BS1377

EXPLANATION OF TERMS AND SYMBOLS

These pages present an explanation of the terms and symbols used on the log sheets entitled "Summary of Soil Profile and Testing". The materials, boundaries and conditions have been interpreted at the test hole locations only and could differ elsewhere on the site.

1. DEPTH / ELEVATION

This column refers to the depth below the ground surface existing at the time of drilling. The corresponding elevations are shown with respect to the datum noted where survey information is available.

2. SOIL AND ROCK SYMBOL

This column contains the standard soil and rock symbols used by Babbage for the materials encountered in the boreholes as shown below:

Fill	Clay	Boulders
Asphalt	Silt	Sandstone
Concrete	Sand	Siltstone
Topsoil	*Gravel*	*Volcanic Rock*
Peat or Organic Soil	Cobbles	Uncertain Material

3. SOIL AND ROCK DESCRIPTION

The terms used to describe the soils and rocks are generally in accordance with the NZ Geomechanics Society's "***Guidelines for the Field Description of Soils and Rocks in Engineering Use***", Nov. 1988 and the NZ Geotechnical Society's "***Guidelines for the Classification and Field Description of Soils and Rocks for Engineering Purposes***" Feb 2003 (draft for comment).

The **soils** are generally described in the following order:

Major soil type, minor soil type/s, consistency (for cohesive soils) or density (for cohesionless soils), plasticity, structure and/or particle shapes, colour, moisture condition, minor inclusions, other significant aspects (e.g. geological description).

Where rock is encountered, the **rock material** and the **rock mass** are described in the following order:

Major rock type, texture and fabric, strength, weathering, colour, discontinuity type, discontinuity spacing, discontinuity orientation, discontinuity opening, discontinuity roughness, geological description (if this can be determined).

Where no field or laboratory tests are carried out, the soils and rock descriptions are based on handling and visual assessment of the recovered samples. **Any design based on such descriptions should allow for the generic nature of the descriptions.**

4. GEOLOGIC UNIT

This column divides the soil and/or rock encountered in the borehole into units that have been formally described and published by geologists (determined from geological maps), or informal units describing what general categories the materials belong to eg. fill, weathered rock, alluvium, etc.

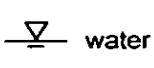
EXPLANATION OF TERMS AND SYMBOLS

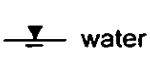
5. PIEZOMETER

This column graphically displays what happens to the hole on completion of drilling – ie. whether the hole is backfilled, left open with a plug, or if a piezometer/standpipe is installed. Details of the installation are given in the "Remarks" section at the bottom of the log.

6. GROUNDWATER

The groundwater level, or the depth at which free water was observed in the borehole, or any seepage observed in the borehole, are denoted by the symbols given below.

 water level at time of drilling

 water level at a later date

observed seepage

The level is the water level in an open hole unless otherwise indicated.

N in the column indicates the water level could not be recorded due to drilling water/mud, rain or hole caving.
NR in this column indicates that no record of the groundwater level was taken.
D in this column indicates that the hole was dry.
F in this column indicates when free water in the hole was first noticed.

7. SOIL SAMPLES

Condition

This column indicates the depth, length and condition of each sample taken. The following symbols are used to represent the condition of the samples.

undisturbed

disturbedremoulde

sample / solid nose SPT test

standard penetration

no recovery

rock core

Type (and sample number)

The type of sample and its sequential number is indicated in this column as follows:

A	auger sample	**P**	piston tube sample
B	block or bulk sample	**S**	standard penetration test (SPT) sample
D	disturbed sample (eg. open barrel core)	**T**	thin-walled tube sample
J	jar sample	**W**	wash or air return sample
GW	ground water sample	**O**	other (see text)

Disturbed soils samples are transported and stored in plastic bags. Machine borehole disturbed samples are transported and stored in core boxes. Tube samples are sealed with plastic bags in the field and with wax on return to the laboratory.

Method

This refers to the particular drilling/sampling technique:

HA	hand auger	**TU**	push-tube
HD	hand dug	**SSA**	solid stem machine auger
HSA	hollow stem machine auger	**SPT**	standard penetration test
EX	hydraulic excavator	**SP**	scala penetrometer
OB	open barrel	**TT**	triple tube
PP	pneumatic percussion	**WD**	wash drill

Recovery

This column gives the sample recovery as a percentage of the sampled length for open barrel and triple tube core runs, and also split spoon SPT tests. If nothing is shown, the sample recovery was not measured.

8. TEST RESULTS

Penetration Resistance

The Penetration Resistance is the number of blows required to drive either a 50mm (outside diameter) open end "spilt spoon" or "Raymond" sampler the final 300mm of a 450mm penetration using a 64kg weight falling 760mm. The number of blows required to drive the sampler the final 300mm is referred to as the **"N" value**. The test is referred to as the **Standard Penetration Test or SPT**. The number of blows for each 150mm penetration of the test, or part-penetration when driving is terminated due to hard ground, are given in the "Other Tests" column, e.g. 15, 36, 46 for 55mm would indicate 15 blows for the first 150mm, 36 blows for the second 150mm and 46 blows for a further 55mm penetration and a N value of greater than 50 would be reported.

In some cases a solid steel 60° cone is used for this test (a **solid nose Standard Penetration Test**). For these cases the penetration resistance is reported as an **"S" value** is reported in this column.

Water Content and Atterberg Limits

The moisture or water content, plastic limit and liquid limit of the recovered soil sample, as determined in the laboratory in accordance with the test procedures set out in NZS4402, is plotted against depth. The abbreviations and graphic symbols are defined as follows:

•	w	natural moisture content
×	w_P	plastic limit
+	w_L	liquid limit

Other Tests

The following abbreviations are used to indicate the type of test undertaken:

COM	Compaction Test	pp	Pocket penetrometer strength
*CON	Consolidation test	*Q	Consolidated undrained triaxial test
G	Specific gravity or solid density of particles	qu	Unconfined compressive strength
k	Permeability coefficient	*SB	Shear box test
LS	Linear shrinkage	SP	Scala penetrometer
OC	Organic content	*ST	Swelling test
*PSD	Particle size distribution	SV	Vane shear strength: (U) – undisturbed (R) – remoulded

*These tests are usually summarised separately.

9. REMARKS

Any additional observations or relevant information such as weather conditions, piezometer design, daily drilling progress, survey co-ordinates of the borehole, problems encountered during drilling, etc.

Appendix C

Laboratory Testing

Babbage Geotechnical Laboratory
109 Fanshawe Street
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Auckland
Telephone
Fax
Email

P O Box 2027
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64-9-367 4954
64-9-377 0554
wec@babbage.co.nz

Please reply to: W.E. Campton

Babbage Consultants Limited
P O Box 2027
Auckland 1140, New Zealand

Attention: **RUSSELL ALLISON**

Job Number: 42608/GE/L
File:
Checked by: J.F.
JF
28th July 2006

Dear Sir,

Re: ***West Coast Road, Henderson***
SPT Moisture Content Testing
Report No. 42608/GE/L/SPT Moistures

The following table presents the results of moisture content testing on drill rig Standard Penetration Test (SPT) soil samples collected by this laboratory on the 18th, 19th and 25th of July 2006. Test Standards used are as follows:

Moisture Content NZS4402:1986:Test 2.1

Hole No.	Sample No.	Depth (m)	Moisture Content (%)
BH1	S1	4.50 – 4.95	61.8
	S2	7.50 – 7.95	37.4
	S3	9.00 – 9.45	34.6
	S4	10.50 – 10.95	33.4
BH2	S1	4.50 – 4.95	44.0
	S2	8.00 – 8.45	45.9
	S3	9.50 – 9.95	33.3
BH3	S1	1.50 – 1.95	72.8
	S2	3.00 – 3.45	76.4
	S3	4.50 – 4.95	42.6
	S4	6.00 – 6.45	38.1
BH4	S1	2.00 – 2.45	37.2
	S2	3.50 – 3.95	61.8
	S3	5.00 – 5.45	67.5
	S4	7.50 – 7.95	94.1
	S5	10.50 – 10.95	46.1
	S6	12.00 – 12.45	38.8

Thank you for the opportunity to carry out this testing. If you have any queries regarding the content of this report please contact the undersigned at your convenience.

Yours faithfully,

Wayne Campton
Signatory (Laboratory Manager)
Babbage Geotechnical Laboratory

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation. This report may not be reproduced except in full.

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Babbage Consultants Limited
P O Box 2027
Auckland 1140, New Zealand

Job Number: 42608/GE/L
File:
Checked by:
JF
7th August 2006

Attention: **RUSSELL ALLISON**

Dear Sir,

Re: ***West Coast Road***
Plasticity Testing
Report No. 42608/GE/L/AL

The following table presents the results of Atterberg Limits testing on soil push-tube samples collected by this laboratory on the 18th of July 2006. Our instructions were to determine the natural moisture content and plasticity index of these samples. Page two of this report shows where these samples plot on the Casagrande Chart.

Test standards used were:

Moisture Content:	NZS4402:1986:Test 2.1	Plastic Limit:	NZS4402:1986:Test 2.3
Liquid Limit:	NZS4402:1986:Test 2.2	Plasticity Index:	NZS4402:1986:Test 2.4

Sample Number	Depth (m)	Moisture Content (%)	Liquid Limit	Plastic Limit	Plasticity Index
BH1 T1	1.50 – 1.95	39.0	78	25	53
BH1 T2	3.00 – 3.45	60.4	110	30	80
BH2 T2	5.00 – 5.45	42.4	68	22	46

Note: The whole soil was used for these tests and was wet up & dried where required.
The test results relate only to the samples under test due to the sampling procedure.

Thank you for the opportunity to carry out this testing. If you have any queries regarding the content of this report please contact the undersigned at your convenience.

Yours faithfully,

Wayne Campton
Signatory (Laboratory Manager)
Babbage Geotechnical Laboratory

new zealand accredited laboratory

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BABBAGE GEOTECHNICAL LABORATORY

Job No:	42608/GE/L	Report No:	Page 2 of 2
Reg. No:	1503	42608/GE/L/AL	Issue Date: Feb-06
			Rev: 0

PROJECT: WEST COAST ROAD, HENDERSON

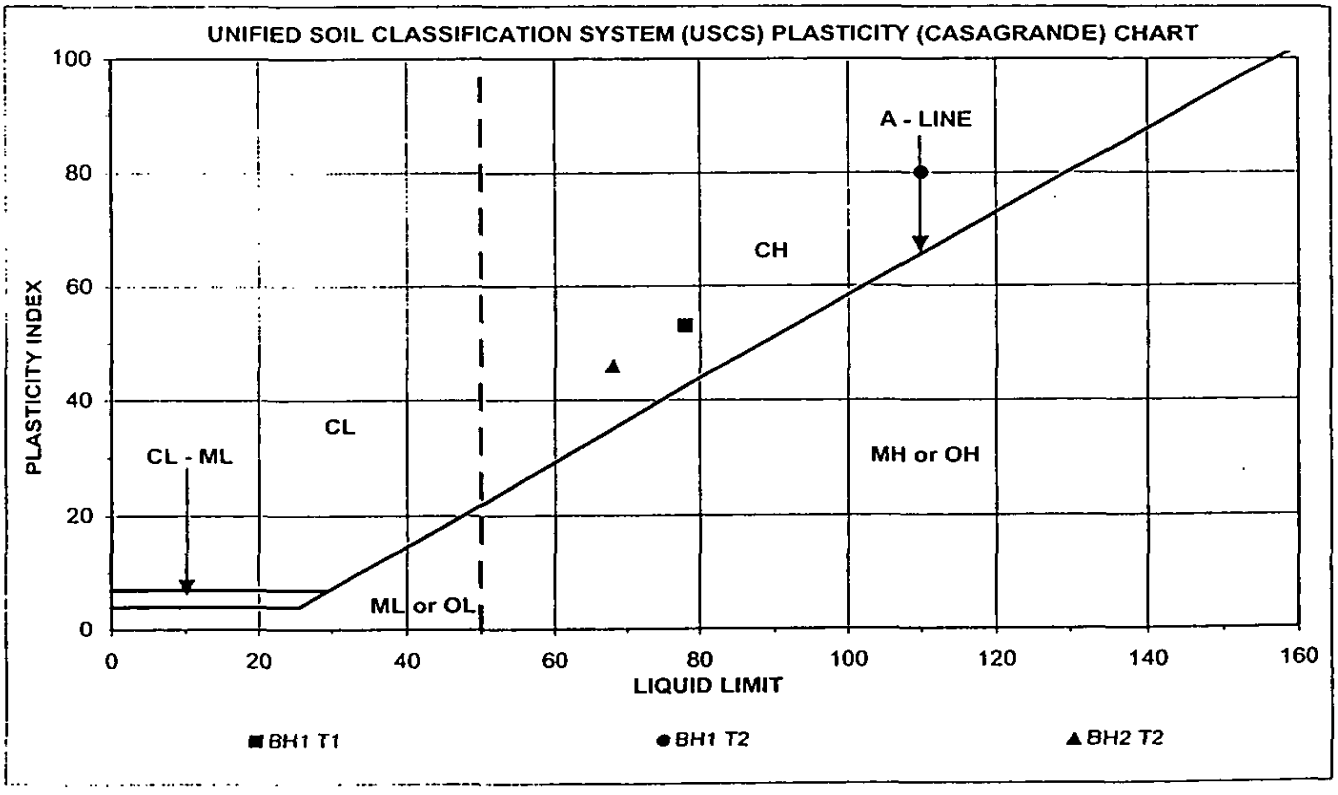
	Initials	Date
Tested By:	JF	4/08/06
Compiled By:	JF	7/08/06
Checked By:	JF	7/08/06

Determination of the Liquid Limit, Plastic Limit, and the Plasticity Index

Test Method: NZS4402: 1986: Test 2.2, Test 2.3 and Test 2.4

SUMMARY OF TESTING

SAMPLE NUMBER	Liquid Limit	Plastic Limit	Plasticity Index	Soil Classification
BH1 T1 / 1.50 - 1.95m	78	25	53	CH
BH1 T2 / 3.00 - 3.45m	110	30	80	CH
BH2 T2 / 5.00 - 5.45m	68	22	46	CH



LEGEND

CL	Clay - low plasticity	CH	Clay - high plasticity
ML	Silt - low liquid limit	MH	Silt - high liquid limit
OL	Organic Soil - low liquid limit	OH	Organic Soil - high liquid limit

NOTE: soil type descriptions are based on recommendations in the NZGS "Field Description of Soils & Rocks" (Draft for comment Feb 2003).

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Attention: **RUSSELL ALLISON**

Job Number: 42608/GE/L

Checked by: JF

23rd August 2006

Dear Sir,

Re: ***West Coast Road***
One Dimensional Consolidation Testing
Report Number: 42608/GE/L/ODC

The following ten pages presents a summary of the results of one dimensional consolidation testing on 75mm and 60mm diameter push-tube samples collected by this laboratory on the 18th of July 2006. These push-tube samples were tested in accordance with the following standards:

Moisture Content:	NZS4402:1986:Test 2.1
One Dimensional Consolidation:	NZS4402:1986:Test 7.1

Samples were extruded from the tube and then trimmed close to final ring diameter using a scalpel blade. The consolidation ring was then pushed over the trimmed soil until the sample protruded from both ends of the ring. A wire was then used to cut the sample from the remaining tube and a flat edge used to trim the soil in the ring.

These test results relate to the samples tested only. The values of Mv shown on the tables have been calculated for each pressure increment, using void ratio difference for that increment.

Sample Descriptions ;

BH1 T1 / 1.50 – 1.95m
CLAY, trace fine sand, trace silt, firm to stiff, highly plastic, light grey with orange & black mottles, very moist, rootlets.

BH1 T2 / 3.00 – 3.45m
CLAY, trace fine sand, trace silt, firm, highly plastic, light grey, very moist.

BH2 T2 / 5.00 – 5.45m
CLAY, minor fine sand, minor silt, very stiff, highly plastic, light grey, slightly moist.

Thank you for the opportunity to carry out this testing. If you have any queries regarding the content of this report please contact the undersigned at your convenience.

Yours faithfully,

Wayne Campton
Signatory (Laboratory Manager)
Babbage Geotechnical Laboratory

new zealand accredited laboratory

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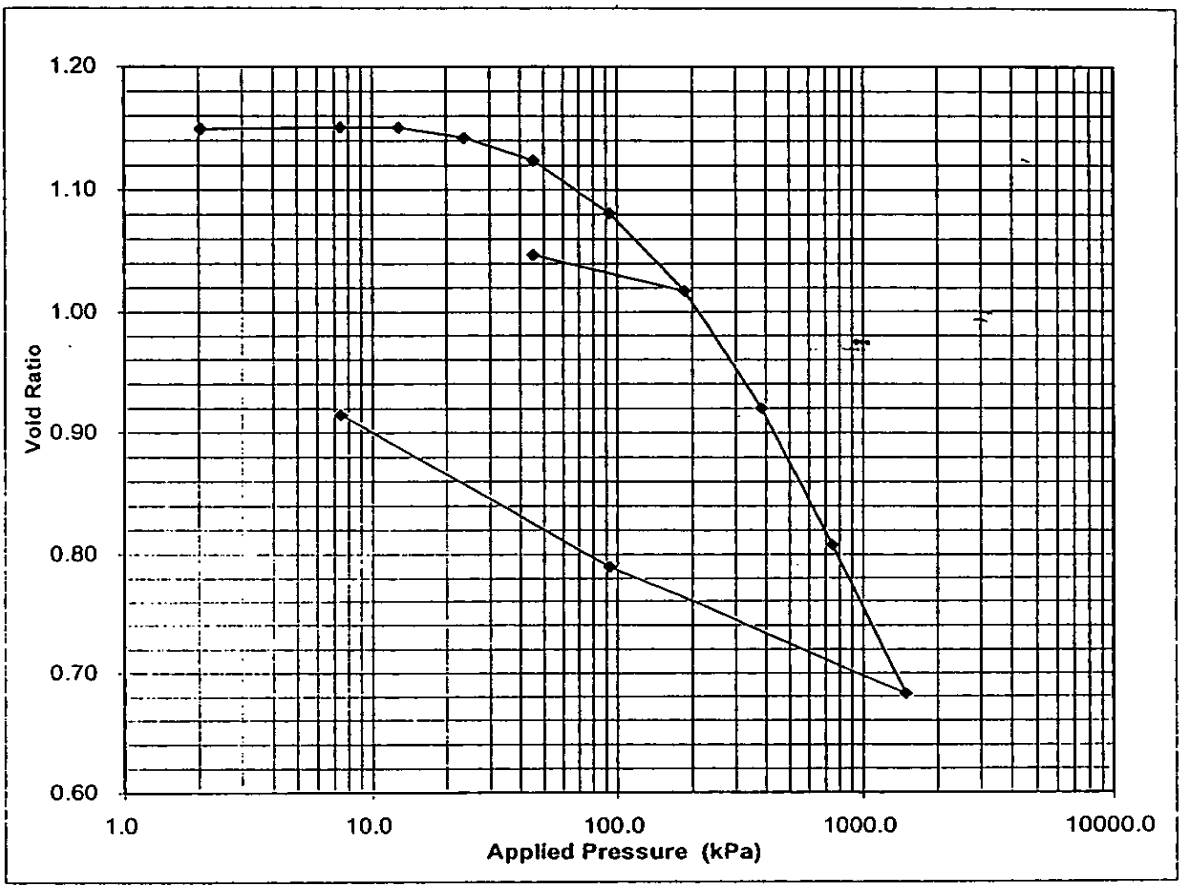
BGL Babbage Geotechnical Laboratory	Job No:	Reg. No:	Sheet	of	Issue Date:	Aug-99
	42608/GE/L	1503	2	10	Rev. No:	4
	PROJECT				Auth. By:	WEC
	WEST COAST ROAD					
					Initials	Date
ONE DIMENSIONAL CONSOLIDATION					Tested By:	JF Jul-06
Test Method: NZS4402:1986:Test 7.1					Compiled By:	JF Jul-06
					Checked By:	WEC 23/08/06

Bore No: BH1 **Sample Number:** T1 **Depth:** 1.5 - 2.0m



Applied Pressure kPa	Void Ratio e	MV m²/MN	Consolidation Coefficient Cv (log t) m²/year	Cv (sqrt t) m²/year
2.0	1.149			
7.5	1.151	-0.127		
12.9	1.151	0.024		
23.7	1.142	0.369	1.9	9.9
45.4	1.124	0.391	1.3	2.7
93.1	1.081	0.421	1.4	3.6
186.3	1.017	0.329	1.1	2.1
45.4	1.047	0.104		
186.3	1.018	0.102		
383.6	0.920	0.245	1.0	1.3
747.7	0.808	0.160	0.9	1.0
1493.5	0.682	0.093	0.8	1.1
93.1	0.790	0.046		
7.5	0.915	0.818		

BGL Babbage Geotechnical Laboratory	Job No: 42608/GE/L	Reg. No: 1503	Sheet of 3 10	Issue Date:	Aug-99
	PROJECT WEST COAST ROAD			Rev. No:	4
				Auth. By:	WEC
				Initials	Date
ONE DIMENSIONAL CONSOLIDATION Test Method: NZS4402:1986:Test 7.1			Tested By:	JF	Jul-06
			Compiled By:	JF	Jul-06
			Checked By:	WEC	23/08/06

RESULT SUMMARY:

Bore Number: BH1 **Sample Number:** T1 **Depth:** 1.5 - 2.0m

Sample History: Undisturbed ~~/ remoulded / compacted / other~~
Specimen from 75mm diameter tube
~~Compacted with ..... compactive effort / other~~

Sample preparation: Extruded from 75mm diameter tube in increments and trimmed around ring. 60mm diameter ring then pushed over sample.

Test details: Consolidation machine number : 2 Ring number : Brass
Area of ring : 2827mm^2
Solid density of soil particles, Ps = 2.65t/m^3 : ~~measured~~/assumed

			INITIAL		FINAL
Mass of dry specimen	Ms (g)		72.50		72.50
Thickness of specimen	H (mm)	Hi	20.800	Hf	16.278
Water content	w (%)	w_i	42.8	w_f	36.5
Dry density $P_d = \frac{M_S}{H \times A}$	t/m^3	Pd_i	1.23	Pd_f	1.58
Height of Soil Particles $H_S = \frac{M_S \times 1000}{P_S \times A}$	mm	Hs	9.677	Hs	9.677
Void Ratio $e = \frac{H - H_S}{H_S}$		e_i	1.149	e_f	0.682
Degree of Saturation $S = \frac{P_S \times w}{e}$	%	Si	98.6	Sf	142

BGL Babbage Geotechnical Laboratory	Job No:	Reg. No:	Sheet of	Issue Date:	Aug-99
	42608/GE/L	1503	4 10	Rev. No:	4
	PROJECT			Auth. By:	WEC
	WEST COAST ROAD				
				Initials	Date
ONE DIMENSIONAL CONSOLIDATION			Tested By:	JF	Jul-06
Test Method: NZS4402:1986:Test 7.1			Compiled By:	JF	Jul-06
			Checked By:	WEC	23/08/06

Bore No: BH1 **Sample Number:** T1 **Depth:** 1.5 - 2.0m

Applied Pressure kPa	Incremental Deflection mm	Thickness of Specimen mm	Comp. Ratio	Height of Voids mm	Void Ratio e	Coefficient of Consolidation (log t) m²/year	Coefficient of Consolidation (sqrt t) m²/year
2.0	0.000	20.800	1.000	11.123	1.149		
7.5	-0.014	20.814	1.001	11.138	1.151		
12.9	0.003	20.812	1.001	11.135	1.151		
23.7	0.083	20.728	0.997	11.052	1.142	1.94	9.93
45.4	0.176	20.553	0.988	10.876	1.124	1.35	2.70
93.1	0.412	20.140	0.968	10.464	1.081	1.37	3.62
186.3	0.618	19.523	0.939	9.846	1.017	1.05	2.13
45.4	-0.286	19.809	0.952	10.132	1.047		
186.3	0.286	19.523	0.939	9.846	1.018		
383.6	0.944	18.579	0.893	8.903	0.920	0.99	1.33
747.7	1.084	17.495	0.841	7.818	0.808	0.88	1.00
1493.5	1.217	16.278	0.783	6.602	0.682	0.78	1.08
93.1	-1.040	17.318	0.833	7.641	0.790		
7.5	-1.213	18.531	0.891	8.854	0.915		

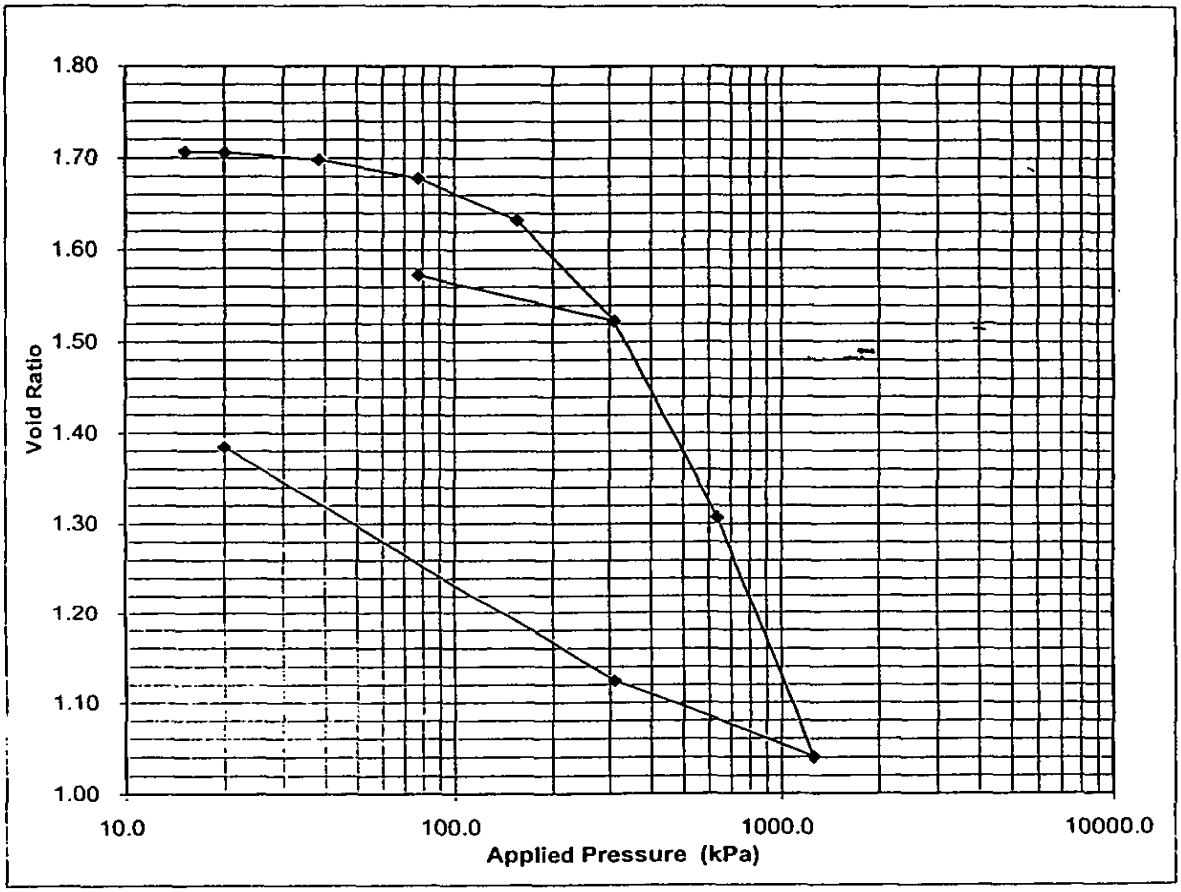
Overburden Pressure	P_o	kpa
Pressure P_i	$P_o + 100$	kPa
Thickness at P_o	H_o	mm
Thickness at P_i	H_i	mm
Voids Ratio at P_o	e_o	
Voids Ratio at P_i	e_i	

Coefficient of Compressibility M_v m^2/MN

$$\frac{(e_o - e_i)}{(1+e_o)(P_i - P_o)} * 1000$$

Job No:	Reg. No:	Sheet	of	Issue Date:	Aug-99
42608/GE/L	1503	5	10	Rev. No:	4
PROJECT				Auth. By:	WEC
WEST COAST ROAD					
				Initials	Date
ONE DIMENSIONAL CONSOLIDATION			Tested By:	JF	Jul-06
Test Method: NZS4402:1986:Test 7.1			Compiled By:	JF	Jul-06
			Checked By:	WEC	23/08/06

Bore No: BH1 **Sample Number:** T2 **Depth:** 3.0-3.5m



Applied Pressure kPa	Void Ratio e	MV m²/MN	Consolidation Coefficient Cv (log t) m²/year	Cv (sqrt(t)) m²/year
15.1	1.707			
20.0	1.706	0.060		
38.4	1.698	0.156	3.6	6.4
77.3	1.678	0.190	2.7	4.4
154.9	1.632	0.221	2.9	3.5
310.2	1.523	0.267	1.3	1.6
77.3	1.573	0.084		
310.2	1.523	0.083		
636.4	1.307	0.263	1.2	1.2
1257.7	1.040	0.186	1.0	1.0
310.2	1.125	0.044		
20.0	1.385	0.422		

BGL Babbage Geotechnical Laboratory	Job No: 42608/GE/L	Reg. No: 1503	Sheet 6 of 10	Issue Date:	Aug-99
	PROJECT: WEST COAST ROAD			Rev. No:	4
				Auth. By:	WEC
				Initials	Date
ONE DIMENSIONAL CONSOLIDATION Test Method: NZS4402:1986:Test 7.1			Tested By:	JF	Jul-06
			Compiled By:	JF	Jul-06
			Checked By:	WEC	23/08/06

RESULT SUMMARY:

Bore Number: BH1 **Sample Number:** T2 **Depth:** 3.0-3.5m

Sample History: Undisturbed ~~/ remoulded / compacted~~ / ~~other~~
Specimen from 75mm diameter tube
~~Compacted with ..... compactive effort / other~~

Sample preparation: Extruded from 75mm diameter tube in increments and trimmed around ring. 63.4mm diameter ring then pushed over sample.

Test details: Consolidation machine number : 7 Ring number : Silver
Area of ring : 3157mm^2
Solid density of soil particles, Ps = 2.65 t/m^3 : ~~measured~~/assumed

			INITIAL		FINAL
Mass of dry specimen	Ms (g)		70.46		70.46
Thickness of specimen	H (mm)	Hi	22.800	Hf	17.186
Water content	w (%)	w_i	68.3	w_f	53.6
Dry density $P_d = \frac{M_S}{H \times A}$	t/m^3	Pd_i	0.98	Pd_f	1.30
Height of Soil Particles $H_S = \frac{M_S \times 1000}{P_S \times A}$	mm	Hs	8.423	Hs	8.423
Void Ratio $e = \frac{H - H_S}{H_S}$		e_i	1.707	e_f	1.040
Degree of Saturation $S = \frac{P_S \times w}{e}$	%	Si	106.0	Sf	137

BGL Babbage Geotechnical Laboratory	Job No: 42608/GE/L	Reg. No: 1503	Sheet 7 of 10	Issue Date:	Aug-99
	PROJECT: WEST COAST ROAD			Rev. No:	4
				Auth. By:	WEC
				Initials	Date
ONE DIMENSIONAL CONSOLIDATION Test Method: NZS4402:1986:Test 7.1			Tested By:	JF	Jul-06
			Compiled By:	JF	Jul-06
			Checked By:	WEC	23/08/06

Bore No: BH1 **Sample Number:** T2 **Depth:** 3.0-3.5m

Applied Pressure kPa	Incremental Deflection mm	Thickness of Specimen mm	Comp. Ratio	Height of Voids mm	Void Ratio e	Coefficient of Consolidation (log t) m^2/year	Coefficient of Consolidation (sqrt t) m^2/year
15.1	0.000	22.800	1.000	14.377	1.707		
20.0	0.007	22.793	1.000	14.371	1.706		
38.4	0.066	22.728	0.997	14.305	1.698	3.55	6.41
77.3	0.167	22.560	0.989	14.138	1.678	2.69	4.42
154.9	0.388	22.172	0.972	13.750	1.632	2.94	3.53
310.2	0.920	21.252	0.932	12.830	1.523	1.28	1.62
77.3	-0.417	21.669	0.950	13.246	1.573		
310.2	0.417	21.252	0.932	12.830	1.523		
636.4	1.820	19.432	0.852	11.010	1.307	1.17	1.15
1257.7	2.246	17.186	0.754	8.763	1.040	0.98	0.96
310.2	-0.711	17.897	0.785	9.475	1.125		
20.0	-2.192	20.089	0.881	11.666	1.385		

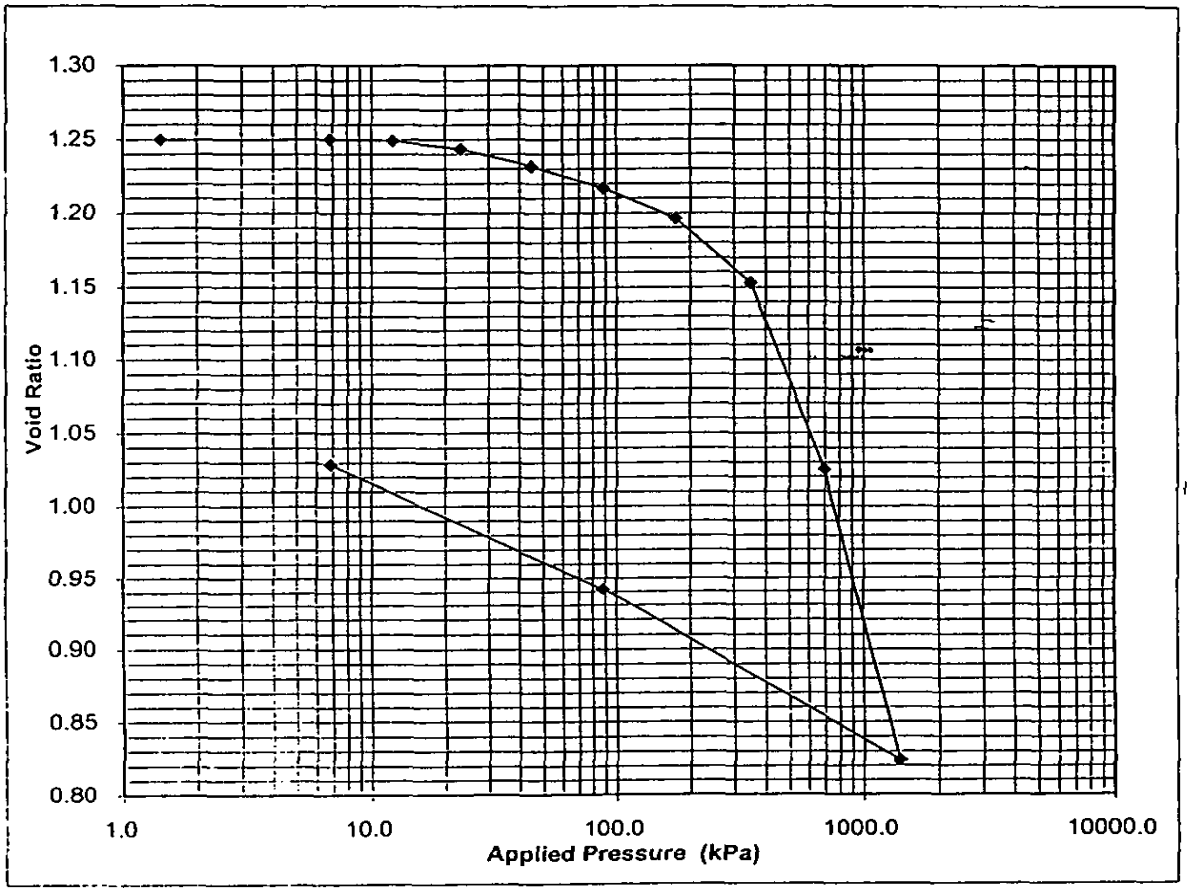
Overburden Pressure	P_o	kpa
Pressure P_i	$P_o + 100$	kPa
Thickness at P_o	H_o	mm
Thickness at P_i	H_i	mm
Voids Ratio at P_o	e_o	
Voids Ratio at P_i	e_i	

Coefficient of Compressibility M_v m^2/MN

$$\frac{(e_o - e_i)}{(1+e_o)(P_i - P_o)} * 1000$$

Job No:	Reg. No:	Sheet	of	Issue Date:	Aug-99
42608/GE/L	1503	8	10	Rev. No:	4
PROJECT				Auth. By:	WEC
WEST COAST ROAD					
				Initials	Date
ONE DIMENSIONAL CONSOLIDATION			Tested By:	JF	Aug-06
Test Method: NZS4402:1986:Test 7.1			Compiled By:	JF	Aug-06
			Checked By:	WEC	23/08/06

Bore No: BH2 **Sample Number:** T2 **Depth:** 5.0 - 5.5m



Applied Pressure kPa	Void Ratio e	MV m²/MN	Consolidation Coefficient Cv (log t) m²/year	Cv (sqrt t) m²/year
1.4	1.250			
6.8	1.250	0.000		
12.3	1.249	0.094	18.1	48.2
23.1	1.244	0.222	18.0	30.8
44.8	1.232	0.246	18.0	30.7
88.1	1.217	0.156	16.0	26.7
174.8	1.196	0.105	17.5	34.4
348.3	1.153	0.114	11.9	20.4
695.1	1.025	0.171	2.5	6.6
1388.8	0.824	0.143	1.1	2.2
88.1	0.942	0.050		
6.8	1.029	0.550		

	Job No:	Reg. No:	Sheet of	Issue Date:	Aug-99
BGL BABBAGE GEOTECHNICAL LABORATORY	42608/GE/L	1503	9 10	Rev. No:	4
	PROJECT			Auth. By:	WEC
	WEST COAST ROAD				
				Initials	Date
ONE DIMENSIONAL CONSOLIDATION			Tested By:	JF	Aug-06
Test Method: NZS4402:1986:Test 7.1			Compiled By:	JF	Aug-06
			Checked By:	WEC	23/08/06

RESULT SUMMARY:

Bore Number: BH2 **Sample Number:** T2 **Depth:** 5.0 - 5.5m

Sample History: Undisturbed ~~/ remoulded / compacted / other~~
Specimen from 60mm diameter tube
~~Compacted with ..... compactive effort / other~~

Sample preparation: *Extruded from 60mm diameter tube directly into ring, ends of sample then trimmed flat with edge of ring using a straight edge.*

Test details: Consolidation machine number : 1 Ring number : Silver
Area of ring : 2827mm^2
Solid density of soil particles, Ps = 2.65t/m^3 : ~~measured~~/assumed

			INITIAL		FINAL
Mass of dry specimen	Ms (g)		83.26		83.26
Thickness of specimen	H (mm)	Hi	25.000	Hf	20.269
Water content	w (%)	w_i	48.1	w_f	41.9
Dry density $P_d = \frac{M_S}{H \times A}$	t/m^3	Pd_i	1.18	Pd_f	1.45
Height of Soil Particles $H_S = \frac{M_S \times 1000}{P_S \times A}$	mm	Hs	11.112	Hs	11.112
Void Ratio $e = \frac{H - H_S}{H_S}$		e_i	1.250	e_f	0.824
Degree of Saturation $S = \frac{P_S \times w}{e}$	%	Si	102.0	Sf	135

BGL Babbage Geotechnical Laboratory	Job No: 42608/GE/L	Reg. No: 1503	Sheet 10 of 10	Issue Date:	Aug-99
	PROJECT: WEST COAST ROAD			Rev. No:	4
				Auth. By:	WEC
				Initials	Date
ONE DIMENSIONAL CONSOLIDATION Test Method: NZS4402:1986:Test 7.1			Tested By:	JF	Aug-06
			Compiled By:	JF	Aug-06
			Checked By:	WEC	23/08/06

Bore No: BH2 **Sample Number:** T2 **Depth:** 5.0 - 5.5m

Applied Pressure kPa	Incremental Deflection mm	Thickness of Specimen mm	Comp. Ratio	Height of Voids mm	Void Ratio e	Coefficient of Consolidation (log t) m^2/year	Coefficient of Consolidation (sqrt t) m^2/year
1.4	0.000	25.000	1.000	13.888	1.250		
6.8	-0.005	25.005	1.000	13.893	1.250		
12.3	0.013	24.993	1.000	13.881	1.249	18.06	48.20
23.1	0.060	24.932	0.997	13.820	1.244	18.04	30.82
44.8	0.133	24.799	0.992	13.687	1.232	17.96	30.67
88.1	0.167	24.632	0.985	13.520	1.217	15.99	26.67
174.8	0.225	24.407	0.976	13.295	1.196	17.53	34.36
348.3	0.484	23.923	0.957	12.811	1.153	11.91	20.41
695.1	1.419	22.504	0.900	11.392	1.025	2.48	6.61
1388.8	2.235	20.269	0.811	9.157	0.824	1.10	2.25
88.1	-1.310	21.579	0.863	10.467	0.942		
6.8	-0.965	22.544	0.902	11.432	1.029		

Overburden Pressure	P_o		kpa
Pressure P_i	$P_o + 100$		kPa
Thickness at P_o	H_o		mm
Thickness at P_i	H_i		mm
Voids Ratio at P_o	e_o		
Voids Ratio at P_i	e_i		

Coefficient of Compressibility M_v m^2/MN

$$\frac{(e_o - e_i)}{(1+e_o)(P_i - P_o)} * 1000$$

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Please reply to: W.E. Campton

Babbage Consultants Limited
P O Box 2027
Auckland 1140, New Zealand

Attention: Russell Allison

Job Number: 42608/GE

Checked by:
WEC
2nd November 2006

Dear Sir,

Re: ***West Coast Road***
Triaxial Testing - Quick Undrained
Report Number 42608/QUT Aug 06 Rev A

The following 2 pages presents the results of Compressive Strength in Undrained Triaxial Compression without Measurement of Pore Water Pressure testing on two tube samples collected by this laboratory on the 18th July 2006. The 60 mmØ tube samples were tested in accordance with the following standard:

BS1377 :1990 :Part 7 Section 8

Each sample was set up in a triaxial cell with a covering membrane (0.4mm thick), and the cell filled with water. Cell pressure was then raised to 100kPa, and tested without confirming saturation or allowing for consolidation.

The loading machine was adjusted and rate of compression set to induce failure at 5 min to 10 min (from triaxial test results). Load versus strain was measured until failure, or until 20% strain.

The table below summarises the test results.

Sample Number	Depth	Dimensions	Bulk Density	Moisture Content	Dry Density	Deviator Stress	Strain %
BH1, T1	1.5m	60mmDx 125mmL	1.72t/m^3	44.9%	1.18t/m^3	54kPa	8.1%
BH2, T1	3.0m	60mmDx111mmL	1.52t/m^3	70.4%	0.90t/m^3	123kPa	3.2%

Yours faithfully,

Wayne Campton
Signatory (Laboratory Manager)
Babbage Geotechnical Laboratory

new zealand accredited laboratory

All tests reported herein have been *performed in accordance with* the laboratory's scope of accreditation. This report may not be reproduced except in full.

BGL BABBAGE GEOTECHNICAL LABORATORY	Job No: 42608	Reg. No: 1503	Report No: 42608/QUT Rev A	Page 2 of 3
				Issue Date: Aug-06

PROJECT: West Coast Road

		Initials	Date
Undrained Shear Strength in Triaxial Compression	**Tested By:**	wec	Jul-06
Without PWP Measurement	**Compiled By:**	comp	Aug-06
Test Method: BS1377:1990:Part 7 Section 8	**Checked By:**	wec	2/11/06

Bore Number: BH1 **Sample Number:** T1 **Depth:** 1.5

Test Performed on: Whole soil / ~~Fraction passing 19mm test sieve~~
Sample History: Undisturbed ~~/ remoulded / recompacted / unknown~~
Sample Method & Type: From core sample ~~/ larger tube / block sample / pressed into tube / compacted with standard/heavy compactive effort~~

Cell Confining Pressure Set at: 100 kPa

Sample Description:

Membrane Thickness	0.4mm
Membrane Correction	1

Determination of Bulk Density:		
Diameter of Specimen:	(mm)	60.00
Initial Area of Specimen:	(mm^2)	2827.43
Initial Length:	(mm)	125.00
Initial Mass:	(g)	609.61
Volume	(mls)	353.43
Bulk Density:	(t/m^3)	1.725
Proving Ring No:		10-13232
Calibration Constant	(N/mm)	1491.75
Rate of Strain:	(%/min)	1.25

Determination of Water Content:		
Container Number:		96
Mass container + wet soil:		187.851
Mass container + dry soil:		146.091
Check container + dry soil		146.091
Mass of container:		53.014
Water Content:	(%)	44.9
Dry Density:	(t/m^3)	1.191

Time	Compression Gauge (mm)	Specimen Compression (mm)	Strain	Load Gauge (mm)	Axial Force (N)	Corrected Area (mm^2)	Measured Deviator Stress
14:01:26	0.334	0.000	0.000	-2.949	0.0	2827.4	0
14:01:57	1.063	0.729	0.006	-2.925	36.7	2844.0	13
14:02:27	1.843	1.509	0.012	-2.897	78.7	2862.0	27
14:02:58	2.624	2.290	0.018	-2.882	100.0	2880.2	35
14:03:28	3.409	3.075	0.025	-2.871	116.6	2898.7	40
14:03:58	4.197	3.863	0.031	-2.869	120.1	2917.6	41
14:04:29	4.979	4.644	0.037	-2.860	133.2	2936.5	45
14:04:59	5.760	5.426	0.043	-2.856	139.3	2955.7	47
14:05:30	6.545	6.210	0.050	-2.851	146.0	2975.3	49
14:06:00	7.334	7.000	0.056	-2.847	153.0	2995.2	51
14:07:31	9.697	9.363	0.075	-2.839	163.8	3056.4	54
14:08:02	10.485	10.150	0.081	-2.835	169.9	3077.3	55
14:08:32	11.263	10.928	0.087	-2.846	153.4	3098.3	50
14:09:02	12.048	11.714	0.094	-2.844	156.8	3119.8	50
14:09:33	12.821	12.487	0.100	-2.859	135.0	3141.2	43

Failure Conditions: **Maximum Deviator Stress** **54** kPa
Cu **27** kPa

Strain at failure: 8.1 % 10.15 *mm*

Mode of Failure: plastic

BGL BABBAGE GEOTECHNICAL LABORATORY	Job No: 42608	Reg. No: 1503	Report No: 42608/QUT Rev A	Page 3 of 3
				Issue Date: Aug-06

PROJECT: [redacted] West Coast Road

		Initials	Date
Undrained Shear Strength in Triaxial Compression	**Tested By:**	wec	Jul-06
Without PWP Measurement	**Compiled By:**	comp	Aug-06
Test Method: BS1377:1990:Part 7 Section 8	**Checked By:**	wec	2/11/06

Bore Number: BH2 **Sample Number:** T1 **Depth:** 3

Test Performed on: Whole soil ~~/ Fraction passing 19mm test sieve~~
Sample History: Undisturbed ~~/ remoulded / recompacted / unknown~~
Sample Method & Type: From core sample ~~/ larger tube / block sample / pressed into tube / compacted with standard/heavy compactive effort~~

Cell Confining Pressure Set at: 100 kPa
Sample Description:

Membrane Thickness	0.4mm
Membrane Correction	0.3

Determination of Bulk Density:		
Diameter of Specimen:	(mm)	60.00
Initial Area of Specimen:	(mm^2)	2827.43
Initial Length:	(mm)	111.50
Initial Mass:	(g)	477.93
Volume	(mls)	315.26
Bulk Density:	(t/m^3)	1.516
Proving Ring No:		10-13232
Calibration Constant	(N/mm)	1491.75
Rate of Strain:	(mm/min)	0.81

Determination of Water Content:		
Container Number:		97
Mass container + wet soil:		152.883
Mass container + dry soil:		111.684
Check container + dry soil		111.684
Mass of container:		53.151
Water Content:	(%)	70.4
Dry Density:	(t/m^3)	0.890

Time	Compression Gauge (mm)	Specimen Compression (mm)	Strain	Load Gauge (mm)	Axial Force (N)	Corrected Area (mm^2)	Measured Deviator Stress
15:32:38	-2.121	0.000	0.000	-2.927	0.0	2827.4	0
15:33:08	-1.674	0.446	0.004	-2.917	14.9	2838.8	5
15:33:38	-1.177	0.944	0.008	-2.907	30.2	2851.6	11
15:34:09	-0.710	1.410	0.013	-2.890	56.0	2863.7	20
15:34:39	-0.339	1.781	0.016	-2.794	198.6	2873.3	69
15:35:10	0.079	2.200	0.020	-2.738	283.2	2884.3	98
15:35:40	0.525	2.646	0.024	-2.706	330.6	2896.2	114
15:36:10	1.004	3.125	0.028	-2.692	351.7	2909.0	121
15:36:41	1.486	3.607	0.032	-2.685	361.5	2921.9	124
15:37:11	1.975	4.096	0.037	-2.687	359.3	2935.3	122
15:37:42	2.472	4.593	0.041	-2.694	347.5	2948.9	118
15:38:12	2.971	5.091	0.046	-2.703	334.1	2962.7	113
15:38:43	3.330	5.451	0.049	-2.761	248.9	2972.8	84

Failure Conditions: **Maximum Deviator Stress** **123** kPa
Cu **62** kPa

Strain at failure: 3.2 %
3.61 mm

Mode of Failure: planar

Appendix D

Slope Stability Analysis

	Gamma kN/m3	C kPa	Phi deg	Piezo Surf.	Ru
CLAY Stiff	18	5	30	1	0
CLAY Soft/Firm	18	2	27	1	0
CLAY Very Stiff	20	7	32	1	0

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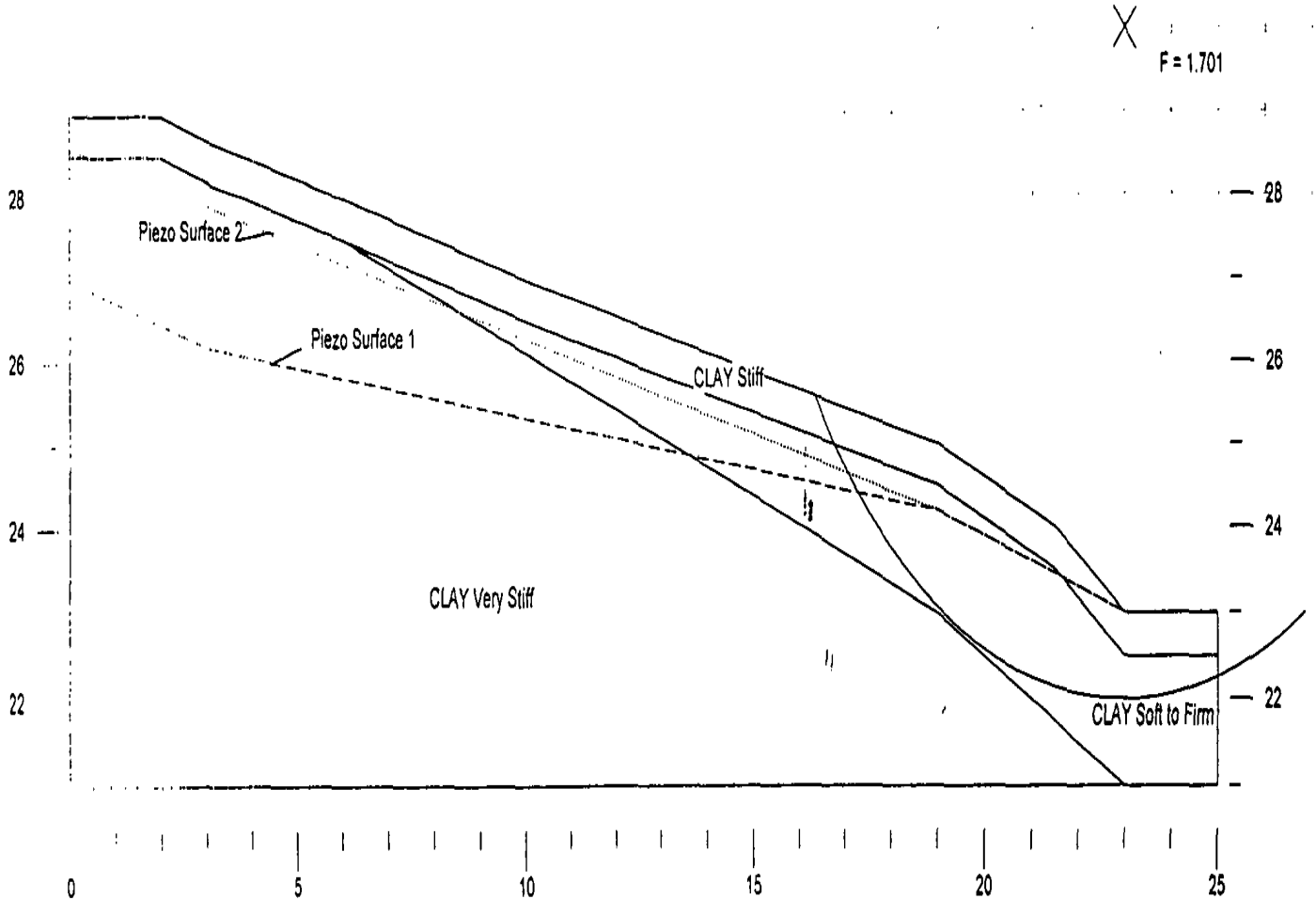
AA



	Gamma	C	Phi	Piezo	Ru
	kN/m3	kPa	deg	Surf.	
CLAY Stiff	18	5	30	2	0
CLAY Soft/Firm	18	2	27	2	0
CLAY Very Stiff	20	7	32	2	0

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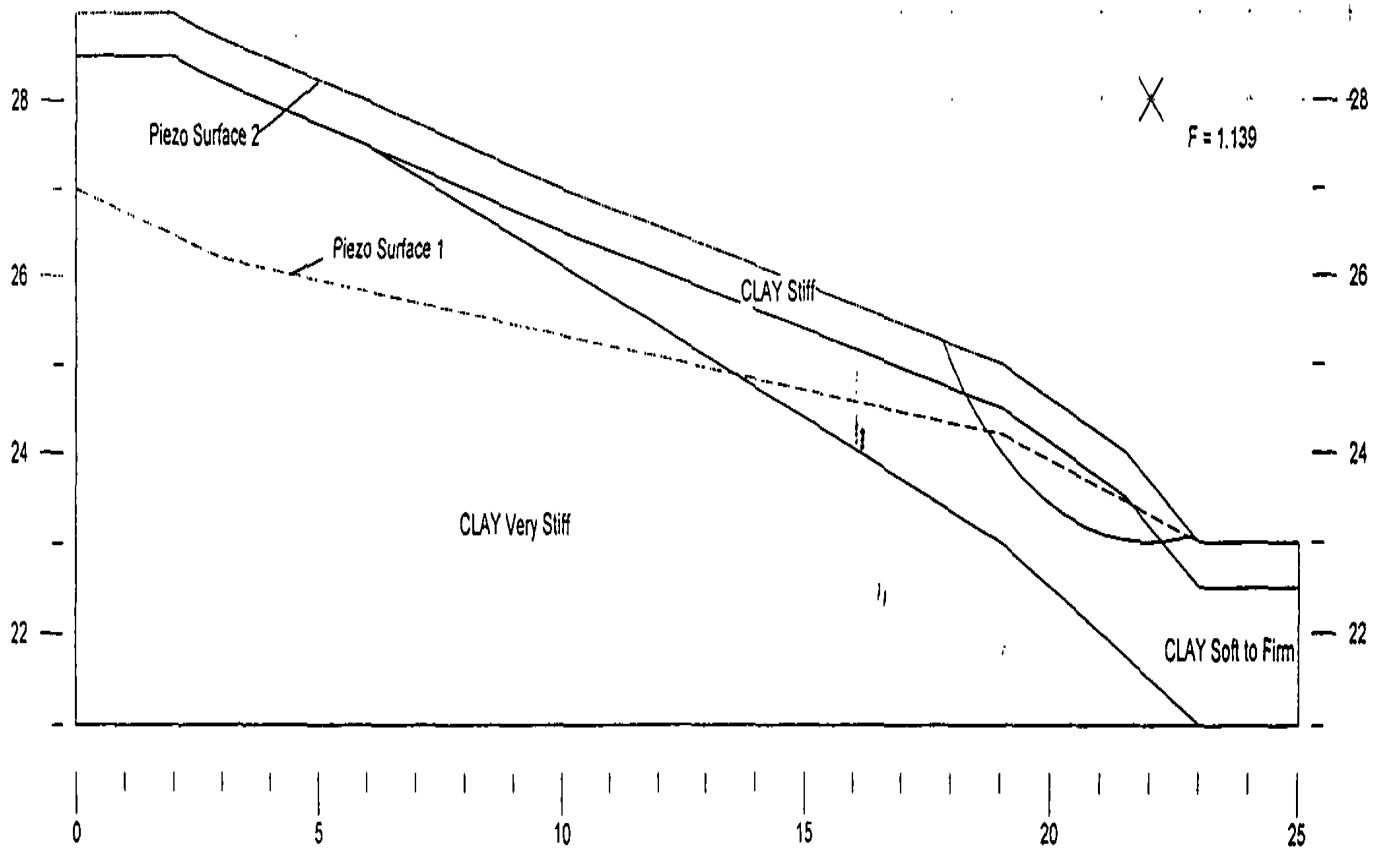
West Coast Road
7th November 2006
AA



	Gamma	C	Phi	Piezo	Ru
	kN/m3	kPa	deg	Surf.	
Fill	17	5	30	0	0
CLAY Stiff	18	5	30	0	0
CLAY Firm	18	2	27	0	0
CLAY Stiff	18	5	30	0	0

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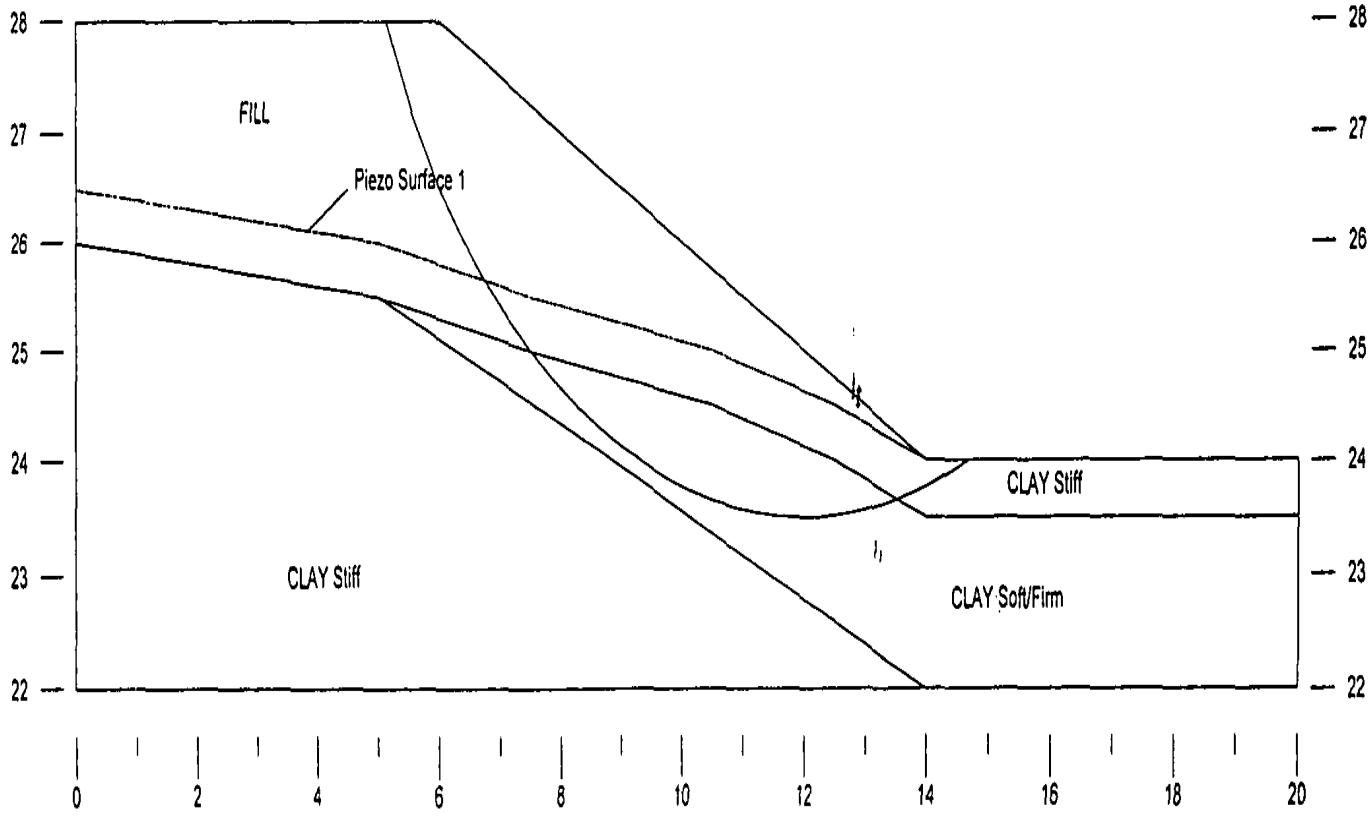

	Gamma kN/m3	C kPa	Phi deg	Piezo Surf.	Ru
Fill	17	5	30	1	0
CLAY Stiff	18	5	30	1	0
CLAY Firm	18	2	27	1	0
CLAY Stiff	18	5	30	1	0

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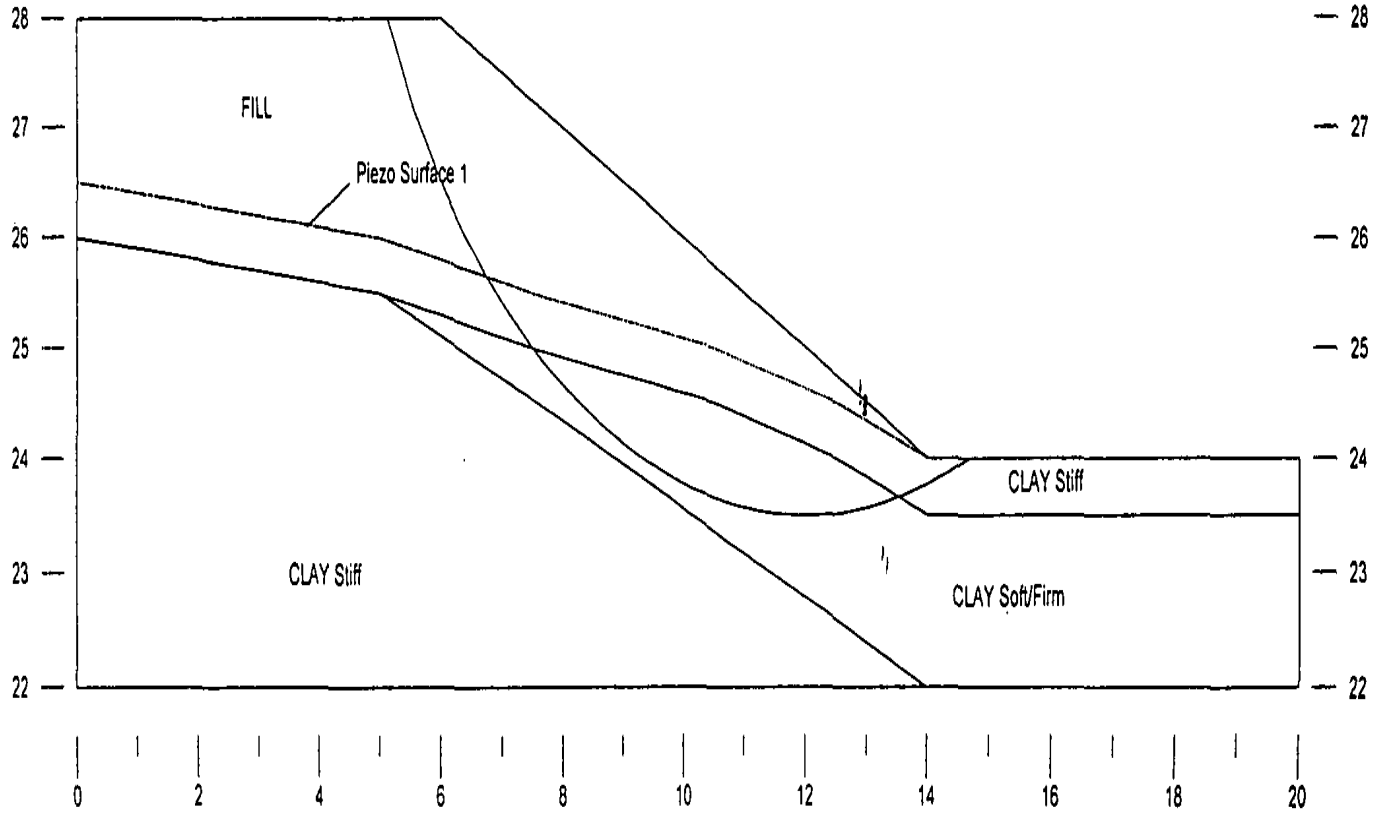

ENGINEERS CALCULATIONS

- SPECIFIC DESIGN ON THE MASONRY FIREWALLS

- SPECIFIC DESIGN & PS1 FOR FLOOR SLABS

All generally used loadings are given below, refer to calculations for any specific cases.

Sig. NP Date. 8.8.2007

Job Name. Design Calculations for New Zealand Housing @ West Coast Rd West Auckland

No geotechnical assessment has been carried out on this site to support the *assumed soil propoperties used in these calculations.*

Liability will not be accepted should soils properties differ from those used in design.

Soil Data.

$q_{working} = CN_c/F = 50*6/3 = 100kPa$

$q_{ultimate} = \Phi CN_c = 0.5*50*6 = 150kPa$

Shaft Adhesion = 25kPa (NZBC)

Roofing.

Concrete Tiles. (Terracotta)	[illegible]	kPa
Galvanised Steel.	[illegible]	kPa

Walls.

Framing	Stud Centres.		
	300	400	600
100 x 50	[illegible]	[illegible]	[illegible]
150 x 50	[illegible]	[illegible]	[illegible]
	kPa	kPa	kPa

Lining.	Sheet Thickness.			
	9.5mm	12.5mm	16mm	19mm
Gib.	[illegible]	[illegible]	[illegible]	[illegible]
Fyreline.	[illegible]	[illegible]	[illegible]	[illegible]
Braceline.	[illegible]	[illegible]	[illegible]	[illegible]
	kPa	kPa	kPa	kPa

Gypsum. (two coat / 12mm)	[illegible]	kPa
Glazing.	[illegible]	kPa

Flooring /10mm.

Ceramic Tiles	[illegible]	kPa
Terazzo Paving.	[illegible]	kPa
PVC Tiles.	[illegible]	kPa
Cork.	[illegible]	kPa

Framing	Joist Centres. (with nogs)		
	300	400	600
150 x 50	[illegible]	[illegible]	[illegible]
200 x 50	[illegible]	[illegible]	[illegible]
250 x 50	[illegible]	[illegible]	[illegible]
300 x 50	[illegible]	[illegible]	[illegible]
	kPa	kPa	kPa

Ceiling /10mm.

Acoustic Tiles.	[illegible]	kPa
Portland Cement Plaster.	[illegible]	kPa

Boarding.

Board Type.	Sheet Thickness.				
	7.5mm	9mm	12mm	15mm	18mm
Softboard.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Hardboard.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Fibreboard.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Plasterboard.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Hardboard.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Chipboard.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Plywood.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Weatherboard.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	kPa	kPa	kPa	kPa	kPa

Others.

Brick Work 90mm	[illegible]	kPa	
Concrete 100mm	[illegible]	kPa	
125mm	[illegible]	kPa	
150mm	[illegible]	kPa	
200 Series Block.	[illegible]	kPa	Solid
	[illegible]	kPa	Partial
150 Series Block.	[illegible]	kPa	Solid
	[illegible]	kPa	Partial
Timber Wet	[illegible]	kNm^{-3}	
12% M/C	[illegible]	kNm^{-3}	

Standard Design Weights.

Walls	(Weatherboarded)	[illegible]	kPa
	(Plastered)	[illegible]	kPa
Roofs	(Conc Tiled)	[illegible]	kPa
	(Sheet Profile)	[illegible]	kPa
	(Live)	[illegible]	kPa
Flooring	(Dead)	[illegible]	kPa
	(Live)	[illegible]	kPa
Decking	(Dead)	[illegible]	kPa
	(Live)	[illegible]	kPa

Seismic Loading.

$C = C_0(t,\mu)S_pRZL_s$

$C_s = 0.35*0.67*1.0*0.6*1.0$ = [illegible] *(Intermediate Soils / Auckland / Braced Frame)*

$C_s = 0.69*0.67*1.0*0.6*1.0$ = [illegible] *(Intermediate Soils / Auckland / Reinf. Masonry)*

Wind Loading.

$q(z)_u = 0.6*(V*M_{lu}*M_{(z,cat)}*M_s*M_t*M_y)^2*0.001$

$q(z)_u = 0.6*(45*0.93*0.85*1.0*1.0*1.0)^2*0.001$ = [illegible] *(Terrain #2 / Auckland / <3m)*

$q(z)_u = 0.6*(45*0.93*0.91*1.0*1.0*1.0)^2*0.001$ = [illegible] *(Terrain #2 / Auckland / 3-5m)*

$q(z)_u = 0.6*(45*0.93*0.75*1.0*1.0*1.0)^2*0.001$ = [illegible] *(Terrain #3 / Auckland / <5m)*

Design Codes.

NZS4203:1992	LOADINGS
NZS3101:1995	CONCRETE
NZS3404:1997	STEEL
NZS3603:1993	TIMBER
NZS4230:1990	MASONRY

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Nick C. Covich - Associate B.E. (Hons), M.Z.C.E., M.I.P.E.N.Z., CP Eng.
Naresh M. Panchia - Associate M.E., M.I.P.E.N.Z., CP Eng.

Sig. J Pilny Date. 8/8/2007

Job Name: Gold Smith Development

Design Calculations for New Zealand Housing Foundation, Gold Smith Developments

Design Boundary Block wall

consider wind + EQ lateral forces.

category 2 wind zone - developing subdivision. $M_t = 1.0$

$V_{sit,\beta} = 45 \times 1.0 \times 0.96 \times 1.0 \times 1.0$
$= 43.2 m/s$

$P = 43.2^2 \times 0.5 \times 1.2$
$= 1.12 kPa$

$W_u = 1.12 \times 0.6$ (600mm strip)
$= 0.67 kN/m$

$M^*_w = 3.0 kNm$

Earthquake actions

Assume shallow soil $T = 0.4s$ $C_h(t) = 2.36$
Glen Eden $Z = 0.13$
$N = 1.0$
$R_u = 1.0$

$\therefore C(t) = 2.36 \times 0.13$
$= 0.31$

Partially grouted block wall, $\mu = 1.25$

$S_p = 1.3 - 0.3 \times 1.25$
$= 0.925$

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Sig. _____ Date. _____

Job Name: _____

Soil Class C

$k_m = \frac{(1.25-1)\times 0.4}{0.7} + 1 = 1.14$

$C_d(T_1) = \frac{0.31 \times 0.925}{1.14} = 0.25$

$W_c = 0.25 \times 0.6 \times 2.45$ 600mm strip
$= 0.37\ kN/m$

$M_c^* = 1.7\ kNm$

Wind Governs, $M^* = 3.0\ kNm$

try D12's @ 600mm c/c

$d = 190/2 = 95mm$

$T = A_s f_y = \pi \times 12^2/4 \times 300 = 33.9\ kNm$

$b_w = 200m$

$a = \frac{33.9 \times 10^3}{0.85 \times 8 \times 10^3 \times 0.19} = 26mm$

$jd = d - a/2 = 95 - 13 = 82\ mm$

$\phi M_n = \phi T jd = 33.9 \times 82 \times 0.85 = 2.4\ kNm$ NG.

try D16 bars @ 600mm c/c

$T = 60.3kN$ $a = 46mm$

$jd = 72mm$ $\phi M_n = 0.85 \times 60.3 \times 72 = 3.7\ kNm > M^* = 3.0$

Use D16 bars @ 600mm c/c

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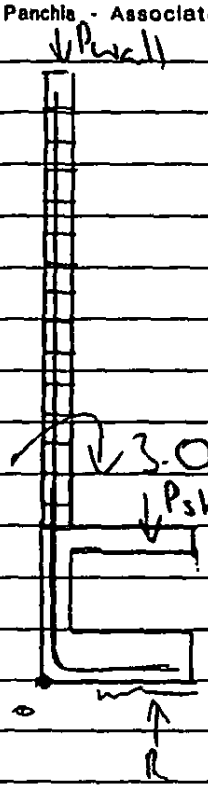
Job Name: _____



Case 1

$R = \Sigma P$ $\quad P_{wall} = 2.45 \times 0.6 \times 3$

$= 4.41 kN$

$P_{slab} = 24 \times (2 \times 0.2)$

$= 9.6 kN/m$

$R = 14.0 kN$

$\Sigma M_o = 4.41 \times 0.19/2 + 9.6 \times 0.8^2/2 - 14x = 0$

$x = 0.25$

$M_R = 14 \times 0.25$

$= 3.5 kNm$

$3.5 kNm > 3.0 kNm$ OK for overturning.

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Sig. _____ Date. _____

Job Name: _____

Design Beam ① span = 5.9m

$W_{G(ROOF)} = 0.4^{\#} \times 2 \quad 0.8\,kN/m$

$W_{G(WALL)} = 0.4^{\#} \times 2.4 \quad 1.0\,kN/m$

$W_{G(FLOOR)} = 0.4^{\#} \times 3.1/2 = 0.62\,kN/m$

$W_{G(ROOF2)} = 0.4^{\#} \times 2.7/2 = 0.54\,kN/m$

$W_{G(TOT)} = 3.0\,kN/m$

$W_{Q(FLOOR)} = 1.5^{\#} \times 3.1/2 = 2.3\,kN/m$

$W_{Q(ROOFS)} = 0.25^{\#} \times (3/2 + 2.7/2) = 0.7\,kN/m$

$W_{Q(FLOOR)}$ critical case for live loads

$\therefore W_Q = 2.3\,kN/m$

$1.2G + 1.5Q$

$= 7.1\,kN/m$

$M^* = 30.9\,kNm$

try 250 PFC $\phi M_n = 114\,kNm > M^*$ OK.

$\delta(G+Q_s) = \dfrac{5 \times 4610 \times 5.9^4}{384 \times 200 \times 10^9 \times 45.1 \times 10^{-6}} = 8.1\,mm$ OK for deflection

Use 250 PFC for Beam ①

Design Beam 2 span = 4.7m

$W_{G(WALL)} = 0.4^{\#} \times 2.8 = 1.1\,kN/m$

$W_{G(ROOF)} = 0.4^{\#} \times 0.45 = 0.2\,kN/m$

$W_{G(FLOOR)} = 0.4^{\#} \times 0.45/2 = 0.1\,kN/m$

$W_{G(TOT)} = 1.4\,kN/m$

$W_{Q(ROOF)} = 0.25^{\#} \times 0.45 = 0.1\,kN/m$

$W_{Q(FLOOR)} = 1.5^{\#} \times 0.45/2 = 0.4\,kN/m$ (critical)

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Naresh M. Panchia - Associate M.E., M.I.P.E.N.Z., CP Eng.

Sig. _____ Date. _____

Job Name: _____

$P_G = 2.72 \times 5.9/2 = 8.0kN$

$P_Q = 2.3 \times 5.9/2 = 6.8kN$

$M^+ = 1.2 \times (1.4 \times 4.7^2/8 + 8 \times 4.7/4) + 1.5 \times (0.4 \times 4.7^2/8 + 6.8 \times 4.7/4)$

$= 29.6kNm$

try 250 PFC

$\phi M_n = 114kNm > M^+$ OK

$\Delta(G+Q_s) = \frac{5 \times 1680 \times 4.7^4}{384 \times 200 \times 10^3 \times 45.1 \times 10^6} + \frac{12760 \times 4.7^3}{48 \times 200 \times 10^3 \times 45.1 \times 10^6}$

$= 1.2 + 3.1$

$= 4.3mm$ OK

try smaller section

230 PFC

$\phi M_n = 73.3kNm > M^+$ OK

$\Delta(G+Q_s) = 1.2 \times \frac{45.1}{26.4} + 3.1 \times \frac{45.1}{26.4}$

$= 2.0 + 5.2$

$= 7.2mm$ OK for deflection.

Use 230 PFC for Beam 2

■ GRAFTON:
Ground Floor, 2 Kari Street, Auckland. PO Box 65-248, Mairangi Bay
Ph: 09-307 2141 Fax: 09-307 2143 email: grafton@mvengineers.com

■ PAPAKURA:
2nd Floor, 37 Elliott Street, PO Box 72-799, Papakura
Ph: 09-298 8800 Fax: 09-298 9920 email: papakura@mvengineers.

CONSULTING ENGINEERS LTD

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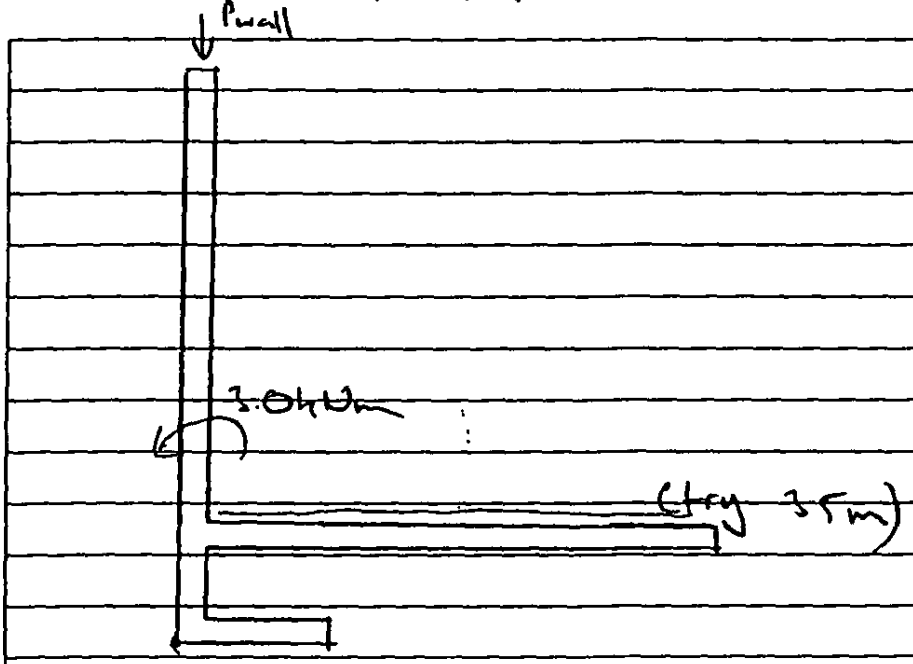
Sig. _____ Date. _____

Job Name: _____



$W_{slab} = 24 \times 0.2 \times 1.0$
$= 4.8 kN/m$

$P_{wall} = 4.4 kN$ $R = 4.8 \times 3.5 + 4.4 = 21.2 kN$

$\Sigma M_o = 4.4 \times 0.1 + 4.8 \times 3.5^2/2 - 21.2 \times x = 0$
$x = 1.41$

$M_R = 21.2 \times 1.41$
$= 29.9 kN > 3.0 kNm$ OK.

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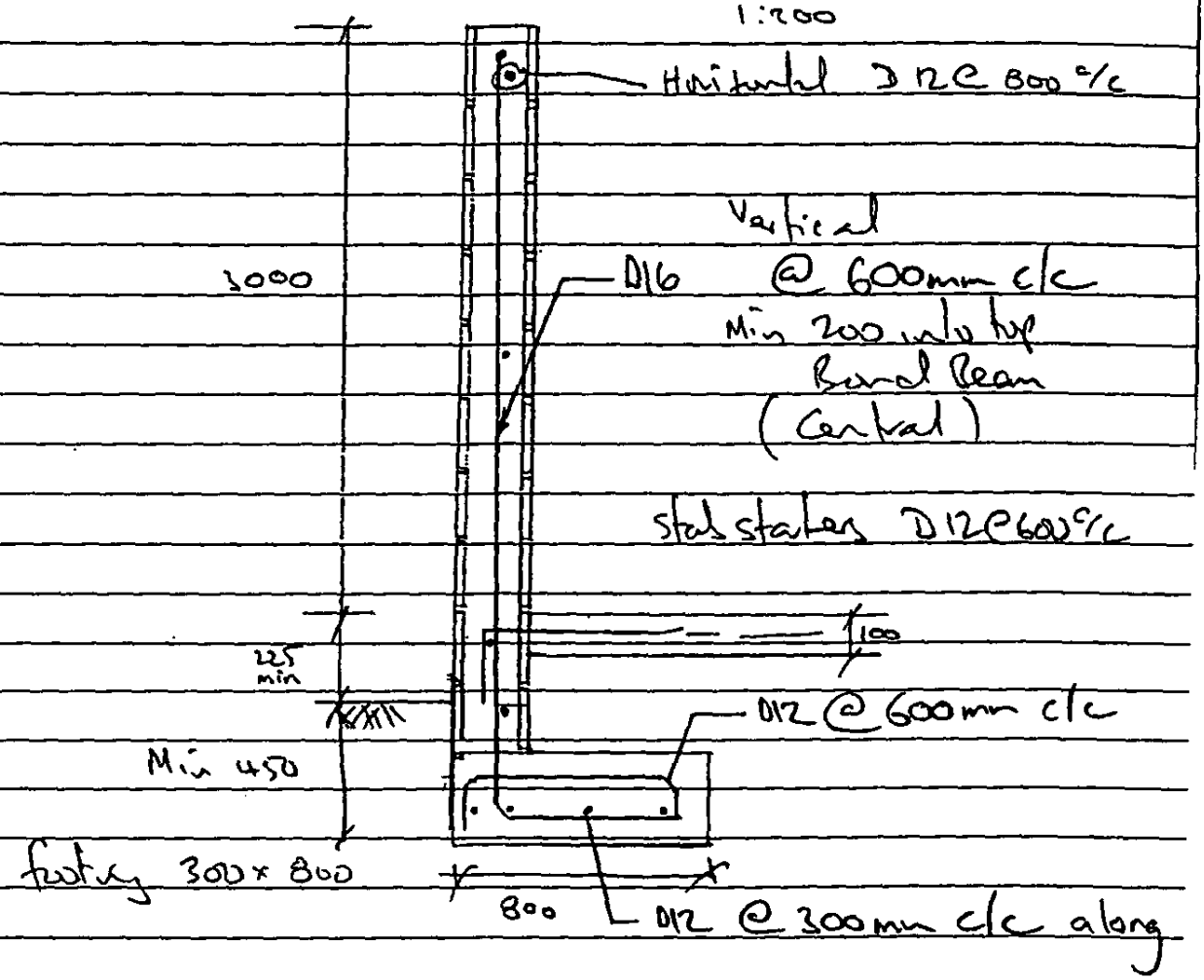
Naresh M. Panchia - Associate M.E., M.I.P.E.N.Z., CP Eng.

Sig. _____ Date. _____

Job Name: _____

Firewall Section



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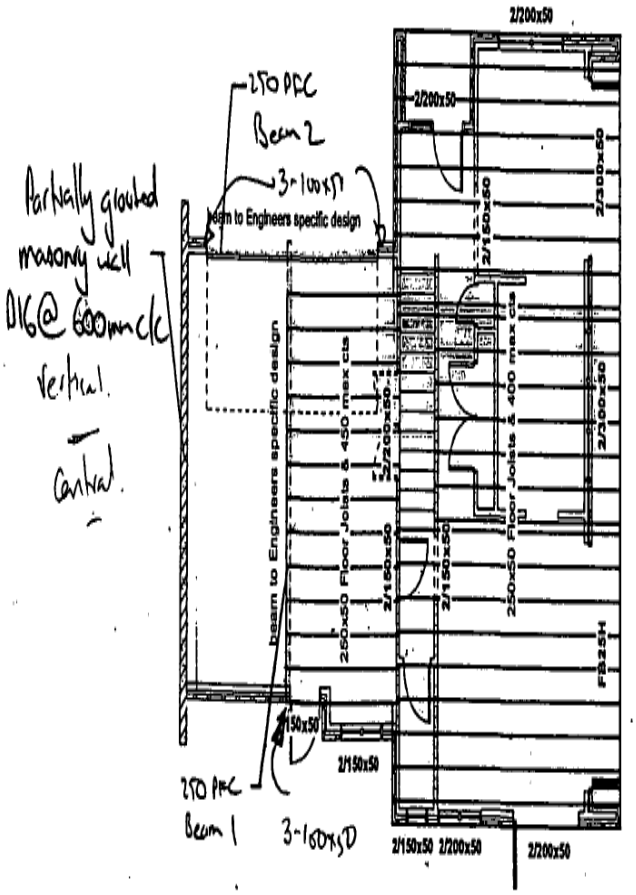

MID FLOOR NOTES:

- All floor joists 250x50 @ 400 cts.
- Solid nog all joists to NZS 3604.1999.
- All structural timber to be MSG8 min grade.
- Use H-1.2 joists thoughout with H-3.1 joists in "Wet Areas".
- Use H-3 ply flooring in "Wet Areas".

6 Mid Floor
Scale: 1:100

Job
CONCEPT ONLY - TYPE 5a HOUSE
NEW ZEALAND HOUSING FOUNDATION
WEST COAST ROAD DEVELOPMENT

Builder
GOLDSMITH DEVELOPMENTS LTD

Date
07/07

Page Scale
1:100

Drawn By
BENNETT DRAUGHTING
116 RED HILL ROAD
PAPAKURA
ph: (09) 296 6369

Page No	Total Pages

TYPE 5a - 5 BEDROOM

IPENZ ENGINEERS NEW ZEALAND | NEW ZEALAND INSTITUTE OF ARCHITECTS | ACENZ

Building Code Clause(s) .....

PRODUCER STATEMENT – PS1 – DESIGN

(Guidance notes on the use of this form are printed on the reverse side)*

[redacted]

ISSUED BY: Wilton Joubert Ltd
(Design Firm)

TO: Goldsmith Developments
(Owner/Developer)

TO BE SUPPLIED TO: Waitakere City Council
(Building Consent Authority)

IN RESPECT OF: raft floor slab, drain bridging
(Description of Building Work)

AT: 19 Titch Place, Henderson
(Address)

..... **LOT** 32 ..... **DP** 339810 ..... **SO** .....

We have been engaged by the owner/developer referred to above to provide engineering design & draughting services
..... services in respect of the requirements of
(Extent of Engagement)
Clause(s) B1 ..... of the Building Code for
○ All or ◉ Part only (as specified in the attachment to this statement), of the proposed building work.

The design carried out by us has been prepared in accordance with:
☑ Compliance Documents issued by Department of Building & Housing B1 / VM1
(verification method / acceptable solution)
..... or
☐ Alternative solution as per the attached schedule .....

The proposed building work covered by this producer statement is described on the drawings titled.....
19 Titch Place, Henderson ..... and numbered S1,S2 .....;

together with the specification, and other documents set out in the schedule attached to this statement.

On behalf of the Design Firm, and subject to:

(i) Site verification of the following design assumptions .....
Soils as per Babbage Consultants report ref:42608, November 2006

(ii) [redacted] proprietary products meeting their performance specification requirements;

I **believe on reasonable grounds** the building, if constructed in accordance with the drawings, specifications, and other documents provided or listed in the attached schedule, will comply with the relevant provisions of the Building Code.

I, Andrew Wilton ..... am: ☑ CPEng 176859 .....#
(Name of Design Professional)
☐ Reg Arch .....#

I am a Member of : ☑ IPENZ ☐ NZIA and hold the following qualifications: BE, MIPENZ, CPEng, IntPE, Dip.MS.

The Design Firm issuing this statement holds a current policy of Professional Indemnity Insurance no less than $200,000*.
The Design Firm is a member of ACENZ ○ **YES** ◉ **NO**

SIGNED BY Andrew Wilton ..... ON BEHALF OF Wilton Joubert Ltd.....
(Design Firm)

Date 29 July 2009 ... (*signature*) .....

Note: This statement shall only be relied upon by the Building Consent Authority named above. Liability under this statement accrues to the Design Firm only. The total maximum amount of damages payable arising from this statement and all other statements provided to the Building Consent Authority in relation to this building work, whether in contract, tort or otherwise (including negligence), is limited to the sum of $200,000.*

This form is to accompany **Form 2 of the Building (Forms) Regulations 2004** for the application of a Building Consent.

THIS FORM AND ITS CONDITIONS ARE COPYRIGHT TO ACENZ, IPENZ AND NZIA

WILTON JOUBERT Ltd

PRODUCER STATEMENTS – Advisory Note

Producer Statements shall be submitted to territorial authorities or building certifiers in order for Code of Compliance Certificates to be issued. The requirement for consultants to issue the related Producer Statements may appear as a condition under the building consent documents or as a separate letter from the territorial authority or building certifier. It is the owner's (or consent applicant) responsibility to notify Wilton Joubert Ltd. in relation to the requirement for construction inspections required (and the subsequent PS4: Producer Statement for Construction Review) as stated on the consent documents.

In order to secure our inspection services, it is strongly recommended that Wilton Joubert Ltd. be given at least 48 hours notice prior to time of inspection. Our inspections are limited to items that have been designed and detailed by us. We are also unable to inspect non-consented or unauthorised work. Building consented, stamped plans with consent numbers (or legible copy of the same) including amendments where applicable shall be made available on site during inspections.

In some cases due to the distance of the job from our offices, it may be more practical and cost effective to contact a local professional engineer to carry out the inspection, who may contact us with any questions that may arise. The engineer who carried out the inspection would subsequently be responsible for the issue of the producer statement for construction review.

The costs associated with site inspections and issuing of Producer Statements are separate from any previous work that we have been engaged for, such as engineering design of works. The costs for carrying out the inspections and related work are based on time spent travelling to site, time on site and other associated costs. Please contact us for an estimate of costs. Our assumptions are that the person(s) who arranged the inspection is responsible for payment of the fees, unless otherwise stated at time of engagement.

P.O BOX 11-381 ELLERSLIE, AUCKLAND, NEW ZEALAND PH: +64 (9) 579 1114 FAX: +64 (9) 579 7778

GUIDANCE ON USE OF PRODUCER STATEMENTS

Producer statements were first introduced with the Building Act 1992. The producer statements were developed by a combined task committee consisting of members of the New Zealand Institute of Architects, Institution of Professional Engineers New Zealand, Association of Consulting Engineers New Zealand in consultation with the Building Officials Institute of New Zealand. The original suite of producer statements has been revised at the date of this form as a result of enactment of the Building Act (2004) by these organisations to ensure standard use within the industry.

The producer statement system is intended to provide Building Consent Authorities (BCAs) with reasonable grounds for the issue of a Building Consent or a Code Compliance Certificate, without having to duplicate design or construction checking undertaken by others.

PS1 Design	Intended for use by a suitably qualified independent design professional in circumstances where the BCA accepts a producer statement for establishing reasonable grounds to issue a Building Consent;
PS2 Design Review	Intended for use by a suitably qualified independent design professional where the BCA accepts an independent design professional's review as the basis for establishing reasonable grounds to issue a Building Consent;
PS3 Construction	Forms commonly used as a certificate of completion of building work are Schedule 6 of NZS 3910:2003[1] or Schedules E1/E2 of NZIA's SCC 2007 [2]
PS4 Construction Review	Intended for use by a suitably qualified independent design professional who undertakes construction monitoring of the building works where the BCA requests a producer statement prior to issuing a Code Compliance Certificate. This must be accompanied by a statement of completion of building work (Schedule 6).

The following guidelines are provided by ACENZ, IPENZ and NZIA to interpret the Producer Statement.

Competence of Design Professional

This statement is made by a Design Firm that has undertaken a contract of services for the services named, and is signed by a person authorised by that firm to verify the processes within the firm and competence of its designers.

A competent design professional will have a professional qualification and proven current competence through registration on a national competence-based register, either as a Chartered Professional Engineer (CPEng) or a Registered Architect.

Membership of a professional body, such as the Institution of Professional Engineers New Zealand (IPENZ)or the New Zealand Institute of Architects (NZIA), provides additional assurance of the designer's standing within the profession. If the design firm is a member of the Association of Consulting Engineers New Zealand (ACENZ), this provides additional assurance about the standing of the firm.

Persons or firms meeting these criteria satisfy the term "suitably qualified independent design professional".

*** Professional Indemnity Insurance**

As part of membership requirements, ACENZ requires all member firms to hold Professional Indemnity Insurance to a minimum level.

The PI insurance minimum stated on the front of this form reflects standard, small projects. If the parties deem this inappropriate for large projects the minimum may be up to $500,000.

Professional Services during Construction Phase

There are several levels of service which a Design Firm may provide during the construction phase of a project (CM1-CM5)[3] (OL1-OL4)[2]. The Building Consent Authority is encouraged to require that the service to be provided by the Design Firm is appropriate for the project concerned.

Requirement to provide Producer Statement PS4

Building Consent Authorities should ensure that the applicant is aware of any requirement for producer statements for the construction phase of building work at the time the building consent is issued as no design professional should be expected to provide a producer statement unless such a requirement forms part of the *Design Firm's engagement.*

Attached Particulars

Attached particulars referred to in this producer statement refer to supplementary information appended to the producer statement.

Refer Also:

1 *Conditions of Contract for Building & Civil Engineering Construction NZS 3910: 2003*

2 *NZIA Standard Conditions of Contract SCC 2007 (1st edition)*

3 *Guideline on the Briefing & Engagement for Consulting Engineering Services (ACENZ/IPENZ 2004)*

www.acenz.org.nz
www.ipenz.org.nz
www.nzia.co.nz

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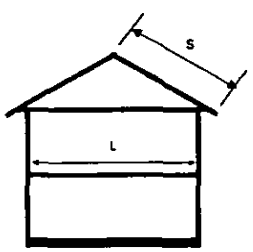
CONQRA RAFT FLOOR SYSTEM

RAFTFLOOR DESIGN - EDGE BEAM

<Job No.>:	16193 rev 03	Date:	22/07/2009
<Job Title>:	Lot 32, 19 Titch Place	Designer:	BR
<Description>:	Edge beam	Checker:	DBL

Loadings

Upper Wall must be Timber



Tributary Roof and Floor Lengths

WALLS

Lower: Timber

(North/South Taupo)

	=	38	kg/m²
	=	0.37	kPa
Height	=	2.50	m
Load/m	=	0.93	kN/m

Upper: Timber

(North/South Taupo)

	=	38	kg/m²
	=	0.37	kPa
Height	=	2.50	m
Load/m	=	0.93	kN/m

Other (Specify Wall Weight)

Weight	=	150	kg/m²
	=	1.47	kPa
Height	=	2.50	m
Load	=	4	kN/m

SUSPENDED MID-FLOOR

Tributary Length L/2

Unit/Floor	=	Timber	
Topping	=	N/A	
	=	0.38	kPa
Live Loading	=	1.50	kPa
Super Imposed Dead	=		kPa
Tributary Span	=	2.50	m
Dead Load/m	=	0.95	kN/m
Live Load/m	=	3.75	kN/m

ROOF

Tributary Length = S

Light	=	0.46	kPa
Live Loading		0.25	kPa
Tributary Span	=	4.20	m
Dead Load/m	=	1.93	kN/m
Live Load/m	=		kN/m

Loadings Summary

Walls	5.64	kN/m	Dead
Mid Floors	0.95	kN/m	Dead
	3.75	kN/m	Live
Slab*	2.31	kN/m	Dead+SDL
	1.35	kN/m	Live
Roof	1.93	kN/m	Dead
		kN/m	Live^
Extra Dead		kN/m	Dead
Extra Live		kN/m	Live

* Includes Edge Beam Weight, SDL = 0.5 kPa LL = 1.5 kPa

^ Roof LL not added if midfloor exists else LL = 0.25 kPa

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CONQRA RAFT FLOOR SYSTEM

Job Details: Lot 32, 19 Titch Place | *15193 rev 03* | *22/7/09*

Working Loads	Dead		10.73	kN/m
	Live		5.10	kN/m
Ultimate Loads (1.2G + 1.5Q)	*Dead*		*12.88*	*kN/m*
	Live		7.65	kN/m
Total Ultimate Load on Edge	w	=	20.53	kN/m

Wall Construction Type	Standard Block min beam width 300mm		
Edge Beam Details	Beam Width =	300	mm
	Pod Depth =	200	mm
	Top slab Depth =	100	mm
	Self Weight =	2.16	kN/m
	Construction Type =	Standard Raft	

Standard Raft Construction

Dependable Bearing Capacity: 100 kPa

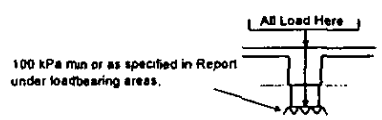
Bearing Check = OK!
Working Pressure = 43 kPa

Steel Requirements - As Per CONQRA Std Drg's

Top Steel: 1HD12
Btm Steel: 2HD12

Continuous Piers

(N.B. All Edge Beam Load in to 'strip' footing)
Assume 100 kPa Bearing Under Edge Beam,
unless a Soil Report indicates otherwise.



Bearing Capacity under Piers: 100 kPa

Bearing Check =
Pressure = kPa

Steel Requirements - As Per CONQRA Std Drg's

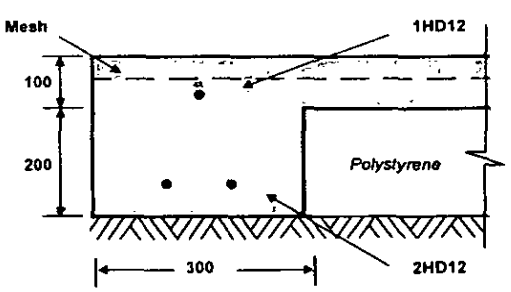
Top Steel:
Btm Steel:

The prescribed Edge Beam design is:

Location (ie: which wall):
All external footings

Standard Raft Contruction

300 mm wide edge beam with
1HD12 in top & 2HD12 in bottom



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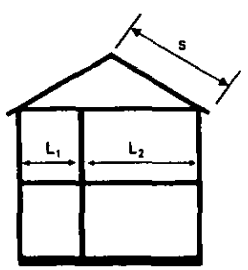
CONQRA RAFT FLOOR SYSTEM

RAFTFLOOR DESIGN - INTERNAL LOADBEARING RIB

<Job No.>:	15193 rev 03	Date:	22/07/2009
<Job Title>:	Lot 32, 19 Titch Place	Designer:	BR
<Description>:	Internal thickening	Checker:	DBL

Loadings



Tributary Roof and Floor Lengths

WALLS

Lower: HOTBloc | Solid | Light | (North/South Taupo)

	=	400	kg/m²
	=	3.92	kPa
Height	=		*m*
Load/m	=		kN/m

Upper: HOTBloc | Solid | Light | (North/South Taupo)

	=	*400*	*kg/m²*
	=	3.92	kPa
Height	=		m
Load/m	=		kN/m

Other (Specify Wall Weight)

Weight	=	30	kg/m²
	=	*0.29*	*kPa*
Height	=	2.50	m
Load	=	1	kN/m

SUSPENDED MID-FLOOR

Tributary Length = $(L_1+L_2)/2$

Unit/Floor	=	Timber	
Topping	=	N/A	
	=	0.38	kPa
Live Loading	=	1.50	kPa
Super Imposed Dead	=		kPa
Tributary Span	=	3.20	m
Dead Load/m	=	1.22	kN/m
Live Load/m	=	4.80	kN/m

ROOF

Tributary Length = S (Check if Rafter or Truss)

Light

	=	0.46	kPa
Live Loading		0.25	kPa
Tributary Span	=	6.60	m
Dead Load/m	=	3.04	kN/m
Live Load/m	=		kN/m

Loadings Summary

Walls	0.74	kN/m	Dead
Mid Floors	1.22	kN/m	Dead
	4.80	kN/m	Live
Slab*	4.47	kN/m	Dead+SDL
	2.70	kN/m	Live
Roof	3.04	kN/m	Dead
		kN/m	Live^
Extra Dead		kN/m	Dead
Extra Live		kN/m	Live

* *Includes Internal Rib Weight, SDL = 0.5 kPa LL = 1.5 kPa*

^ Roof LL not added if midfloor exists else LL = 0.25 kPa

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CONQRA RAFT FLOOR SYSTEM

Job Details: Lot 32, 19 Titch Place | Job Number: 5193 rev 03 | 22/7/09

Working Loads	Dead	9.46	kN/m
	Live	7.50	kN/m
Ultimate Loads (1.2G + 1.5Q)	Dead	11.35	kN/m
	Live	11.25	kN/m
Total Ultimate Load on Internal	w =	22.60	kN/m

Internal Rib Details

Rib Width =	300	mm
Pod Depth =	200	mm
Top slab Depth =	100	mm
Self Weight =	1.44	kN/m
Construction Type	Standard Raft	

Standard Raft Construction

Dependable Bearing Capacity: 100 kPa

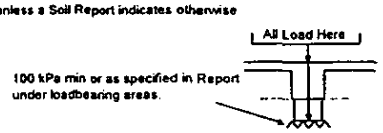
Bearing Check = OK!
Working Pressure = 42 kPa

Steel Requirements - As Per CONQRA Std Drg's

Btm Steel: 2HD12

Continuous Piers

(N.B. All Interal Load in to 'strip' footing)
Assume 100 kPa Bearing Under Loadbearing Rib, unless a Soil Report indicates otherwise



Bearing Capacity: 100 kPa

Bearing Check =
Pressure = kPa

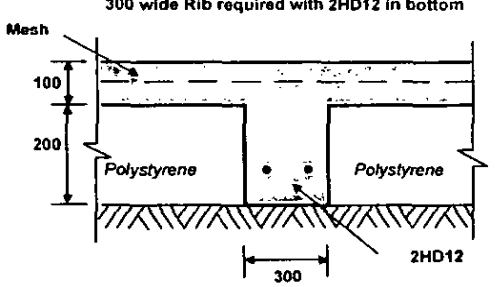
Steel Requirements - As Per CONQRA Std Drg's

Btm Steel:

The prescribed internal rib design is:

Location (ie: which wall):
Internal thickening

Standard Raft Contruction,
300 wide Rib required with 2HD12 in bottom



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CONQRA RAFT FLOOR SYSTEM

RAFTFLOOR DESIGN - INTERNAL LOADBEARING RIB

<Job No.>:	16193 rev 03	Date:	22/07/2009
<Job Title>:	Lot 32, 19 Titch Place	Designer:	BR
<Description>:	Standard Rib	Checker:	DBL

Loadings

WALLS

Lower: HOTBloc | Solid | Light | (North/South Taupo)

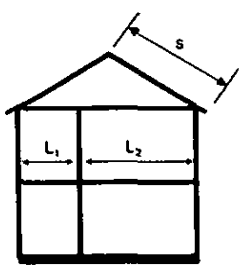
	=	400	kg/m²
	=	3.92	kPa
Height	=		m
Load/m	=		kN/m

Upper: HOTBloc | Solid | Light | (North/South Taupo)

	=	400	kg/m²
	=	3.92	kPa
Height	=		m
Load/m	=		kN/m

Other (Specify Wall Weight)

Weight	=	30	kg/m²
	=	0.29	kPa
Height	=	2.50	
Load	=	1	kN/m



Tributary Roof and Floor Lengths

STA...

SUSPENDED MID-FLOOR

Tributary Length = $(L_1+L_2)/2$

Unit/Floor	=	Timber	
Topping	=	N/A	
	=	0.38	kPa
Live Loading	=	1.50	kPa
Super Imposed Dead	=		kPa
Tributary Span	=		m
Dead Load/m	=		kN/m
Live Load/m	=		kN/m

ROOF

Tributary Length = S (Check if Rafter or Truss)

Light	=	0.46	kPa
Live Loading		0.25	kPa
Tributary Span	=		m
Dead Load/m	=		kN/m
Live Load/m	=		kN/m

Loadings Summary

Walls	0.74	kN/m	Dead
Mid Floors		kN/m	Dead
		kN/m	Live
Slab*	4.40	kN/m	Dead+SDL
	2.70	kN/m	Live
Roof		kN/m	Dead
		kN/m	Live^
Extra Dead		kN/m	Dead
Extra Live		kN/m	Live

* Includes Internal Rib Weight, SDL = 0.5 kPa LL = 1.5 kPa

^ *Roof LL not added if mid/floor exists else LL = 0.25 kPa*

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CONQRA RAFT FLOOR SYSTEM

Job Details: Lot 32, 19 Titch Place | Job Number: 5193 rev 03 | 22/7/09

Working Loads	Dead	5.14	kN/m
	Live	2.70	kN/m
Ultimate Loads (1.2G + 1.5Q)	Dead	6.16	kN/m
	Live	4.05	kN/m
Total Ultimate Load on Internal	w =	10.21	kN/m

Internal Rib Details	Rib Width =	160	mm
	Pod Depth =	200	mm
	Top slab Depth =	100	mm
	Self Weight =	0.77	kN/m
	Construction Type	Standard Raft	

Standard Raft Construction

Dependable Bearing Capacity: 100 kPa

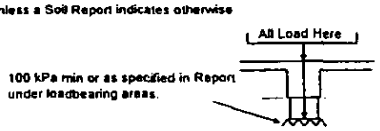
Bearing Check = OK!
Working Pressure = 39 kPa

Steel Requirements - As Per CONQRA Std Drg's

Btm Steel: 1HD12

Continuous Piers

(N.B. All lateral Load in to 'strip' footing)
Assume 100 kPa Bearing Under Loadbearing Rib, unless a Soil Report indicates otherwise



Bearing Capacity: 100 kPa

Bearing Check =
Pressure = kPa

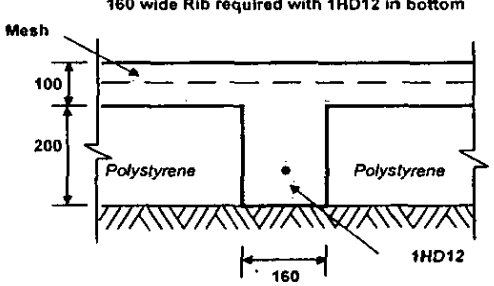
Steel Requirements - As Per CONQRA Std Drg's

Btm Steel:

The prescribed internal rib design is:

Location (ie: which wall):
Standard Rib

Standard Raft Contruction,
160 wide Rib required with 1HD12 in bottom



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Project: Lot 32 19 Titch Place
Job Number: 15193 rev 02

Cantilevered Raft Edge

Cantilevered length: 0.77 m
Load on edge beam: e.g.Point load from roof G, wall G, edgebeam self weight. (x load factor)
P = 18.36 kN/m
rib spacing = 1360 mm
Multiply for rib spacing = 24.9696 kN

M* = 21.56807 kNm

Check cracking moment: $M_{cr} = \frac{f_r I_g}{y_t}$

Ig = 8.03E+08 mm4
yt = 78.57143 mm
f'c = 20 MPa
fr = 3.58 MPa
øMcr = 31.1 kNm

Therefore øMcr > M* OK.

$\phi M_u = \phi A_s f_y (d - a/2)$

$a = \frac{A_s f_y}{0.85 f'_c b}$

Mesh =	665	
Area per m =	147	mm2
mesh yield =	485	MPa
reinforcing diameter =	12	mm
spacing =	1360	mm
reinforcing yield =	500	MPa

As fy = 112.8749

a = 66.397
dmesh = 265 mm dbars = 276 mm

øMu = 22.6 kN/m OK

Check SLS

SLS load = 11.24 kN/m
= 13.488 kN per rib spacing

Msls = 11.68798 kNm

Mcr greater than SLS moment, therefore OK

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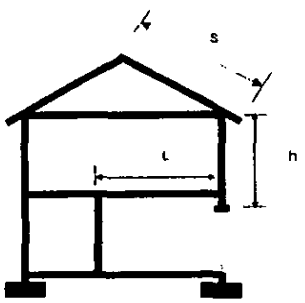
BRIDGING BEAM DESIGN

<Job No.>:	15193 rev 03	Date:	22/7/2009
<Job Title>:	Lot 32, 19 Titch Place	Designer:	BR
<Description>:	Capping edge beam	Checker:	DBL

Geometry and Lintel info.

L =	3.1 m	Reinforced Concrete
b =	180 mm	
h =	400 mm	
d =	344 mm	

Loading info.



Tributary Roof and Floor Lengths

MASONRY WALL ABOVE

HOTBLOC | 600 crs | Light | (North/South Taupo)

	=	38	kg/m²
	=	0.37	kPa
Height (h)	=	5.00	m
Load/m	=	1.86	kN/m

OTHER WALL ABOVE (Specify Wall Weight)

Weight	=	150	kg/m²
	=	1.47	kPa
Height (h)	=	2.50	m
Load	=	3.68	kN/m

FLOORS Tributary Length L/2

Unit/Floor	=	Timber	
Topping	=	N/A	
	=	0.38	kPa
Live Loading	=	1.50	kPa
Super Imposed Dead	=		kPa
Tributary Span	=	0.50	m
Dead Load/m	=	0.19	kN/m
Live Load/m	=	0.75	kN/m

ROOF *Tributary Length = S*

Light	=	0.46	kPa
Live Loading		0.25	kPa
Tributary Span	=	*1.00*	*m*
Dead Load/m	=	0.46	kN/m
Live Load/m	=		kN/m
Self Weight:	=	1.73	kN/m

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BRIDGING BEAM DESIGN

Capping edge beam | Job:15193 rev 03 | Title: Lot 32, 19 Titch Place

Loadings Summary

Walls	5.54	kN/m	Dead
Floors	0.19	kN/m	Dead
	0.75	kN/m	Live
Roof	0.46	kN/m	Dead
		kN/m	Live
Self Weight:	1.73	kN/m	Dead
Extra Dead		kN/m	Dead
Extra Live		kN/m	Live

Loads Summary

Dead	7.92	kN/m	
Live	0.75	kN/m	
Ultimate Loads (1.2G + 1.5Q)			
Dead	9.50	kN/m	
Live	1.13	kN/m	
Total Ultimate Load Lintel			
w =	10.6	kN/m	

Design Parameters

ø =	0.85	
E_c or E_m =	20	GPa
E_s =	200	GPa
f'_c or f'_m =	20.0	MPa
f'_c or f'_m =	20.0	MPa

Design Bending Moment
Ultimate Moment Capacity

Beam Type: Simply Supported — w/y s

M^* = 12.8 kNm

$øA_sf_y(d-a/2)$ = øMu kNm

(Grade/size/No. of bars in *TENSION*)

2 | HD12

A_s = 226 mm^2
f_y = 500 MPa
d = 344 mm
ø = 0.85

$$a = \frac{A_s f_y}{0.85 b f'_c}$$

where f'_c is either f'_c or f'_m

b = 180 mm
f'_c or f'_m = 20.0 MPa

a = 37 mm
c = a/0.85 mm
= 43 mm

øMu = 31.3 kNm OK

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BRIDGING BEAM DESIGN

Capping edge beam *Job Number* 5193 rev 03 *Title:* Lot 32, 19 Titch Place

Yield check:

ϵ_s = f_y/E_s = 0.0025 (Yield Strain)
$\epsilon_c(d-c)/c$ = 0.0173 (Act. Strain @ Mu)
(ϵ_c assumed as 0.0025)

$\epsilon_c(d-c)/c - \epsilon_s$ = 0.0148 OK

Deflection check:

$I = bd^3/12$ = 610613760 mm^4

$\delta = \frac{5\,wl^4}{384\,EI}$ = 1.05 mm

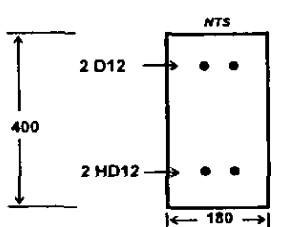
δ/L = 0.000338 L

Shear check:

ϕ =	0.75 (Reinforced Concrete)	
V_{max} =	16.5 kN	wl/2
V* =	12.8 kN	$V_{max}(l/2-d)/(l/2)$
v_n =	0.28 MPa	$(V^*/\phi)/(bd)$
v_c =	0.45 MPa	v_m or v_b
v_s =	0.15 MPa	v_n-(v_m or v_b)
d_b	6 mm	
No. Legs	2	
A_v	56.5 mm^2	
Spacing, s =	625 mm	$A_v f_y/V_s b$

The prescribed lintel design is:

Location on plan: (i.e. Bedroom window etc.)
Capping edge beam



Reinforced Conc. Lintel

Stirrup requirements: R6 @ 170 crs (d/2)

Stirrup Layout:

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PILE LOADING

<Job No.>:	15193 rev 03	Date:	22/7/2009
<Job Title>:	Lot 32, 19 Titch Place	Designer:	BR
<Description>:	Pile P1	Checker:	DBL

Line load from spreadsheet (ULS loads)	=		kN/m
Pile spacing	=		m
Point load	=	32	kN

$$Q_A = Q_s + Q_p = A\left(\frac{(9c_u + 4c_aD/D_p)}{F}\right) + P_0$$

Q_A =	allowable bearing capacity of a pile			
Q_s =	load applied to the top of the pile by the structure	=	32	kN
Q_p =	total mass of pile	=	1.66	kN
A =	area of pile at base or tip	=	0.07	m^2
c_u =	immediate undrained shear strength obtained by field measure	=	60	kPa
c_a =	adhesion between the soil and the pile obtained by suitable laboratory or field measurements, with a minimum value equal to the remoulded undrained shear strength.	=	30	kPa
D =	depth to base of pile	=	1	m
D_p =	average diameter of pile	=	0.3	m
F =	factor of safety	=	2	
P_0 =	total overburden pressure defined by the expression $P_0 = \gamma D$ where γ is saturated density of the clay.	=	18	kPa
	γ =	=	18	kN/m^3

Q_A = **34.49 kN** **OK!**

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PILE LOADING

<Job No.>:	15193 rev 03	Date:	22/7/2009
<Job Title>:	Lot 32, 19 Titch Place	Designer:	BR
<Description>:	Pile P2	Checker:	DBL

Line load from spreadsheet (ULS loads)	=	kN/m
Pile spacing	=	m
Point load	=	72 kN

$$Q_A = Q_s + Q_p = A\left(\frac{(9c_u + 4c_aD/D_p) + P_0}{F}\right)$$

Q_A =	allowable bearing capacity of a pile		
Q_s =	load applied to the top of the pile by the structure	=	72 kN
Q_p =	total mass of pile	=	5.82 kN
A =	area of pile at base or tip	=	0.07 m^2
c_u =	immediate undrained shear strength obtained by field measure	=	60 kPa
c_a =	adhesion between the soil and the pile obtained by suitable laboratory or field measurements, with a minimum value equal to the remoulded undrained shear strength.	=	30 kPa
D =	depth to base of pile	=	3.5 m
D_p =	average diameter of pile	=	0.3 m
F =	factor of safety	=	2
P_0 =	*total overburden pressure defined by the expression*	=	63 kPa
	$P_0 = \gamma D$ where γ is saturated density of the clay.		
	γ =	=	18 kN/m^3

Q_A = **73.02 kN** **OK!**

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Beams Analysis

Job Number:	15193 rev 02	Date:	22/07/2009
Job Title:	Lot 32 19 Titch Place	Designer:	BR
Beam Description:	Cantilever Edge beam 1		

Beam Loadings: Primary Beam

roof span:	1	m	Beam Span =	1.3	
roof weight:	0.48	kPa	floor A span:	0.6	m
roof live load (Q):		kPa	floor A weight:	2.5	kPa
roof live load (Su or Wu):		kPa	floor A live load:	1.5	kPa
wall A height:	5	m	floor B span:		m
wall A mass:	38	kg/m²	floor B weight:		kPa
wall B height:	2.5	m	floor B live load:		kPa
wall B mass:	150	kg/m²	self weight:	1.323	kN/m

Beam Loadings: Secondary Beam

roof span:	m	Beam Span =	
roof weight:	kPa	floor A span:	m
roof live load (Q):	kPa	floor A weight:	kPa
roof live load (Su or Wu):	kPa	floor A live load:	kPa
wall A height:	m	floor B span:	m
wall A mass:	kg/m²	floor B weight:	kPa
wall B height:	m	floor B live load:	kPa
wall B mass:	kg/m²	self weight:	kN/m

Beam Loadings: Additional Point Load b (PL b)

G:	kN
Q:	kN
Su or Wu:	kN

Beam Loadings: Additional Point Load c (PL c)

G:	kN
Q:	kN
Su or Wu:	kN

Loadings Summary

UDL G:	8.82565	kN/m	Point Load, G:	0	kN
Q:	0.9	kN/m	Q:	0	kN
Wu or Su:	0	kN/m	Wu or Su:	0	kN

Consider Load Combination: 1.2 1.5 Q Su or Wu

UDL:	11.94078	kN/m		
Point Load:	0	kN	at	m from free end
Additional Point Load (PL b):	0	kN	at	m from free end
Additional Point Load (PL c):	0	kN	at	m from support 1

Beam end support condition: cantilever

Try: **180W x 300D**

Beam Type: concrete

for timber &	b =	180	mm
flitched beams	d =	300	mm
	I =	405000000	mm⁴
for other beams	I =	283500000	mm⁴
	E =	23500	MPa

M* = 10.1 kNm
V* = 15.5 kN

reaction force 32.5 kN
backspan force = 6.89580045 kN

max. long term deflection: ***1.0*** ***mm***
max. short term deflection: **1.0** mm
allowable defn (functionality), L/400 = 3.3 mm
OK

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Beams Analysis

Job Number:	15193 rev 02	Date:	22/07/2009
Job Title:	Lot 32 19 Titch Place	Designer:	BR
Beam Description:	*Cantilever Edge beam 2*		

Beam Loadings: Primary Beam

roof span:	3.2	m	Beam Span =	0.9	
roof weight:	0.46	kPa	floor A span:	0.6	m
roof live load (Q):		kPa	floor A weight:	2.5	kPa
roof live load (Su or Wu):		kPa	floor A live load:	1.5	kPa
wall A height:	5	m	floor B span:	1.6	m
wall A mass:	38	kg/m²	floor B weight:	0.4	kPa
wall B height:	2.5	m	floor B live load:	1.5	kPa
wall B mass:	150	kg/m²	self weight:	1.764	kN/m

Beam Loadings: Secondary Beam

roof span:	1	m	Beam Span =	3.1	
roof weight:	0.46	kPa	floor A span:	0.6	m
roof live load (Q):		kPa	floor A weight:	2.5	kPa
roof live load (Su or Wu):		kPa	floor A live load:	1.5	kPa
wall A height:	5	m	floor B span:	0.5	m
wall A mass:	38	kg/m²	floor B weight:	0.4	kPa
wall B height:	2.5	m	floor B live load:	1.5	kPa
wall B mass:	150	kg/m²	self weight:	2.9	kN/m

Beam Loadings: Additional Point Load b (PL b)

G:		kN
Q:		kN
Su or Wu:		kN

Beam Loadings: Additional Point Load c (PL c)

G:		kN
Q:		kN
Su or Wu:		kN

Loadings Summary

UDL G:	*10.91865*	kN/m	*Point Load, G:*	*16.4341075*	kN
Q:	3.3	kN/m	Q:	2.5575	kN
Wu or Su:	*0*	kN/m	*Wu or Su:*	*0*	kN

Consider Load Combination: 1.2 1.5 Q Su or Wu

UDL:	*18.05238*	kN/m		
Point Load:	23.557179	kN	at	0 m from free end
Additional Point Load (PL b):	0	kN	at	m from free end
Additional Point Load (PL c):	0	kN	at	m from support 1

Beam end support condition: cantilever

Try: **180W x 400D**

Beam Type: concrete

for timber &	b =	180	mm
flitched beams	d =	400	mm
	I =	960000000	mm⁴
for other beams	I =	332733958	mm⁴
	E =	23500	MPa

M* =	***28.5***	***kNm***
V* =	***39.8***	***kN***
reaction force	72.1	kN
backspan force =	3.7960425	kN
max. long term deflection:	**1.3**	**mm**
max. short term deflection:	**1.4**	**mm**
allowable defn (functionality), L/400 =	2.3	mm
	OK	

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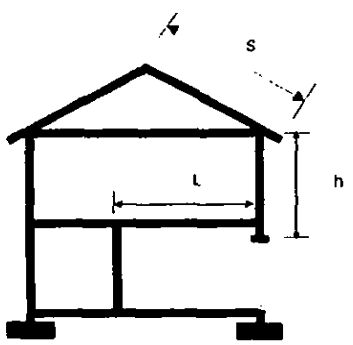
BEAMS/LINTEL DESIGN

<Job No.>:	15193 rev 02	Date:	22/7/2009
<Job Title>:	Lot 32 19 Titch Place	Designer:	BR
<Description>:	Cantilever edge beam 1	Checker:	ARW

Geometry and Lintel info.

L =	1.3 m	Reinforced Concrete
b =	180 mm	
h =	300 mm	
d =	244 mm	

Loading info.



Tributary Roof and Floor Lengths

MASONRY WALL ABOVE

20 Series | Solid | Light | (North/South Taupo)

	=	400	kg/m³
	=	3.92	kPa
Height (h)	=		m
Load/m	=		kN/m

OTHER WALL ABOVE (Specify Wall Weight)

Weight	=		kg/m³
	=		kPa
Height (h)	=		m
Load	=		kN/m

FLOORS Tributary Length L/2

Unit/Floor	=	150 IS	
Topping	=	80 mm	
	=	2.87	kPa
Live Loading	=	1.50	kPa
Super Imposed Dead	=	*0.50*	*kPa*
Tributary Span	=		m
Dead Load/m	=		kN/m
Live Load/m	=		kN/m

ROOF Tributary Length = S

Heavy	=	0.84	kPa
Live Loading		0.25	kPa
Tributary Span	=		m
Dead Load/m	=		kN/m
Live Load/m	=		kN/m
Self Weight:	=	1.30	kN/m

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BEAMS/LINTEL DESIGN

Cantilever edge beam 1 Job: 5193 rev 02 Title: Lot 32 19 Titch Place

Loadings Summary				
	Walls		kN/m	Dead
	Floors		kN/m	Dead
			kN/m	Live
	Roof		kN/m	Dead
			kN/m	Live
	Self Weight:	1.30	kN/m	Dead
	Extra Dead		kN/m	Dead
	Extra Live		kN/m	Live

Loads Summary				
	Dead	1.30	kN/m	
	Live		kN/m	
Ultimate Loads (1.2G + 1.5Q)	Dead	1.56	kN/m	
	Live		kN/m	
Total Ultimate Load Lintel	w =	1.6	kN/m	

Design Parameters

ø =	0.85	
E_c or E_m =	21	GPa
E_s =	200	GPa
f'_c or f'_m =	17.5	MPa
f'_c or f'_m =	17.5	MPa

Design Bending Moment
Ultimate Moment Capacity
From Beam loadings

Beam Type: Cantilever wl²/ 2

M* = 10.1 kNm

$øA_sf_y(d-a/2)$ = øMu kNm

(Grade/size/No. of bars in *TENSION*)

2 HD12 A_s = 226 mm²
f_y = 500 MPa
d = 244 mm
ø = 0.85

$$a = \frac{A_s f_y}{0.85 b f'_c}$$

where f'_c is either f'_c or f'_m

b = 180 mm
f'_c or f'_m = 17.5 MPa

a = 42 mm
c = a/0.85 mm
= 50 mm

øMu = 21.4 kNm OK

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BEAMS/LINTEL DESIGN

Cantilever edge beam 1 *Job Number* **15193 rev 02** *Title:* **Lot 32 19 Titch Place**

Yield check:

$\epsilon_s =$ $f_y/E_s =$ 0.0025 (Yield Strain)
$\epsilon_c(d-c)/c =$ 0.0098 (Act. Strain @ Mu)
(ϵ_c assumed as 0.0025)

$\epsilon_c(d-c)/c - \epsilon_s \approx$ 0.0073 OK

Deflection check:

$I =$ $bd^3/12$ = 217901760 mm^4

$\delta =$ $\frac{1}{8}\frac{wl^4}{EI}$ = 0.12 mm

$\delta/L =$ 0.000094 L

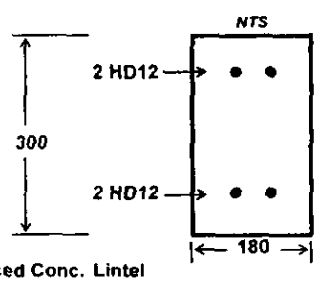
Shear check:

From Beam loadings

$\phi =$	0.75 (Reinforced Concrete)	
$V_{max} =$	2.0 kN	wl
$V^* =$	15.5 kN	$V_{max}(l/2-d)/(l/2)$
$v_n =$	0.47 MPa	$(V^*/\phi)/(bd)$
$v_c =$	0.51 MPa	v_m or v_b
$V_s =$	0.15 MPa	v_n-(v_m or v_b)
d_b	6 mm	
No. Legs	2	
A_v	56.5 mm^2	
Spacing, s =	625 mm	$A_v f_y/V_s b$

The prescribed lintel design is:

Location on plan: (i.e. Bedroom window etc.)
Cantilever edge beam 1



Reinforced Conc. Lintel

Stirrup requirements: R6 @ 120 crs (d/2)

Stirrup Layout:

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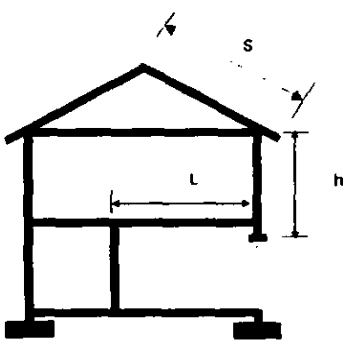
BEAMS/LINTEL DESIGN

<Job No.>:	15193 rev 02	Date:	22/7/2009
<Job Title>:	Lot 32 19 Titch Place	Designer:	BR
<Description>:	Cantilever edge beam 2	Checker:	ARW

Geometry and Lintel info.

L =	0.9 m	Reinforced Concrete
b =	180 mm	
h =	400 mm	
d =	344 mm	

Loading info.



Tributary Roof and Floor Lengths

MASONRY WALL ABOVE

20 Series | Solid | Light | (North/South Taupo)

	=	400	kg/m³
	=	3.92	kPa
Height (h)	=		m
Load/m	=		kN/m

OTHER WALL ABOVE (Specify Wall Weight)

Weight	=		kg/m³
	=		kPa
Height (h)	=		m
Load	=		kN/m

FLOORS Tributary Length L/2

Unit/Floor	=	150 IS	
Topping	=	80 mm	
	=	2.87	kPa
Live Loading	=	1.50	kPa
Super Imposed Dead	=	0.50	kPa
Tributary Span	=		m
Dead Load/m	=		kN/m
Live Load/m	=		kN/m

ROOF Tributary Length = S

Heavy	=	0.84	kPa
Live Loading		0.25	kPa
Tributary Span	=		m
Dead Load/m	=		kN/m
Live Load/m	=		kN/m
Self Weight:	=	1.73	kN/m

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BEAMS/LINTEL DESIGN

Cantilever edge beam 2 Job: 5193 rev 02 Title: Lot 32 19 Titch Place

Loadings Summary				
	Walls		kN/m	Dead
	Floors		kN/m	Dead
			kN/m	Live
	Roof		kN/m	Dead
			kN/m	Live
	Self Weight:	1.73	kN/m	Dead
	Extra Dead		kN/m	Dead
	Extra Live		kN/m	Live

Loads Summary				
	Dead	1.73	kN/m	
	Live		kN/m	
Ultimate Loads (1.2G + 1.5Q)	Dead	2.07	kN/m	
	Live		kN/m	
Total Ultimate Load Lintel	w =	2.1	kN/m	

Design Parameters

ø =	0.85	
E_c or E_m =	21	GPa
E_s =	200	GPa
f'_c or f'_m =	17.5	MPa
f'_c or f'_m =	17.5	MPa

Design Bending Moment
Ultimate Moment Capacity
From Beam loadings

Beam Type: Cantilever $wl^2/2$

M^* = 28.5 kNm

$øA_sf_y(d-a/2)$ = øMu kNm

(Grade/size/No. of bars in *TENSION*)

2 HD12 A_s = 226 mm^2

f_y = 500 MPa

d = 344 mm

ø = 0.85

$$a = \frac{A_s f_y}{0.85 b f'_c}$$

where f'_c is either f'_c or f'_m

b = 180 mm

f'_c or f'_m = 17.5 MPa

a = 42 mm

c = a/0.85 mm

= 50 mm

øMu = 31.0 kNm OK

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BEAMS/LINTEL DESIGN

Cantilever edge beam 2 *Job Number* **15193 rev 02** *Title:* **Lot 32 19 Titch Place**

Yield check:

ϵ_s = f_y/E_s = 0.0025 (Yield Strain)
$\epsilon_c(d-c)/c$ = 0.0148 (Act. Strain @ Mu)
(ϵ_c assumed as 0.0025)

$\epsilon_c(d-c)/c - \epsilon_s$ = 0.0123 OK

Deflection check:

$I = bd^3/12$ = 610613760 mm^4

$\delta = \frac{1}{8} \frac{wl^4}{EI}$ = 0.01 mm

δ/L = *0.000015* L

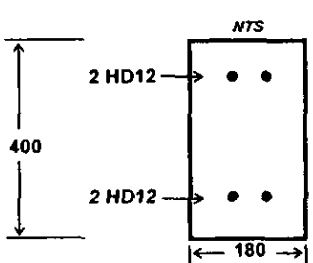
Shear check:

From Beam loadings

ϕ =	0.75 (Reinforced Concrete)	
V_{max} =	1.9 kN	wl
V^* =	39.8 kN	$V_{max}(l/2-d)/(l/2)$
v_n =	0.86 MPa	$(V^*/\phi)/(bd)$
v_c =	0.46 MPa	v_m or v_b
V_s =	0.41 MPa	v_n-(v_m or v_b)
d_b	6 mm	
No. Legs	2	
A_v	56.5 mm^2	
Spacing, s =	225 mm	$A_v f_y/V_s b$

The prescribed lintel design is:

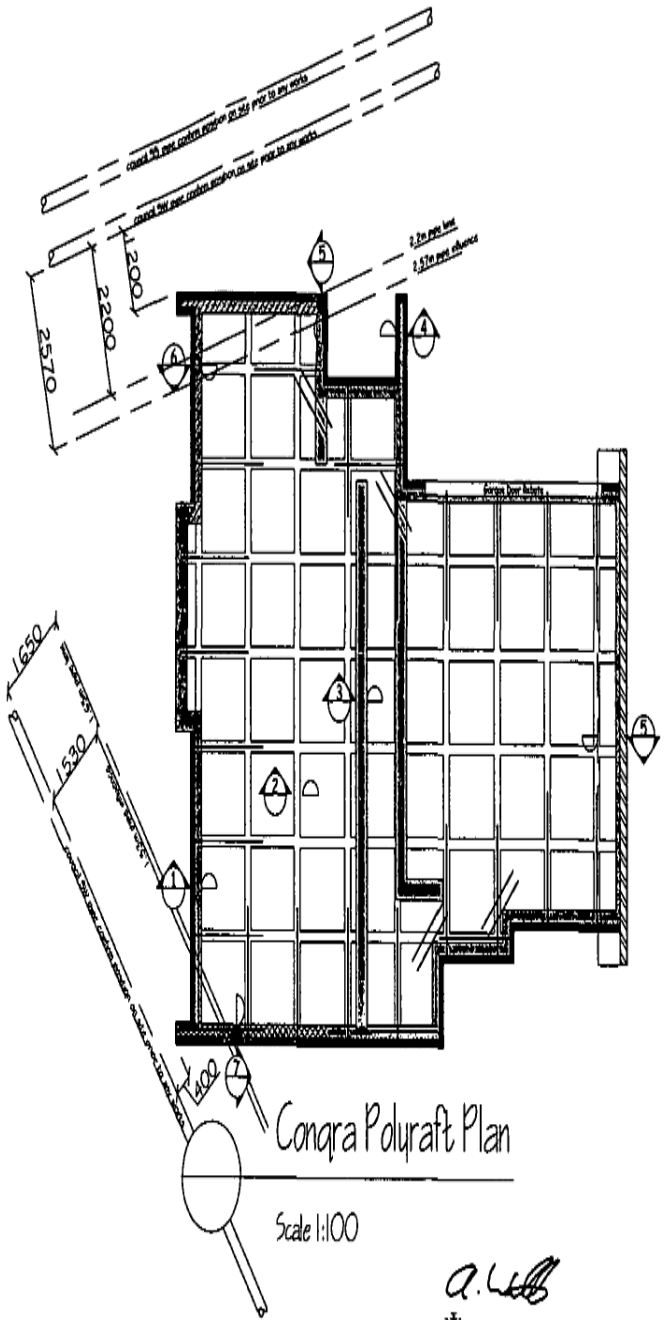
Location on plan: (i.e. Bedroom window etc.)
Cantilever edge beam 2



Reinforced Conc. Lintel

Stirrup requirements: R6 @ 170 crs (d/2)

Stirrup Layout:



Conqra Polyraft Plan

Scale 1:100

a. Lobb

R6 Entrant corner steel 2HD12 x 1200mm at 200 crs

1HD12 @ 1360clc 1.85m long then bent 150mm into edge beam

300D Bored Concrete Pile 2HD12 placed centrally, min. 4.0m into good natural ground or 1.5m below invert level whichever depth is greater.

300D Bored Concrete Pile. 2HD12 placed centrally, min. 1.5m into good natural ground or 1.5m below invert level whichever depth is greater.

300W x 300D edge beam 5HD12 along

300W x 400D edge beam 5HD12 along R6 @ 170clc

300W x 300D edge beam 5HD12 along R6 @ 120clc

NOTE:

Building platform shall be tested to ensure availability of min. 100kPa dependable bearing capacity

It is increasingly common for building consent authorities to require a "PS4" for specifically designed structures. For Wilton Joubert Ltd. to issue this, we need to inspect prior to concrete pour. Ring 09 579 1114 to arrange a booking. A local, qualified engineer may also be engaged to carry out the inspection & issue a PS4 subsequently

NO INSPECTION EQUALS
NO PS4 ISSUED.

Conqra Polyraft

##

NOTES:

Only Conqra polystyrene pods and R6 galvanised spacers to be used for this design.
Under no circumstances shall polystyrene spacers be used.
Where underfloor heating is installed, floor topping shall be increased to 120mm.
Unless otherwise noted;
All Concrete strength shall be minimum 25MPa in sea spary zone, 20MPa elsewhere (if in doubt check with local T.A.)
Do not scale from Drawings. Refer Architectural Drawings for overall dimensions.

Revision	Description	Date
2	total revision	24-7-09

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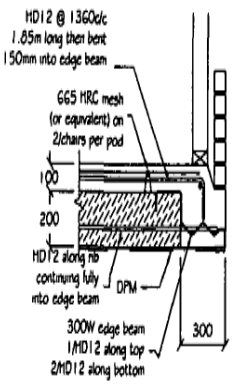
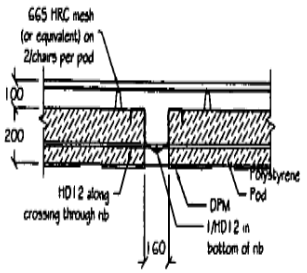
Job Title:
Proposed Residence
lot 32 of
Lot 2 : DP 339810
19 Titch Place

Sheet Title:
Conqra Polyraft Plan

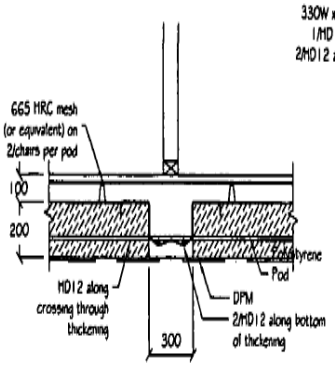
Drawn BR	Chk TE
Date DL	
Scale 1:100	File 19-09-08
JOB # WJ15193	Sheet S1
Amendments to revision 2	



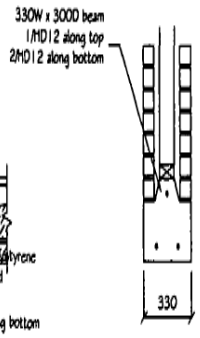
1 Detail
Conqra Polyraft
Perimeter Beam 300
Scale 1:25



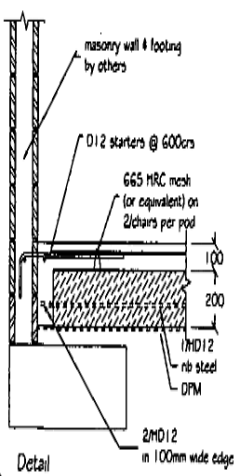
2 Detail
Conqra Polyraft
Internal Beam 160
Scale 1:25



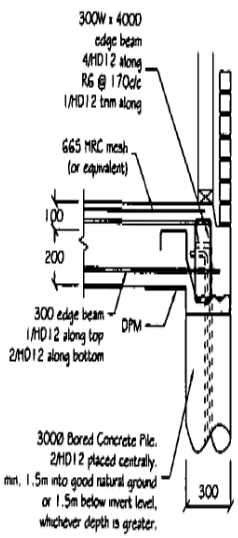
3 Detail
Conqra Polyraft
Internal Beam 300
Scale 1:25



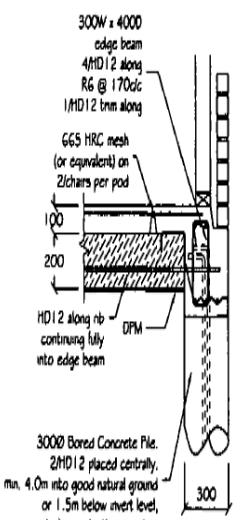
4 Detail
Wingwall Beam - 330
Scale 1:25



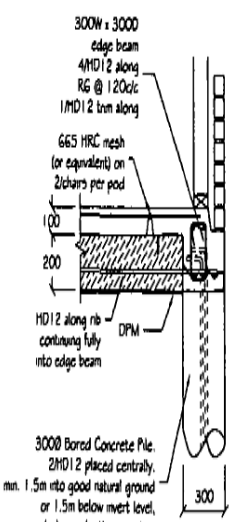
4 Detail
Raftfloor to Wall
Scale 1:25



5 Detail
Raftfloor Edge Beam - 300
on 3000 BCP
Scale 1:25



6 Detail
Raftfloor Edge Beam - 300
on 3000 BCP
Scale 1:25



7 Detail
Raftfloor Edge Beam - 300
on 3000 BCP
Scale 1:25

Conqra Polyraft

Rev: ##

NOTES:

Only Conqra polystyrene pods and R6 galvanised spacers to be used for this design.
Under no circumstances shall polystyrene spacers be used.
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Unless otherwise noted;
All Concrete strength shall be minimum 25MPa in sea spary zone, 20MPa elsewhere (if in doubt check with local T.A.)
Do not scale from Drawings. Refer Architectural Drawings for overall dimensions.

Revision	Description	Date
2	total redesign	24-7-08

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Job Title
Proposed Residence
lot 32 of
Lot 2 : DP 339810
19 Titch Place

Sheet Title
Conqra Polyraft
Details

Drawn: BR	Rev: TE
Design: DL	
Scale: 1:25	Date: 19-09-08
Job #: WJ15193	Dwg: S2
Comments: Title to revision 2	

EXTERIOR CLADDING RISK SCORE ANALYSIS

DATE: August 2007

ADDRESS Housing Foundation of New Zealand - Type 5 House

BUILDING FACE TYPICAL

ELEV ALL

RISK SCORE	LOW	MEDIUM	HIGH	VERY HIGH	SCORE
WIND ZONE	LOW	MEDIUM	HIGH	VERY HIGH	
	0	0	1	2	1
NUMER OF STOREY'S	1 STOREY	2 STOREY'S IN PART	2 STOREY'S	MORE THAN 2 STOREY'S	
	0	1	2	4	2
ROOF TYPE	HIP OR GABLE WITH EAVES	GABLE WITHOUT EAVES OR SIMPLE MONO-PITCH	COMPLEX SHAPES & DORMERS	MULTIPLE LEVELS COMPLEX SHAPES PARAPETS	
	0	1	3	5	0
EAVE WIDTH	GREATER THAN 600 MM @ FIRST FLOOR LEVEL	450-600 OR GREATER THAN 600 MM @ 2ND FLOOR LEVEL	100-450MM OR 450MM @ 2ND FLOOR LEVEL	0-100MM, 100-450MM @ 2ND FLOOR LEVEL 450-600MM @ 3RD FLOOR LEVEL	
	0	1	2	5	1
ENVELOPE CAPACITY	SIMPLE RECTANGULAR L, T OR BOOMERANG ALL WALLS COVERED BY EAVES.	BUILDINGS WITH ROOFS ABUTTING ADJACENT WALLS	BUILDINGS & MULTIPLE CLADDING AND ROOFLINE ABUTTING ADJACENT WALLS	AS HIGH WITH MULTIPLE PENETRATIONS, OTHER THAN DOORS & WINDOWS, THROUGH WALLS, COMPLEX JUNCTIONS	
	0	1	3	6	3
DECKS & BALCONIES	NONE, TIMBER SLAT DECK OR PORCH @ GROUND LEVEL	FULLY COVERED IN PLAN BY ROOF OR TIMBER SLAT DECK ATTACHED @ 1ST FLOOR OR 2ND FLOOR LEVELS	EXPOSED IN PLAN OR CANTILEVERED @ 1ST FLOOR LEVEL	EXPOSED IN PLAN OR CANTILEVERED @ 2ND FLOOR LEVEL OR ABOVE	
	0	2	4	6	0
KEY		0-10 MEDIUM RISK			7

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Email Daniel: danielbennett@xtra.co.nz

10.09.09

GLAZING CALCULATIONS

NZHF – TYPE 5aHOUSE – Lot 32

The sum of the glazing in the East / West / South walls must not exceed 30%, to comply with the schedule method.
Garage is excluded from calculations.
Insulate walls separating garage & dwelling to R2.6.

Ground Level West elevation wall area	=	16.2m2 (excluding garage)
Ground Level West elevation glazing area	=	3.8m2 (3.2+0.6)
Top Level West elevation wall area	=	22.57m2
Top Level West elevation glazing area	=	3.24m2 (2.16+0.6+0.48)
TOTAL	=	38.77m2 / 7.04m2 = 18.15%
Ground Level East elevation wall area	=	13.79m2 (excluding garage)
Ground Level East elevation glazing area	=	4.4m2 (2.6+1.8)
Top Level East elevation wall area	=	22.57m2
Top Level East elevation glazing area	=	4.68m2 (2.16+2.16+0.36)
TOTAL	=	36.36m2 / 9.08m2 = 24.97%
Ground Level South elevation wall area	=	9.38m2 (excluding garage)
Ground Level South elevation glazing area	=	0m2 (no glazing in southern walls)
Top Level South elevation wall area	=	25.65m2
Top Level South elevation glazing area	=	1.8m2 (1.8)
TOTAL	=	35.03m2 / 1.8m2 = 5%

TOTAL WALL AREA (East, West, South)	=	110.16m2 (excluding garage)
TOTAL GLAZING AREA (East, West, South)	=	17.92m2
GLAZING AREA (East, West, South)	=	16.2% - OK

Gound Level North elevation wall area	=	25.07m2
Ground Level North elevation glazing area	=	7.2m2 (2.4+4.8)
Top Level North elevation wall area	=	25.65m2
Top Level North elevation glazing area	=	6.48 (2.16+2.16+2.16)

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TOTAL NORTH	=	50.72m2 / 13.68m2 = 26.9%
TOTAL WALL AREA (all elevations excluding garage)	=	160.88m2 (excluding garage)
TOTAL GLAZING AREA (all elevations excluding garage)	=	31.60m2
TOTAL GLAZING COVER	=	**19.64%**

COMPLIES WITH SCHEDULE METHOD
R Values as per Pink Batts R Value Installation Guide
NZBC Clause H1 – Energy Efficiency – Third Edition.

THE NEW ZEALAND BUILDING CODE

The documents listed below identify requirements to ensure a building is safe, durable, healthy, accessible and energy efficient, and list the acceptable solutions.

No.	Title	
HB	New Zealand Building Code Handbook	
A1	Classified Uses	
A2	Interpretation	
B1	Structure	AS1
B2	Durability	AS1
C1	Outbreak of Fire	AS1
C2	Means of Escape	AS1
C3	Spread of Fire	AS1
C4	Structural Stability During Fire	AS1
D1	Access Routes	AS1
E1	Surface Water	AS1
E2	External Moisture	AS1
E3	Internal Moisture	AS1
F2	Hazardous Building Materials	AS1
F4	Safety From Falling	AS1
F5	Construction and Demolition Hazards	AS1
G1	Personal Hygiene	AS1
G2	Laundering	AS1
G3	Food Preparation and Prevention of Contamination	AS1
G4	Ventilation	AS1
G5	Interior Environment	AS1
G7	Natural Light	AS1
G8	Artificial Light	AS1
G9	Electricity	AS1
G10	Piped Services	AS1
G11	Gas as an Energy Source	AS1
G12	Water Supplies	AS1
G13	Foul Water	AS1, AS2
H1	Energy Efficiency	AS1

The relevant documents are to be utilised in association with the attached drawings and specification.

7.3 Level thresholds

Where provision for level access is required, this shall be provided as shown in Figure 17A and Figure 17B.

7.3.1 Enclosed decks

Where provision for level access is required for an *enclosed deck*, this shall be provided in Figure 17A. The underlying *membrane deck* surface shall be made *weathertight* as described in Paragraph 8.5.

7.3.1.1 Removable surfaces

Raised removable surfaces of tiles or timber shall be provided over the underlying *weathertight enclosed deck* surface, as shown in Figure 17A. A minimum gap of 12 mm shall be provided against the wall or balustrade *cladding*.

7.3.1.2 Timber option

Timber decking shall be over 75 x 50 mm *framing* supported on blocks, with spacing in accordance with NZS 3604.

No fixings shall penetrate the underlying *deck membrane*.

COMMENT:

Access to the underlying *weathertight* surface, for cleaning and maintenance, must be provided.

Tiled boards or structural pavers sit on proprietary supports, that can be adjusted according to level changes in the underlying *deck* surface.

The pavers or tiled boards are spaced to allow free drainage and the ability to lift the top surface off when necessary.

The timber alternative allows access by fixing the timber decking with stainless steel screws, so they may be removed when necessary.

7.3.2 Ground floor level access

Where provision for level access is required, this may be provided as shown in Figure 17B, with exterior paving or decking that complies with the *access route* requirements of D1/AS1.

COMMENT:

The specific features of a *building* and its site can have a significant effect on the options available for providing level access at doors. These features include the provision of shelter, prevailing winds and ground levels. Where level access is required, it is highly recommended that the services of a designer experienced in this field be obtained.

7.3.2.1 Concrete slab

Where provision for level access is required from a concrete floor slab to exterior paving, this shall be as shown in Figure 17B with:

a) A channel across the door opening, with:
   i) the width to suit capacity in accordance with E1/AS1,
   ii) a minimum depth of 150 mm,
   iii) a maximum length of 2000 mm, and
   iv) 1:200 minimum fall along length of channel,

b) Grating, in accordance with Table 20, over the channel, that:
   i) is supported independently of the door frame,
   ii) is removable to allow access for cleaning,
   iii) is specifically designed to accommodate imposed loads,
   iv) has gaps sized to prevent the wheels of wheel chairs or mobility aids entering or being trapped, and
   v) has a continuous gap of 12 mm minimum from door frame and wall *cladding*, and

c) Exterior paving that:
   i) has a minimum fall of 1:40 away from the channel,

COMMENT:

The grating support must be specifically detailed to suit the condition of the *building* and site.

   ii) together with the surrounding paving and ground levels, complies with drainage requirements of E1/AS1.

7.3.2.2 Timber floor

Where provision for level access is required from a timber floor to the exterior, this may be provided as shown in Figure 17B, with clearances in accordance with Paragraph 9.1.3.

9.0 Wall Claddings

9.1 General

Wall *claddings* shall meet the requirements of NZBC E2.3.2 to E2.3.7, and comply with the provisions of Paragraph 9.1.1 to Paragraph 9.9.

9.1.1 Limitations

This Acceptable Solution is limited to the wall *cladding systems* listed in Paragraph 3.3. Table 3 lists wall *cladding systems* that shall be used for *buildings* with varying *risk scores*.

The method of establishing the level of risk associated with the use of a specific wall *cladding* is given in Paragraph 3.1. Based on this *risk score*, a wall *cladding* may require the inclusion of a *drained cavity* as described in Paragraph 9.1.8.

9.1.2 Maintenance

COMMENT:
A deterioration in the appearance of the surface of the *cladding* does not necessarily relate to a deterioration in the *weathertightness* of the *cladding*.

Maintenance of wall *claddings* shall be carried out as necessary to achieve the expected *durability* of the material – refer Paragraph 2.5. The extent and nature of the necessary maintenance is dependent on the:

a) Type of *cladding* used,

b) Position of the *cladding* on the *building*,

c) Geographical location of the *building*, and

d) Specific site conditions.

COMMENT:
Washing by rain removes most accumulated atmospheric contaminants, but sheltered areas are protected from the direct effects of rain and require more regular manual washing. Some heavily textured surfaces will not be as effectively washed by rain as smoother surfaces, so will require regular manual washing (high pressure water should not used).

9.1.3 Bottom of cladding

Separations, clearances and overlaps shall be as shown in Figure 65 and Table 18.

Figure 65: Levels and garage openings
Paragraphs 9.1.3 and 9.1.3.4

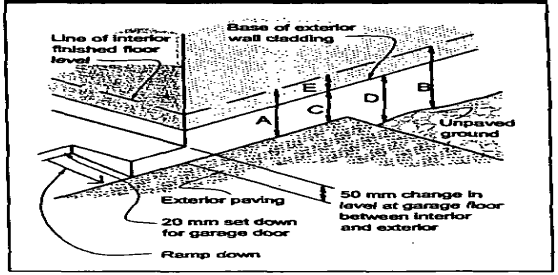


Table 18: Clearances
Paragraphs 9.1.3, 9.1.3.2, 9.1.3.3, 9.1.3.4 and 10.3.5

Minimum clearances (mm)	Masonry veneer		Other claddings				
	A	B	A	B	C	D	E
Concrete slab	100	150	150	225	100	175	50
Timber floor	Refer Note		Refer Note		100	175	50

NOTE: Refer to NZS 3604 for requirements.

9.1.3.1 Concrete slabs

Concrete slabs shall meet the requirements of Paragraph 10.3 as shown in Figure 132.

9.1.3.2 Masonry veneer clearances

The height of the floor slab above *finished ground level* shall be in accordance with Paragraph 10.3.5, as shown in Table 18.

Ground clearances for *masonry veneer* shall be as shown in the Brick Veneer Handbook SNZ HB 4236.

9.1.3.3 Bottom of other wall claddings

At concrete slab level, the base of the *cladding system* shall be as shown in Table 18, and:

a) Finish a minimum of:
   i) 100 mm above a paved surface, or
   ii) 175 mm above an unpaved surface,
b) Overlap the concrete slab by 50 mm, and
c) Be offset horizontally by a minimum of 6 mm to prevent capillary action.

9.1.3.4 Openings to garages

COMMENT:
This paragraph does not apply to garages that are detached outbuildings.

Garage spaces within, or attached to, the *building* envelope shall have:

a) Openings provided with a 50 mm minimum total level change between the interior and the exterior paving, and
b) Provision to drain water away from the threshold of the opening.

COMMENT:
Methods for achieving the required step may include:
- A 50 mm difference in *finished ground level* adjacent to the opening, or
- A raised threshold at the opening, or
- Concrete nibs at the opening.

Refer to Figure 65 and Table 18 for overall level change requirements.

COMMENT:
NZS 3604 may require greater separations depending on floor type and materials.

The likely final landscaped ground levels must be taken into account when planning foundations and earthworks to avoid reductions to the minimum ground clearances in the finished *building*.

9.1.3.5 Ground level timber framing

Suspended timber floors shall meet the requirements of Paragraph 10.0. Clearances from paved and unpaved surfaces to the wall *framing* shall be in accordance with NZS 3604, and Table 18. At ground floor level, the base of the *cladding system* shall:

a) Overlap the timber floor structure by 50 mm minimum, and
b) For walls with *direct fixed claddings*, be offset horizontally from a concrete foundation wall by a minimum of 6 mm.

COMMENT:
Where *claddings* require *drained cavities*, care must be taken to ensure air from the subfloor space cannot enter the cavity. This is important, as moisture levels in subfloor air can be high.

9.1.3.6 Balconies, decks and roofs

A minimum of 35 mm clearance shall be provided from the bottom edge of the wall *cladding* to:

a) The finished plane of any adjacent horizontal surface, or
b) The top surface of any adjacent sloped or horizontal *apron flashing*.

At any junction of a wall with a *deck* or roof, clearance shall be measured from the highest point of the adjacent *deck* or roof, and the highest point of any surface ridges or textures.

COMMENT:
This keeps the bottom edge of the *cladding* dry, and allows cleaning and painting of the bottom surfaces.

9.1.4 Barriers to airflow

This Acceptable Solution requires that *buildings* have barriers to airflow, in the form of:

a) Interior *linings* with all joints stopped, or
b) Where walls are not lined, such as attic spaces at gable ends, a rigid sheathing or an air barrier, complying with Table 23, fixed to *framing* prior to fixing *cladding* or *cavity battens*.

COMMENT:
The primary function of air barriers and *air seals* is to moderate airflows at junctions and inside the wall cavity.

Airflows in certain weather conditions encourage significant amounts of water to move along their path, and it is therefore important to manage airflow in *cavity walls* with barriers and *air seals*.

In the absence of internal *linings*, an air barrier is required to support wind pressures at locations such as *gable ends and unlined garage spaces*. *Air pressure drop* is not always across the internal *lining*, indicating the wrap or sheathing acts as an air barrier as well.

9.1.5 Building wrap to wall openings

Prior to window or door installation:

a) *Building wrap* shall be cut and dressed into all sides of openings as per Figure 72, and

b) *Flexible flashing tape* shall be applied to head and sill *framing* as shown in Figure 72. *Flexible flashing tape* shall:
   i) comply with Parts 3.2 and 4 of ICBO Acceptance Criteria AC148, and
   ii) be compatible with the *building wrap*.

COMMENT:
Dressing the *building wrap* around the *framing* timber and providing a flexible *air seal* limits airflows around the window reveal.

The *flexible flashing tape* keeps any water that does get past the *cladding*, or through the joinery, from direct contact with the timber.

9.1.6 Air seals

Window, door and other penetration openings shall be provided with flexible *air seals* to minimise the risk of airflows carrying water into the *building* wall. The *air seal* shall be:

a) Provided between the reveal or frame and the wrapped opening (for example of use, refer to Figure 81),

b) Installed over a closed cell polyethylene foam (PEF) backing rod, and

c) Made of:
   i) self-expanding polyurethane foam complying with ASTM C1330, or
   ii) sealant complying with:
      a. Type F, Class 20LM or 25LM of ISO 11600, or
      b. low modulus Type II Class A of Federal Specification TT-S-00230C.

COMMENT:
Care must be taken when using self-expanding polyurethane foam as there is a danger of over-filling due to the foam expanding up to twenty times its original volume. A backing rod should be used.

9.1.7 Building wrap

The *building wrap* shall be in accordance with Table 23, and shall:

a) Be run horizontally,

b) Have upper sheets lapped over lower sheets to ensure that direction of laps will allow water to be shed to outside of the *building wrap*,

c) Be lapped not less than 75 mm at horizontal joints,

d) Be lapped not less than 150 mm over *studs* at vertical joints, and

e) Be added as a second layer over head *flashings* as shown in Figure 71.

9.1.8 Drained cavities

Based on the *risk score* for an *external wall* calculated as per Paragraph 3.1, a wall *cladding* may require the inclusion of a *drained cavity*. Where a *drained cavity* is required, it shall meet the requirements of Paragraph 3.1.

COMMENT:
Cavities manage occasional ingress of water past the *cladding*, but should not act as gutters or drains.

9.1.8.1 Limitations

This Acceptable Solution is limited to systems where:

a) *Cavity battens* are fixed, by the *cladding* fixings, to the wall *framing*,

b) *Claddings* are fixed through the *cavity battens* into the wall *framing*, and

c) The *drained cavity* behind *claddings*, except in *masonry veneer*, is not vented at the top.

Systems where the *cladding* is fixed into the *cavity batten* only are outside the scope of this Acceptable Solution.

9.1.8.2 Requirements

Where a *drained cavity* is required, it shall:

a) Be installed over *building wrap* or rigid sheathing that:
   i) complies with Table 23, and
   ii) is fixed to wall *framing*,

b) Be formed using vertical *cavity battens*,

c) Restrict air movement between the *drained cavity* and:
   i) floor, wall and roof *framing*,
   ii) attic roof space, and
   iii) subfloor space,

d) Be drained and open to the exterior at the bottom of cavities.

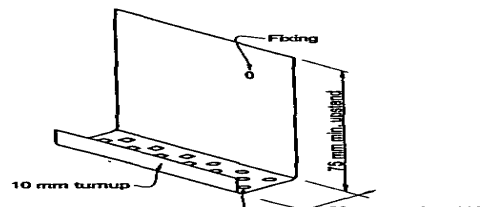
e) Use vermin-proofing at the cavity base as per Paragraph 9.1.8.3 and Figure 66,

f) Use *cavity spacers* as shown in Figure 67, where fixing is required between *cavity battens*, and

g) Not use horizontal *cavity battens*.

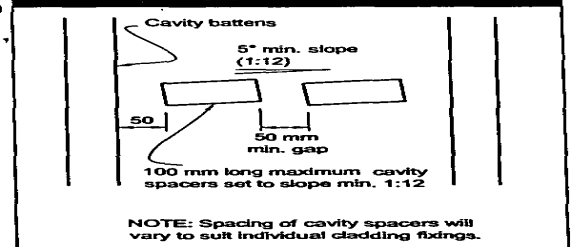
COMMENT:
Horizontal battens obstruct the flow of air in cavities.

Figure 66: Cavity base closure
Paragraphs 9.1.8.2 e) and 9.1.8.3



NOTE: To be used in *drained cavities* at the base of walls and above window head and inter-storey *flashings*.

Figure 67: Cavity spacers
Paragraph 9.1.8.2 f)



NOTE: Spacing of cavity spacers will vary to suit individual cladding fixings.

9.1.8.3 Vermin-proofing

Vermin-proofing shall be provided above window heads and at the base of the *drained cavity*. Figure 66 provides one example of an appropriate cavity closure.

Aluminium, stainless steel or uPVC in accordance with Paragraph 4.1 shall be used where vermin-proofing material is not readily accessible or replaceable.

Vermin-proofing shall:

a) Provide holes or slots between 3 mm and 5 mm,

b) Provide a total area of opening of 1000 mm² per lineal metre of wall, and

c) Be positioned to allow a minimum *drip edge* to the wall *cladding* of:
   i) 10 mm at the base of walls, and
   ii) 15 mm above window head *flashings*.

COMMENT:
It is important the openings in vermin-proofing are kept clear and unobstructed in order to maintain draining and venting of the cavity. The closure shown is only one option for vermin-proofing. Providing openings are as specified, other dimensions can vary, so allowing the use of other shapes such as channels and right-angles.

9.1.8.4 Cavity battens

Cavity battens shall:

a) Be a minimum of 20 mm in thickness,

b) Be at least the same width as the *stud*,

c) Be fixed, by the *cladding* fixings, through the *building wrap* into the *framing*, and

COMMENT:
Battens will be fixed by the *cladding* fixings, which will penetrate the wall *framing*. Battens will therefore need only temporary fixing until the *cladding* is fixed.
Polystyrene battens may be temporarily adhered to the *building wrap*.

d) Comply with the *durability* requirements of B2/AS1, and
   i) if timber, comply with NZS 3602, or
   ii) if polystyrene, comply with Paragraph 9.9.3.1, and be protected from any *incompatible vapours* from timber treatment.

COMMENT:
The solvents from freshly LOSP-treated timber may melt polystyrene, so these should not be used together.

9.1.8.5 Wall framing behind cavities

Where *stud* spacings are greater than 450 mm, an intermediate means of restraining the *building wrap* and insulation from bulging into the *drained cavity* shall be installed. Acceptable means of achieving this are by using:

a) 75 mm galvanized mesh,

b) Polypropylene tape at 300 mm centres,

c) Galvanized wire at 300 mm centres fixed to *dwangs* over the *building wrap*, or

d) Vertical *cavity battens* at 300 mm centres.

Wire or mesh shall be galvanized in accordance with AS/NZS 4534.

Dwangs shall be at a minimum of 800 mm centres, except when rigid sheathing is fixed to the *framing* prior to fixing *cavity battens*.

9.1.9 Penetrations

9.1.9.1 Penetrations through cavities

Window penetrations through cavities shall meet the requirements of Paragraph 9.2 to *Paragraph* 9.9.

9.1.9.2 Other cavity penetrations

Where penetrations of the wall *cladding* are wider than the *cavity batten* spacing, allowance shall be made for air flow between adjacent cavities by leaving a minimum gap of 10 mm between the bottom of the vertical *cavity batten* and the *flashing* to the opening.

9.1.9.3 Pipes and service penetrations

Pipes and service penetrations shall be made *weathertight* by using *flashings* and, where *necessary*, sealant *complying* with:

a) Type F, Class 20LM or 25LM of ISO 11600, or

b) low modulus Type II Class A of Federal Specification TT-S-00230C.

Details specific to particular *claddings* are given in Paragraph 9.2 to Paragraph 9.9.

Acceptable methods of *flashing* pipes and a *meterbox* are shown in Figure 68 and Figure 69.

COMMENT:
Where possible, meterboxes should be located in sheltered areas of the *building*, such as a porch, or be installed behind a weatherproof glazed panel.

Figure 68: General pipe penetration
Paragraph 9.1.9.3, Figure 126

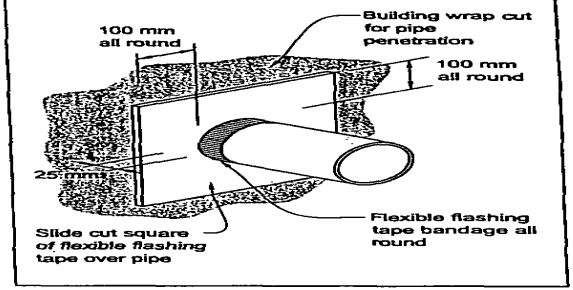
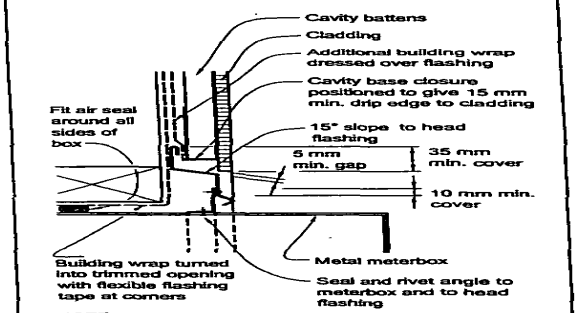


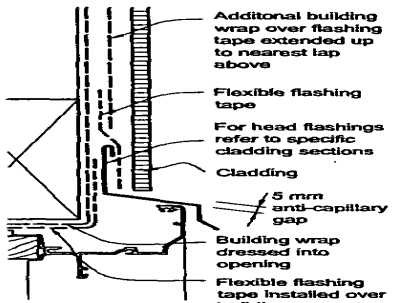
Figure 69: General meterbox:
Paragraphs 9.1.9.3, 9.6.8.5 and 9.6.9.6



NOTE:
(1) Fix angle and seal to all sides of box. At sides and base, *claddings* shall overlap angle by 10 mm minimum. Continuously seal *cladding* against angle.
(2) Suitable for other similar penetrations.

Figure 71: *General sealing of head flashing* Paragraphs 9.1.7 e), 9.1.10.3 and 9.1.10.4 c)

NOTE: May also use *building wrap* lapped over flashing upstand in lieu of *flexible flashing tape*. Refer cladding window details, for example Figure 115.



9.1.10.4 Head flashings

Head *flashings* shall be in accordance with Paragraph 4.6.1.6 and Table 7, and shall:

a) Direct water to the outside of the wall *cladding*, and

b) For *direct fixed cladding*, *stopends* shown on drawings are optional.

COMMENT:
Stopends are useful to prevent water moving past the ends of head *flashings*. However, additional problems of weatherproofing can occur where the *stopend* penetrates the *cladding*.

c) For wall *claddings* on cavity walls, incorporate 10 mm turn-ups as *stopends*,

d) Have the upstand of the *flashing* protected from moisture by lapping an additional layer of *building wrap* over the upstand, or by using *flexible flashing tape* as shown in *Figure 71*. The additional *building wrap* shall extend from the nearest lap above, and be lapped under the top layer.

9.1.10.5 Window sills

Sill tray *flashings* shall be in accordance with Paragraph 4.6.1.6 and Table 7.

a) *Direct fixed claddings* shall have sill tray *flashings* that direct moisture to the outside face of the *cladding system* as shown in the *details included in Paragraph 9.2* to Paragraph 9.9. The sill *flashing* shall extend back past the condensation channel of the *window*. The 5 *mm gap between the window* facing and sill tray must not be sealed.

b) *Claddings* over a *drained cavity* shall have:
   i) face-fixed windows and doors, installed so the window frame flange facing is forward of the line of the *cavity battens*, and
   ii) no sill trays,
   iii) there is no requirement to maintain a 5 *mm gap between the cladding* and window facing at the sill with a cavity. Sealing this gap may reduce water entry during routine maintenance such as washing the *building*.

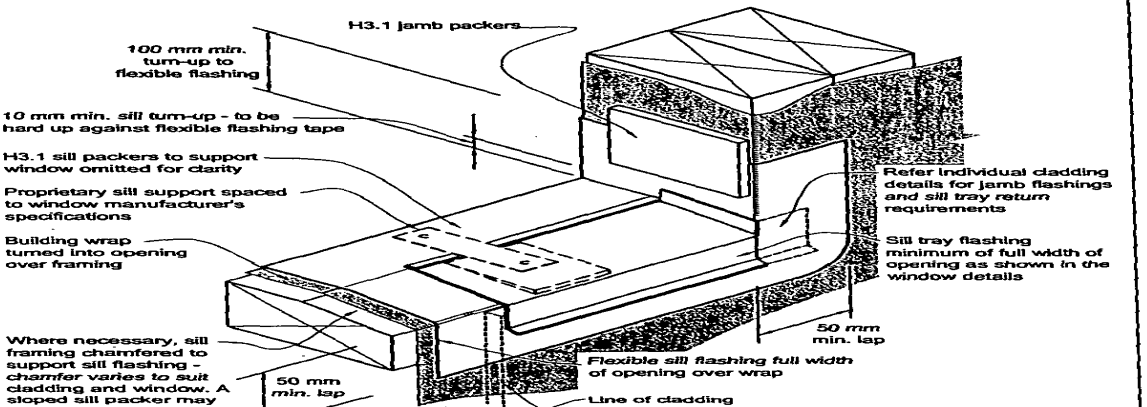
COMMENT:
If a cladding requires continuous horizontal support below the window sill, a sill tray will be needed to direct water from the back of the *drained cavity* out over the *cladding*. This will require *specific weathertightness design*.

c) *Where sill supports are needed, these* shall be to the manufacturer's recommendations, and shall be no closer than 200 mm from corners of the opening, and 100 mm from mullion to frame junction positions.

d) Certain aluminium joinery sections with a *deep profile (such as bi-fold and sliding* doors and windows) will not be able to use the sill details included in this Acceptable Solution and achieve the required window facing cover and sill support with a sloped sill tray. The sill details in these cases shall be specifically designed.

COMMENT:
Alternatives may include a flat extruded sill tray with a *stopend* on three sides. Manufacturers should be consulted for specific details and results of testing on these.

Figure 72: ***General window opening***
Paragraphs 9.1.5 and 9.1.10.2, Figures 76, 81-86, 90, 91, 95, 99, 115, 116, 127 and 128



NOTE:
(1) Detailed *cladding* omitted for clarity, refer to specific *claddings*.
(2) *Sill flashing shall extend* back past the *condensation channel* of the window.
(3) Head to be treated similarly with continuous *building wrap* and *flexible flashing tape* at corners.
(4) Openings in *cavity walls* shall be treated similarly, except the sill *flashings* shall be omitted.

9.1.10.6 Jamb flashings

Jamb *flashings* shall be in accordance with Paragraph 4.6.1.6 and Table 7, and shall be installed where required in the figures included in Paragraph 9.2 to Paragraph 9.9.

Where required, jamb *flashings* shall overlap sill *flashings*, and direct moisture to the outside face of the *cladding system*.

9.1.10.7 Closed cell foam tape

Compressible foam tape shown behind window facings and *cladding* joints shall be closed cell PVC foam, with:

a) Hardness 55-60 to ASTM D2240 Scale OO,

b) Grade VE-43 to ASTM D1667,

c) Compression set of 20% maximum to ASTM D1667, and

d) UV weathering in UV Weatherometer for 1500 light hours to ASTM G154 or ASTM G155 with no visible deterioration in appearance.

9.2 Masonry Veneer

9.2.1 Limitations

This Acceptable Solution is limited to:

a) Clay brick veneer on timber *framing*, and

b) Concrete brick or block veneer on timber *framing*.

COMMENT:
Natural stone bricks or blocks may be suitable. However, these are not part of this Acceptable Solution. Refer to the manufacturer's recommendations for *specific weathertightness design* information.

9.2.2 General

Installation of *masonry veneer* shall be by trained installers, approved by the manufacturer or the NZ agent (in the case of imported *masonry veneer*).

COMMENT:
It is recommended that an installer has successfully completed, or demonstrated skill to the level of, an NZQA *recognised course*.

9.2.3 Installation

Masonry veneer on timber *framing* shall be an Acceptable Solution provided that:

a) The installation complies with SNZ HB 4236 and NZS 3604,

b) The *drained cavity* is sealed off from both the roof space and subfloor space,

c) A *building wrap* complying with Table 23 is applied to the face of timber *framing* in the cavity, and

d) *Control joints* are included as described in Paragraph 9.2.4.

9.2.4 Control joints

9.2.4.1 Clay bricks

Control joints shall be included at locations specified by the brick manufacturer.

When *control joints* are used, they shall be formed as shown in Figure 73, and shall have:

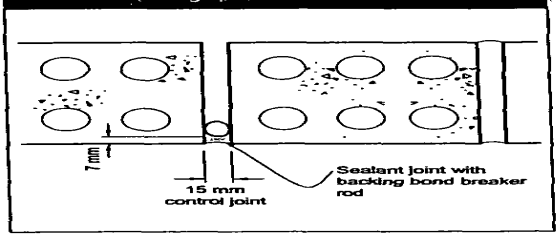
a) A backer rod of compressible foam complying with ASTM C1330, and

b) Sealant in compliance with:
   i) Type F, Class 20LM or 25LM of ISO 11600, or
   ii) low modulus Type II Class A of Federal Specification TT-S-00230C.

COMMENT:
Control joints are not normally necessary for clay bricks except in long walls or at abutments.

Cracks are cosmetic and not likely to cause a moisture problem because of the presence of the cavity. Manufacturers can provide additional information on *control joints*.

Figure 73: Vertical control joint
Paragraphs 9.2.4.1 and 9.2.5



9.2.5 Concrete bricks

Control joints shall be included as specified in the New Zealand Concrete Masonry Manual and in any other locations specified by the manufacturer. *Control joints* shall be formed as shown in Figure 73.

COMMENT:
Concrete bricks shrink over time and this must be allowed for in the design of the *masonry veneer*. Manufacturers can provide additional information on *control joints*.

9.2.6 Windows and doors

The openings in wall *framing* for windows and doors shall have *building wrap* and *flexible flashing tape* applied, in accordance with Paragraph 9.1.5.

Air seals shall be provided in accordance with Paragraph 9.1.6.

Window *flashings* shall be installed in accordance with SNZ HB 4236.

9.2.7 Bottom of masonry veneer

Clearances to ground levels at the bottom of *masonry veneer* shall be in accordance with Paragraph 9.1.3.2.

Vents at the top and drainholes at the base of the *masonry veneer* shall be installed in accordance with SNZ HB 4236 and NZS 3604.

9.2.8 Secondary cladding

Where a secondary *cladding* is used with the *masonry veneer*, and is *direct fixed* to *framing* above windows or at gable ends, this shall be fully sealed on:

a) The face of the *cladding*,

b) All edges of the *cladding*, and

c) A 75 mm *minimum perimeter strip* on the rear of the *cladding*.

BCI-61

Application form for Building consent and/or Project Information Memorandum

Waitakere City Council
Te Tatau o Waitakere

Counter Services

Section 33 or section 45 Building Act 2004 CAT 2

25 SEP 2009 **Office use only**

Consent number Com 20091374 **Date received**

1.THE OWNER		2.AGENT (only required if application is being made on owners behalf)	
Name of owner	NEW ZEALAND HOUSING FOUNDATION	Name of agent	
If owner is a company or trust provide name of contact person	(LOUISE DUNN or BRIAN DONELLY)	If agent is a company or trust provide name of contact person	
Mailing address	P.O. BOX 44018 POINT CHEVALIER, AUCKLAND 1246.	Mailing address	
Street address (For courier)	55 CARRINGTON RD MT ALBERT.	Street address (For courier)	
Landline number	(09) 849 4395 (LOUISE DUNN)	Landline number	
Mobile number	027 559 4524	Mobile number	
After hours	—	After hours	
Facsimile number	(09) 849 4396.	Facsimile number	
Email address	louise.d@housing.foundation.co.nz	Email address	

3. LICENSED BUILDING PRACTITIONERS *(Complete this section ONLY if a Licensed Building Practitioner has been engaged)*

Design License No.	100433 - Design. 2.	Contact person	Bob Bennett.	Ph number	(09) 296 6369
Site License No.		Contact person		Ph number	
Builder License No.		Contact person		Ph number	
DIY		Contact person		Ph number	

4. APPLICATION

I request that you issue a building consent ☑ project information memorandum ☑ for the building work described in this application. *(Please tick one or both as appropriate)*

Project Information Memorandum Number *(If applied for previously)* —

Contact phone number/s 8494395 0275594524

GST Number 98-386-904

I will notify council if any of the information provided on this application form changes before building consent is granted.

Signature of owner/agent _____ Date 24/9/09

5. THE BUILDING

Address of building 19 THCH PLACE - GLEN EDEN.

Legal description: Lot Number Lot 32 - which is a subdivision of Lot 2. DP Number 339810

Building name/Trading name —

Location of building within site/block number AS PER SITE LOCALITY PLAN.

Level/unit number — Site Area (m2) 349 m2

Current, lawfully established, use VACANT LAND / PROPOSED NEW DWELLING.

Include number of occupants per level and per use — Year first constructed NEW

6. THE PROJECT

Stage 1 of an intended 1 Stages

Description of the building work:

(Provide sufficient description of building work to enable scope of work to be fully understood continue on a separate page if necessary, or refer to an attached documents setting out the description)

PROPOSED NEW 5 BEDROOM DWELLING WITH ATTACHED (INTERNAL ACCESS) GARAGE.

What is the existing use of the building? N/A

Will the building work result in a change of use for the building? Yes ☐ No ☑ *(Please tick appropriate one)*

If yes, provide details of the new use

Does the building work create a granny flat and/ or minor unit? Yes ☐ No ☑ *(Please tick appropriate one)*

Intended life of new building *(if less than 50 years)* 50+ years (Indefinite)

Estimated value of intended work *(include GST)* $203,600

Existing gross floor area (m2) ——— Floor area of new work (m2) 180 m² Total floor area (m2) 180m2

List consents (if any) previously issued for this project *(resource, building, subdivision)*

7. PROJECT INFORMATION MEMORANDUM *(Complete this section ONLY if you are applying for a Project Information Memorandum)*

The following matters are involved in this project: *(Tick relevant matters)*

☐ Subdivision ☐ Alterations to land contours ☐ New or altered connections to public utilities

☑ New or altered locations and/ or external dimensions of buildings ☑ New or altered access for vehicles

☐ Building work over or adjacent to any road or public place ☑ Disposal of stormwater

☐ Building work over any existing drains or sewers or in close proximity to wells or water mains

☐ Other matters known to the applicant that may require authorisations from the territorial authority: *(please specify)*

8. THE BUILDING CONSENT *(Complete this section ONLY if you are applying for a building consent)*

The following plans and specifications are attached to this application: *(Please tick appropriate box)*

☑ Specifications ☑ Calculations ☑ Producer Statement ☑ Plans* ☐ Other

**Provide two sets of plans and a third copy of floor plans with application as specified on Lodgement Checklist*

Do any of the drawings for building consent include any existing building work constructed without building consent/ permit?

(Please tick appropriate box) ☐ Yes ☑ No

Does the property have an outstanding Notice to Fix? *(Please tick appropriate box)* ☐ Yes ☑ No

If yes, please include copy of Notice to Fix with application.

9. The building work will comply with the following code(s): *(Complete this section ONLY if you are applying for a building consent)*

Clause *(involved in the proposed work)*	**Means of Compliance** *(refer to compliance documents(s) or detail of alternative solution in the plans or specifications)*	**Clause** *(involved in the proposed work)*	**Means of Compliance** *(refer to compliance documents(s) or detail of alternative solution in the plans or specifications)*
B1 Structure	☑ B1/AS2 ☑ NZS 3604 ☐ NZS4229 ☐ NZS4203 ☐ Other	**G1 Personal hygiene**	☑ G1/AS1 ☐ Other
B2 Durability	☑ B2/AS1 ☐ NZS 3101 ☐ NZS3604 ☐ NZS3602 ☐ Other	**G2 Laundering**	☑ G2/AS1 ☐ Other
C1-4 Fire	☐ C/AS1 ☐ Other	**G3 Food preparation and prevention of contamination**	☑ G3/AS1 ☐ Other
D1 Access Routes	☑ D1/AS1 ☐ NZS 4121 ☐ Other	**G4 Ventilation**	☑ G4/AS1 ☐ AS1668.2 ☐ Other
D2 Mechanical installations for access	☐ D2/AS1 ☐ NZS 4332 ☐ EN81 ☐ EN115 ☐ Other	**G5 Interior environment**	☑ G5/AS1 ☐ Other
E1 Surface water	☑ E1/AS1 ☐ AS/NZS3500.3 ☐ Other	**G6 Airborne and impact sound**	☐ G6/AS1 ☐ Other
E2 External moisture	☑ E2/AS1 ☐ Specific design and testing ☐ Other	**G7 Natural light**	☑ G7/AS1 ☐ Other
E3 Internal moisture	☑ E3/AS1 ☐ Other	**G8 Artificial light**	☐ G8/AS1 ☐ NZS 6703 ☐ Other
F1Hazardous agents on site	☐ F1/AS1 ☐ Other	**G9 Electricity**	☑ G9/AS1 ☐ Other
F2 Hazardous building materials	☑ F2/AS1 ☐ NZS4223	**G10 Piped services**	☐ G10/AS1 ☐ NZS 5261 ☐ Other
F3 Hazardous substances	☐ F3/AS1 ☐ Other	**G11 Gas as an energy source**	☐ G11/AS1 ☐ Other
F4 Safety from falling	☑ F4/AS1 ☐ FSP Act ☐ Other	**G12 Water supplies**	☑ G12/AS1 ☐ AS/NZS3500.2 ☐ AS/NZS3500.5 ☐ Other
F5 Construction and demolition hazards	☐ F5/AS1 ☐ Other	**G13 Foul water**	☑ G13/AS1 ☐ BS5572 ☐ AS/NZS3500.2 ☐ Other
F6 Lighting for emergency	☐ F6/AS1 ☐ Other	**G14 Industrial liquid waste**	☐ G14/AS1 ☐ Other
F7 Warning systems	☑ F7/AS1 ☐ NZS1668 ☐ NZS4512 ☐ NZS4515 ☐ Other	**G15 Solid waste**	☐ G15/AS1 ☐ Other
F8 Signs	☐ F8/AS1 ☐ Other	**H1 Energy efficiency**	☑ H1/AS1 ☐ NZS 4218 ☐ NZS4243 ☐ NZS4241 ☐ ALF Design Manual ☐ Other

IMPORTANT NOTICES

Commencement of work
A building consent cannot be issued for any work that has been commenced/ completed prior to the granting of the building consent. Undertaking building work before the consent is granted is an offence under the Building Act 2004 for which the owner and contractors can be prosecuted and fined. I confirm that this application does not relate to building work that has already been commenced.

Availability of Information
The information collected in this form is required under the provisions of the Building Act 2004. This information forms part of the Council's records relating to the property and will be held for at least the life of the building to which it relates. The information is available to any person who wishes to inspect Council's records except for those plans marked confidential under Section 217 of the Building Act 2004.Information relating to the applicant/ owner, the project and the property contained in this form will be used as part of the statistical information produced by the Council which is provided to Statistics New Zealand and Quotable Values and is also available, for a fee, to any person upon request from the Council.

Fees
A fee is required on lodgement of all applications. All base fees and lodgement fees are the minimum operational costs incurred by Council and are therefore non-refundable. All other fees shall be paid in full without set-off or deduction of any kind within 14 days of the date of the invoice or prior to the issue of the Building Consent, whichever is the sooner. The owner shall further pay to Waitakere City Council, all costs and expenses (including costs on a solicitor/ client basis and debt collector's costs) incurred in the enforcing or attempting to enforce these terms and conditions or in seeking payment of all fees. Where you fail to make payment of any amount on the due date, Waitakere City Council may in addition require you to compensate it by making payment of interest as liquidated damages on the amount due from the due date for payment until the date of actual payment at a rate equal to the current overdraft interest rate Waitakere City Council has with its principal registered bank. All development contributions will be billed to the owner(s). Refer to the current Regulatory Fees & Charges Schedule for upfront Building Consent fees.

10. BUILDING CONSENT APPLICATION CHECKLIST

Please check that all items on the checklist relevant to your building consent have been completed and included. The application will not be accepted by Council unless all the required and appropriate information is provided.

Attachments

- [x] Lodgement Checklist
- [ ] Application for Compliance Schedule
- [x] Water meter connection form
- [ ] Development Contribution Notice
- [ ] Project Information Memorandum(PIM)/ Certificate attached to PIM
- [ ] Application for Vehicle Crossing/ Street damage deposit
- [x] Certificate of Title* / letter of authorisation from the owner for agent to make application on the owner's behalf
- [x] Plans and specifications *(as listed by applicant under section 8 "The Building Consent" above)*

**Certificate of Title must not be older than 90 days*

DECLARATION

All the above information is, to the best of my knowledge, true and correct. I understand that all plans, documentation and reports submitted as part of an application are required to be kept available for public record. Therefore the public may view this application, once submitted.

I have authorisation from my co-owners to sign this application on their behalf. If this application is submitted by an agent a letter of authorisation from the owner to make the application in their behalf has been provided. The letter outlines alternative billing instructions if the primary contact for billing is not the owner.

Signature of Owner*/ Authorised agent _____ Date 24/9/09

*If application submitted on behalf of company/ trust include copy of authorising documents for the company/trust and sign below.

I, Louise Dunn have authority to bind the trust/ company to the agreement.

Signature _____ Date 24/9/09

SUBMITTING YOUR APPLICATION

To submit your application for Building Consent via a pre-lodgement meeting, please call Waitakere City Council Customer Services to arrange meeting time. Phone 839 0400.

Location for pre-lodgement meeting: Waitakere Central, 6 Henderson Valley Road, Henderson

Alternatively mail your Application for Building Consent to: Waitakere City Council, Private Bag 93109,Henderson, WAITAKERE 0650

If you have any queries about any part of the Building Consent process, please contact our Customer Services line 839 0400 or email info@waitakere.govt.nz

LOT 32
NEW APPLICATION (Formerly 4A now 5A)

NEW ZEALAND HOUSING FOUNDATION

Type 5A House

This is a Standard TYPE 5A HOUSE

ATTACHED DOCUMENTS ARE

1- ALL COUNCIL APPLICATION FORMS FOR THIS LOT .

2- A COPY OF THE MASTER CERT. OF TITLE.

3- 2 COPIES OF FULL SPECIFICATIONS AS PER STD PLANS.

4- 2 COPIES OF ENGINEERS CALCS AND FLOOR SLAB DESIGN (INCLUDING PS1 BY ENGINEER).

5- 2 FULL SETS OF WORKING DRAWINGS.

6- 1 ADDITIONAL COPY OF THE FLOOR PLANS.

7- 2 SETS OF – THE RESOURCE CONSENT.
- **THE EARTHWORKS COMPLETION REPORT.**
- **THE GEOTECH COMPLETION REPORT.**

THERE ARE MINOR CHANGES FROM THE STD PLAN

- **WINDOW AND DOOR CHANGES TO THE LOWER LEVEL.**
- **THE KITCHEN NOW PROJECTS OUT 400MM.**
- **LINTEL AND BRACING CHANGES TO SUIT THE ABOVE.**

NOTE THIS IS A NEW PLAN FOR LOT 32 AND REPLACES ALL PREVIOUS CONSENTS

Engineering Plan Approval Application Form

Waitakere City Council
Te Taiao o Waitakere

Send to:
Chief Executive
Waitakere City Council
Private Bag 93109
Henderson
WAITAKERE 0650

Deliver to:
Waitakere Central
6 Henderson Valley Road
Henderson
Telephone (09) 839 0400
Facsimile (09) 836 8001

Applicants Name: Dinesh Mani
(specify if owner, occupier etc)

Site Address: 69 Morgan Avenue,

Agents Name: EMACS Group Limited.

Address for Service: PO Box 67-026, Mt Eden, Auckland.
(including invoicing)

Type of Approval required
(Applicant must tick what approval they require)

☑	Ecowater	☐	Transport Assets	☐	Parks
☐	Shared Driveway	☐	Earthworks	☐	Other (must specify)

Associated Consents Reference Numbers
(Applicant must specify which consents eng approval is in relation to)

Land Use consent LUC LUC-2009-456.

Subdivision consent SUB

Building consent COM/ABA COM-2009-501

☐ None

List Attachments:
(Applicant must specify which plans are attached, and have the minimum copies)
Amended drainage and site plan.

Amendment was required due to non-recorded public sewer assets.

Note: The minimum number of plans is dependent upon the number of approvals being sought and should be equal to the number of approvals plus two. For example if Ecowater and driveway approvals are being sought then the required number of plans will be four.

Waitakere City Council
Te Taiao o Waitakere

Waitakere City Council
Waitakere Central
6 Henderson Valley Road
Henderson 0612

Private Bag 93109
Henderson 0650
Waitakere

Telephone
09 836 8000

24Hr Call Centre
09 839 0400

Facsimile
09 836 8001

DX CX 10250 Auckland Mail Centre
Email: info@waitakere.govt.nz

Website: www.waitakere.govt.nz

5 November 2009

Dinesh Mani
P. O. Box 15093
New Lynn
WAITAKERE 0640

Dear Sir,

APPLICATION NUMBER: COM-2009-501, EWA-2009-241
APLICATION ADDRESS: 69 Margan Ave, New Lynn.

We were informed by council drainage contractor that an existing public wastewater manhole with a 150 dia drain connection was discovered under the garage that had just been demolished. Council has initiated the investigation process to map out the wastewater drain.

Please be advised that the building works cannot proceed as per approved plan as public manhole cannot be built over. A minimum 1 m clearance between the wall of council manhole and the building footprint is required. Amendment to the building consent granted is necessary to address these requirements.

You may either wait until the investigation work is completed by council and use the as-built information for amending the plan or you may proceed to locate the manhole and the drain onsite to expedite the process.

Meanwhile the drain relaying works will be suspended until the amendment plan issue is resolved.

If you need any further clarification please do not hesitate to contact the undersigned at extension 9418.

Kind Regards,

Jason Lim
Subdivision & Consent Engineer
EcoWater

VXG-2009-1023

Vehicle Crossing Application and Street Damage Deposit

Send to: The Chief Executive
Waitakere City Council
Private Bag 93109
Henderson
WAITAKERE 0650

For more information: Waitakere Central
Civic Centre, 6 Henderson Valley Road
Henderson
Telephone (09) 839 0400
Facsimile (09) 836 8001

Waitakere City Council
Te Tiriti o Waitakere

Property owner's name: N.Z. HOUSING FOUNDATION.
Address: P.O. BOX 44018, Pt CHEVALIER · 1246.
Phone number: (09) 849 4395

Applicants name: N.Z. HOUSING FOUNDATION
Address: As Above.
Phone: _____ Mobile: _____
Fax: _____

Project Location

Address: 19 TITCH PLACE,
Suburb: GLEN EDEN.
Lot No: Lot 32 - SUBDIVISION OF 2 DP No: 339810

Project type. Circle on or more as required:
(Vehicle Crossing) (Building) Subdivision

Vehicle Crossing Information

Note: Every property is required to have a complying vehicle crossing. *Please answer every question.*

A vehicle crossing is / is not in place. Crossing is Council certified.
(Yes / ~~No~~ / Unknown.)

The road is: ☑ Kerbed & channelled ☐ Unkerbed

Property: ☑ Meets the road boundary ☐ is on a....unit access

I intend to build a vehicle crossing to the following grade:

Grade: ☑ Residential ☐ Light Commercial ☐ Commercial

Note: Residential crossings serving 5 or more units, require a light commercial grade.

A vehicle crossing complying with Council Standard will be in place at the completion of the work, as per conditions 2 & 3 below.

Resource consent/R & T application. (see condition 3 below)
☑ Has been made ☐ Has not been made

FEE & DEPOSIT DETAILS

See attached Bond and Fees Schedule

Street Damage Inspection (tick if required)

Preliminary street inspection required (optional) ☐

(If not requested the applicant shall be deemed to have accepted that the road, footpath & berm are in good condition at commencement of works.) Bond VXG20071463

Vehicle Crossing Inspection (tick if required)

Boxing check / pre-seal inspection ☐

(After boxing is completed, scoria compacted, cut off drains and reinforcing are in place or metal shaped and compacted sealed crossings.)

Final Inspection (mandatory)

(A final inspection is required regardless of whether or not a deposit is lodged. *Any additional re-inspections required at either the boxing or final inspection shall be at the applicants' cost.*)

Final Inspection ☑

(After construction joints cut, topsoiling & street damage reinstated.)

Receipt No: _____

To Book All Inspections

Please phone 836 8000, extension 8308 or 8725 giving a minimum of one full working days notice. Bookings close at 3.00 pm.

Conditions Please read carefully.

Note: Every property is required to have a complying vehicle crossing.
Under the local Government Act and Council Bylaw No.22, "Use of Public Roads" Council may grant permission for works to make use of the road reserve for site access subject to:

1. Lodging of a Street Damage Deposit and payment of the relevant inspection fee.
2. The applicant obtaining a copy of Council's vehicle crossing standards appropriate to the road type and the extent of the work being done, and on completion of the work, each property involved being serviced by a vehicle crossing which extends from the road edge to the property boundary and has been either installed or upgraded to meet those standards, including requirements for visibility, drainage control, safety platform and surfacing. All crossings are to have the appropriate *inpsections.*
3. The obtaining of a Resource Consent or Roading and Traffic Approval as detailed in "Vehicle Crossing notes & specifications" for any crossing not complying with Council's "Code of Practice" and for those encroaching on a parking bay by more than 1 metre.
4. All proposed excavations over 250mm having the depth and location of services confirmed by hand digging prior to excavation. Any repairs to services will be at the applicants expense.
5. The applicant taking all steps necessary to avoid damage to the street, footpath or berm and any such damage being reinstated to the satisfaction of Council.
6. *The frontage and footpath of each property being kept to a reasonable safety standard during the works. This may require the building of a temporary crossing.*
7. Apart from 8 below, unless a "Bond transfer" form has been filled in, Council will only make refunds in the name of the payer recorded on the receipt. Transfer form attached.....(Unmarked="no")
8. In the event of the property changing ownership before the above works are completed, Council may refund all deposits to the current owner at the time of final clearance.
9. Any additional work undertaken by Council, eg extra inspections or safety work, may be added from the refundable Street Damage Deposit.

I have read the above conditions and those overleaf. I agree to abide by them and those contained in Council's "Code of Practice" and "Vehicle Crossing Notes and Specifications".

Property Owner's Signature: _____ Date: 24/9/09

EcoWater
A Division of WAITAKERE CITY COUNCIL

WATER SUPPLY NEW CONNECTION

water meter approval under 3WATER - 2008-607

Application for New Connection to WCC's Network

Please complete separate forms for each legal address, and connections required on different days.
For efficient processing, submit this with your building consent. Fees to be paid in full prior to building consent issue. Processing timeframe is 20 working days. Enquiries to Waitakere City Council Call Centre on 839 0400.

OFFICE USE ONLY

Application Number:

3WATER - _____ - _____

Lodgement Date: _____

Checklist of Information Required

- ☐ Form completed & signed
- ☐ Site plan attached
- ☐ Water engineer's report (for special connections)

Do not accept the application for processing until all details, plans, reports and signatures are provided.

Special Connections

Water Asset Engineer authorisation:

_____

- ☐ Backflow device required

Processing & Approval Details

Name of processing engineer:

_____

- ☐ Further information required
- ☐ Declined decision
- ☐ Approved decision
- ☐ Conditions & fees applied
- ☐ Letter and invoice sent
- ☐ Invoice paid by customer
- ☐ Connection date advised

Job Request Details

- ☐ Service Request job created

SR#s _____

_____

_____

- ☐ Fax to contractor
- ☐ Job completed (Pathway)
- ☐ As-Built received
- ☐ As-Built to GIS

PROPERTY DETAILS

Property Address: 19 TITCH PLACE subdivision of

Suburb: GLEN EDEN Lot: 2 DP: 339810

If this property has a subdivision consent in progress, which proposed Lots are included in this application?

Proposed Lot # s 32

Other current consents on this property?

PIM # _____ ABA/COM # _____

SUB # _____ LUC # RMA 20061077

WATER SUPPLY CONNECTION DETAILS

Standard Connections *(if you don't know what size meter you need, please discuss with EcoWater's Duty Engineer)*

- ☑ 15mm meter *(building within 35m of public watermain)*
  How many 15mm meters will be installed at the same time? Please specify: _____
- ☐ 20mm meter *(building further than 35m from public watermain)*
  How many 20mm meters will be installed at the same time? Please specify: _____

Special Connections *(not available in Hobsonville or Whenuapai)*

- ☐ 25mm connection and meter *(eg. very long or steep uphill driveways, domestic sprinkler system, etc)*
- ☐ 50mm connection and meter *(eg. resthome, high water use industrial, etc.)*

What is your reason for requesting a special connection? Please specify: _____

Special connections require a Water Engineer's Report to verify the size, pressure and flow rates are appropriate.

What is the flow rate required at the meter? Please specify: _____ (l/s)

Location of Connection

- Clearly draw **WM** at your requested meter location on the site plan, and attach a copy to this application.
- Meters must be clear of driveways, footpaths or fences, and be accessible by Council at all times.
- Water connections should be located near the power and phone connections where possible.
- Meters will be installed approximately 300mm inside the property's road frontage boundary.

TIMING OF WORKS and CONTACT DETAILS

When would you like us to install the connection?

Failure to be prepared for the connection on the date requested will result in additional charges.

- ☐ Directly after payment and advice to Call Centre *(within 10 working days for pop-on) (within 20 working days for dig-down/special)*
- ☑ Mutually agreed date: _____ *(if outside standard timeframe)* **Discuss with EcoWater Customer Services**

Contact details for problems on site during installation?

First Name: Lance Surname: Goldsmith

Company Name *(if applicable)*: Goldsmith Developments

Phone: _____ Mobile: 021 752280

Please turn over and complete other side

Waitakere's ThreeWaters

eco city

Waitakere City Council
Te Taiao o Waitakere

EcoWater
A Division of Waitakere City Council

WATER SUPPLY NEW CONNECTION

Application for New Connection to Waitakere City Council's Network

DEVELOPMENT TYPE TO BE SERVICED

- [x] Residential (eg. dwelling, minor dwelling)
- [ ] Mixed Use Residential *(specify below)* (eg. dwelling/office, dwelling/hairdresser)
- [ ] Commercial *(specify below)*
- [ ] Industrial *(specify below)*
- [ ] Other *(specify below)* (incl. bulk water carriers)

Please specify type of development:

WATER USAGE DETAILS

Is the property already supplied with water? [ ] Yes [ ] No

Were any buildings demolished to which water was supplied? [ ] Yes [x] No

Please tick the boxes below for any applicable water systems or water uses that will occur on the property. If any apply, a report needs to be provided.

- [ ] Fire Sprinkler
- [ ] Fire Hose Reel
- [ ] Irrigation
- [ ] Rain tank top-up
- [ ] Water use for industrial processes (please specify process details):
- [ ] Other (please specify):

APPLICANT'S DETAILS

First Name: Surname:

Company Name (if applicable):

Phone: Mobile: Email:

BILLING INFORMATION

LEGAL OWNER OF THE PROPERTY TO BE CONNECTED AT THE TIME OF APPLICATION
(This person is responsible for payment of the ongoing water charges until such time as legal ownership changes)

First Name: Louise Surname: Dunn Signature of Owner/Agent:

Company Name (if applicable): New Zealand Housing Foundation

Postal Address: PO Box 44018, Point Chevalier, Auckland 1246

Phone: 849 4395 Fax: 849 4396 Email: louise.d@housingfoundation.co.nz

What name do you want to appear on the invoice? (if different from legal owner above)

First Name: Surname: Signature of Debtor:

Company Name (if applicable):

Postal Address:

Phone: Fax: Email:

APPLICANT'S DECLARATION

I, the undersigned, hereby declare that the information given on this application is true and correct, that access to the property to undertake the requested works is authorised by all owners and occupiers, that all fees incurred will be paid in full, and that I will abide by Council's Bylaws, Plumbing Regulations and the NZ Building Act.

Name *(please print)*: Louise Dunn

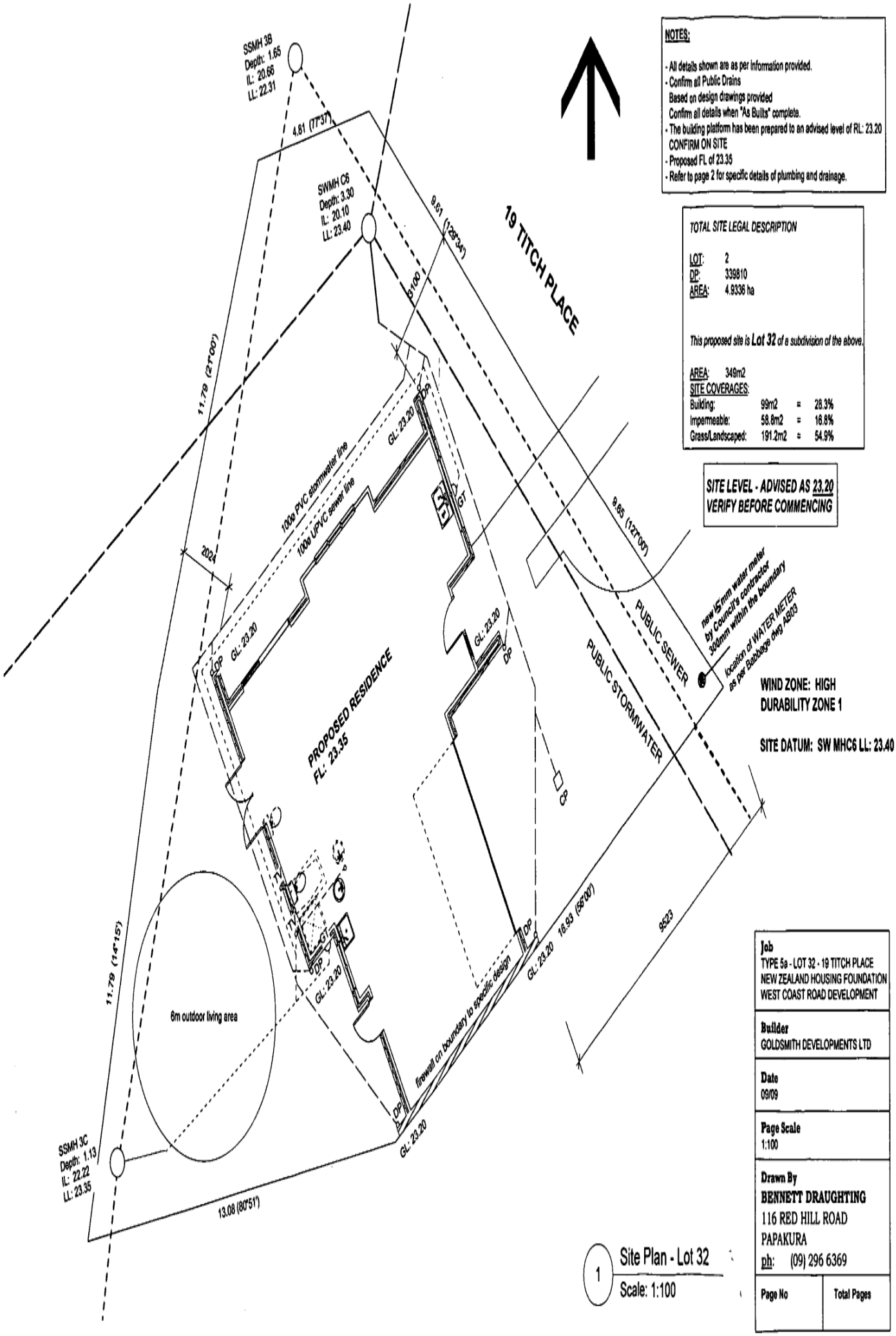
Signature: Date: 24/9/09

For further assistance please phone our 24 hour call centre on 839 0400 or visit: **www.waitakere.govt.nz**

Waitakere's ThreeWaters

eco city

Waitakere City Council
Te Taiao o Waitakere



NOTES:

- All details shown are as per information provided.
- Confirm all Public Drains
  Based on design drawings provided
  Confirm all details when "As Builts" complete.
- The building platform has been prepared to an advised level of RL: 23.20
  CONFIRM ON SITE
- Proposed FL of 23.35
- Refer to page 2 for specific details of plumbing and drainage.

TOTAL SITE LEGAL DESCRIPTION

LOT: 2
DP: 339810
AREA: 4.9336 ha

This proposed site is ***Lot 32*** *of a subdivision of the above.*

AREA: 349m2
SITE COVERAGES:

Building:	99m2	=	28.3%
Impermeable:	58.8m2	=	16.8%
Grass/Landscaped:	191.2m2	=	54.9%

SITE LEVEL - ADVISED AS 23.20
VERIFY BEFORE COMMENCING

1 Site Plan - Lot 32
Scale: 1:100

Job
TYPE 5a - LOT 32 - 19 TITCH PLACE
NEW ZEALAND HOUSING FOUNDATION
WEST COAST ROAD DEVELOPMENT

Builder
GOLDSMITH DEVELOPMENTS LTD

Date
09/09

Page Scale
1:100

Drawn By
BENNETT DRAUGHTING
116 RED HILL ROAD
PAPAKURA
ph: (09) 296 6369

Page No	Total Pages

BCI-09

Building consent application process sheet
General

Waitakere City Council
Te Taiao o Waitakere

Address	19 Tiltch Place	**Lot**	32	**DP**	339	**Lodgement Date**	28/9/09
ABA/COM	2009 - 1374			**PIM**		**Account Manager**	RADA.

	TO	DATE IN	DATE OUT	SENT TO	DECISION (P=PASS F=FAIL C=CANCEL)	STAFF NAME	TIME
	101 Lodgement/Vetting	28/9/09	29/9/09		C	AB	.45
	102 Process Support	2					
	10A Distribution	29/9/09	01 OCT 2009			Q.D	.2
	103 Building Surveyor	02/10/09	6/10/09	10E	letter		5.0
		15/10/09	15/10/09		F		
	104 Plumbing & Drainage	9/10/09	12 OCT 2009	10M	F		.8
	Surveyor (Retic. Site)						
	10S Plumbing & Drainage						
	Surveyor (Septic Tanks)						
	105 Structural Check						
	PSI - OK.						
	10E EcoWater	8/10/09	9/10/09	104	F	JL	BW
	10F Fire & Egress						
	10H Environmental Health						
	10R Roading & Traffic						
	10P Pool & Fencing						
	Legal						
	Other						
224C ISSUED	10L Resource Planner						

Financial contributions	Yes / No	**Is a section 37 required?**	Yes / No If yes	☐ No building work to commence ☐ Specific building work to commence
Uplifted		**Date:**		

	10M Account Manager	~~15 OCT 2009~~ 16/10/09	10X			BSK.	0.65
	13/10/09 ~~01 OCT 2009~~	29/9/09	02/10/09	103	PETER	BSK.	0.75
			12/09/10	10X	P	LARREN	0.20
RMA	10X Final Document Preparation	13-10-09	13/10/09	SUSP	P	JM	.35
			20/10/09	PICKUP	F	JM	0.7

PSI AUTHOR OK - ANDREW WILTON

HAZARD.
LNZ.
GEO-TEC.

2.00pm

REQUIRED INSPECTIONS:	Second Hand building materials report attached	Yes / No
☐ B1 Siting and Foundations	☐ B10 Cladding – Brick Veneer	☐ P4 Pre On-Site Waste Water Disposal
☐ B2 Reinforced Concrete and Blockwork	☐ B11 Cladding - Other	☐ P5 On- Site Waste Water Installation
☐ B3 Tanking	☐ B12 Pre-Line Building	☐ P6 Final Plumbing
☐ B4 Floor Slab	☐ B13 Waterproof Membranes	☐ W1 Weather tightness
☐ B5 Specialty Slab	☐ B14 Gibnail	☐ 222 Resource Consent Monitoring
☐ B6 Timber Sub Floor	☐ B15 Final Building	☐ MISC Miscellaneous
☐ B7 Framing	☐ P1 Pre-Floor Plumbing	☐ DEM Demolition
☐ B8 Building Wrap and Cavity	☐ P2 Pre-Line Plumbing	☐ SFH Solid Fuel Heating
☐ B9 Cladding - Plaster	☐ P3 Drainage	☐ F2 Pool Fencing

Conditions (incl. 1 to 3 standard conditions)

130	Handrails & Barriers	139	Geotech PS4	161	Solid blocking	170	Reinforcing Steel	182	Demolition Site
131	Mechanical Vent	140	Add'l Inspection Fees	162	Sub floor venting	171	Cavity Plastering	PS3	Constructors PS
133	Tanking	141	Sub floor access	163	Impervious surfaces	172	High Wind Zone	PS4	Constn Review
134	Fill depth certificate	142	Driven Piles	164	Plaster systems	173	VHW Zone		
135	12 Kn connections	143	Grade B Masonry	165	Sub-Floor Framing	174	100m S/Spray zone		
136	Height of FFL	144	2nd Hand Bldng	166	Recessed Light Fittings	175	500m S/Spray Zone		
137	Heater Installation	145	Tie downs	167	Window restrictors	176	Monolithic Cladding		
138	Foundations PS4	160	Light & Ventilation	169	Smoke alarms	177	Cavity fixings		

Staff Code	Notations
PCI	A1-A5A, A6, S7, S8

BCI-09

Building consent application process sheet
General

DUPLICATE

Address	19 Tutch Place	Lot	32	DP	339	Lodgement Date	8.10
ABA/COM	2009 - 1374			PIM		Account Manager	RADA.

	TO	DATE IN	DATE OUT	SENT TO	DECISION (I=Interim F=Final P=Publicly)	STAFF NAME	TIME
	101 Lodgement/Vetting						
	102 Process Support						
	10A Distribution						
	103 Building Surveyor						
	104 Plumbing & Drainage						
	Surveyor (Retic. Site)						
	10S Plumbing & Drainage						
	Surveyor (Septic Tanks)						
	105 Structural Check	02/10	5/10/09	10F	F	SABY	2.0
	PSI - OK.						
	10E EcoWater						
	10F Fire & Egress	5/10/09	06 OCT 2009	10L	F	RS	0.4
	10H Environmental Health						
	10R Roading & Traffic						
	10P Pool & Fencing						
	Legal						
	Other						
224C ISSUED	10L Resource Planner	06 OCT 2009	13/10/09	10M	F		PW

Financial contributions	Yes / No	Is a section 37 required?	Yes / No If yes →	☐ No building work to commence ☐ Specific building work to commence
Uplifted		Date:		

	10M Account Manager	01/10 13/10/09	02/10	105	PETER	BSK	0.75
RMA	10X Final Document Preparation						

PSI. Author OK - ANDREW WILTON

LWZ
HAZARD.
GEO-TEC

REQUIRED INSPECTIONS:	Second Hand building materials report attached	Yes / No
☐ B1 Siting and Foundations	☐ B10 Cladding – Brick Veneer	☐ P4 Pre On-Site Waste Water Disposal
☐ B2 Reinforced Concrete and Blockwork	☐ B11 Cladding - Other	☐ P5 On- Site Waste Water Installation
☐ B3 Tanking	☐ B12 Pre-Line Building	☐ P6 Final Plumbing
☐ B4 Floor Slab	☐ B13 Waterproof Membranes	☐ W1 Weather tightness
☐ B5 Specialty Slab	☐ B14 Gibnail	☐ 222 Resource Consent Monitoring
☐ B6 Timber Sub Floor	☐ B15 Final Building	☐ MISC Miscellaneous
☐ B7 Framing	☐ P1 Pre-Floor Plumbing	☐ DEM Demolition
☐ B8 Building Wrap and Cavity	☐ P2 Pre-Line Plumbing	☐ SFH Solid Fuel Heating
☐ B9 Cladding - Plaster	☐ P3 Drainage	☐ F2 Pool Fencing

Conditions (incl. 1 to 3 standard conditions)

130	Handrails & Barriers	139	Geotech PS4	161	Solid blocking	170	Reinforcing Steel	182	Demolition Site
131	Mechanical Vent	140	Add'l Inspection Fees	162	Sub floor venting	171	Cavity Plastering	PS3	Constructors PS
133	Tanking	141	Sub floor access	163	Impervious surfaces	172	High Wind Zone	PS4	Constn Review
134	Fill depth certificate	142	Driven Piles	164	Plaster systems	173	VHW Zone		
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136	Height of FFL	144	2nd Hand Bldng	166	Recessed Light Fittings	175	500m S/Spray Zone		
137	Heater Installation	145	Tie downs	167	Window restrictors	176	Monolithic Cladding		
138	Foundations PS4	160	Light & Ventilation	169	Smoke alarms	177	Cavity fixings		

Staff Code	Notations

BCI-54 & 55

Checklist for building consent document preparation Residential, commercial & minor P & D

Waitakere City Council
Te Taiao o Waitakere

Consent Number: COM - 2009- 1374

The following should be checked on all consents:

1. ***Section 71 (building on land subject to natural hazards)*** *– will be noted on process sheets - should have been to Legal Services and fees charged;*
2. ***Section 75 (construction of building on 2 or more allotments)*** *– will be noted on process sheets - should have been to Legal Services and fees charged;*
3. ***Second hand materials used*** *– will be noted on checklist – if report not attached to file, check with Account Manager*
4. ***Consent for more than one unit*** *– add urgent memo for call centre.*
5. ***Swimming / Spa Pool*** *– check for pool fencing guidelines, F02 inspection, inspection fee & registration fee*
6. *Compliance schedule – Load CERT inspection, generate SPECSYS, fees on fees letter, memo.*
7. ***If all required fees have been paid the building consent can be issued****– attach post-it note for the counter.*

HARDCOPY FILES		
☑	1.	Check all **"Paused" have been "Finalled"** and **account manager has signed.**
☑	2.	Duplicate Only: **Remove process sheet and planning checklist**
☑	3.	Duplicate Only: ~~**Replace superseded plans.**~~ **Check all plans signed**
☒	4.	Original Only – ~~**Place**~~ **amendment on top of each letter request.**
PATHWAY		
☐	5.	**Location Maintenance –** Check against application form
☑		**Names Maintenance-** C/- address and owners name should be showing
☑		**Dates -** Application & Lodgement - Check against application form and any rejections
		Fees –Are there any outstanding upfront fees?
☑		**Building Categories –** Check for BT minor development categories & PIM questions
☑		**NZ Building Stats –** Check Project Value, Intended Life, work types, floor area etc
☑		**Is a VXG required? –** Lodge VXG application if value of work is over $5000.
☒		Check if Preliminary Street Damage inspection requested.
		Conditions Maintenance
☑	6.	**Conditions -** Check all conditions have been entered including 4 standard conditions.
☑		**Sort** by Condition Group & re-order if required.
☒		**Section 37** – Is stop scheduling Inspections box ticked? Have planning seen FIR?
☒		Add **urgent memo** to warn the call centre not to book inspections.
☒	7.	**Notations –** Check if notations have been entered?

☑	8.	**Inspections Maintenance** – Have all inspections been entered? Is **222** Resource Consent Monitoring inspection required? Are resource consents related?
		Workflow – Continue **Document Preparation** task
☐	9.	**Related Applications** – PIM, LUC, VXG & Water. Check fees have been entered.
☐	10.	**PIM** - Generate, Format and print
☐	11.	**Conditions** – Check formatting and print
☐	12.	***Inspection Sheets*** *– Check, sort into numerical order by column 2, print*
☐	13.	**Application status** – Tick required option
☐	14.	**Notations** –Manually generate, check and print
☐	15.	**Section 37 Certificate** – Check and print
CALCULATE FEES		
☑	16.	Check the **Debtor and Receipt** No base fee paid at Lodgement
☐	17.	**Close time recording tasks** – check for hours, rate, activity code and billable tick. Doc Prep time entered for Process Support? Enter Records, Issue & Consultant Fees.
☐	18.	For a **Pre-Pathway application** – have the additional steps been followed?
☑	19.	Complete **Time Cost Sheet & Compare with base fee.**
☐	20.	Enter Granted Fees.
☐	21.	**Section 37?** – Charge fee
☐	22.	**Produce Invoice** Debtor has a problem, invoices to be generated when resolved
☑	23.	**Enter any fees to be paid at issue stage.** Do not transfer to Debtors
☐	24.	**Print GTD fees letter(s).** Include all fees entered but not yet transferred to Debtors, Inspections, CCC, VXG, Water, Development Contributions, Compliance Schedule
☐	25.	**Double check amount due on letter against time cost sheet.** Scan and attach Time cost sheet, time recording report and consultant invoices
☑	26.	**Copying, collating and filing** – no staples left in file. Stamp copy of GTD letter with 'Consent Issued'. Is a VXG Bond Receipt Holder form required? **E-mail** to contact.
☑	27.	Insert & start **Pickup task**
☑	28.	Update **Process sheet.**
☐	29.	**Complete Clipboard** showing consents waiting to be collected by Counter

Signed _____ Dated 20-10-09

BCI-89

Residential building processing checklist

Waitakere City Council
Te Taiao o Waitakere

Instructions

1. Provide written comments in each section where applicable.
2. Y = complies N = does not comply N/A = not applicable
3. If application includes an Alternative Solution, attach completed checklist AS-01 in accordance with PR-25
4. Record and attach all communications regarding the assessment.

Address	!9, Titch PLace												
Date	1.10.09			**Consent number**		**2009-1374**	**Checked by:**					Rada Ristic	
Building Cat.	1		2		3	**Comp. level**	1	2	3	4	5		
Wind zone	L	M	H	VH	SD	**Corrosion**	Zone 1					Seaspray	

Item checked				**Comments**
Quality and N^{o} of plans	Y			Good
Specifications	Y			Specifications must be relevant to project
Description of work	Y			
Scope within NZS3604	Y			
PIM issues				**Comments**
Heritage site/building			N/A	
Power lines			N/A	
Geotechnical	Y			Report by Babbage Consultants
Flooding			N/A	
Min. floor level or HIRB	Y			Survey certificate required
Drains (Bridging and close proximity)	Y			
Section 37 / other			NA	
Site plan				**Comments**
Scale	Y			
Siting dimensions 3 minimum required			NA	
ROW >18m			N/A	N.B Fire Service approval required
Buildings closer than 1.0m to boundary			N/A	N.B Check fire ratings
Eaves closer than 670mm to boundary			N/A	N.B Check fire ratings
Retaining walls (if on bdy assumed to incur a surcharge)			N/A	
Earthworks (cut and fill)		N		
Finished floor level		N		To provide on floor plans
Datum / contours		N		To provide on Site plan

Drains - public				Comments
Public drains shown (depth / close proximity)	Y			
Ground				**Comments**
Geotechnical issues (report provided / required)	Y			
PS1 / PS2 (register checked)	Y			PS1 by Babbage Consultatnts
NZS3604 >300 kPa	Y			
Clay S, M, H, E soil	Y			
Cut / fill / piling (certificates required)			NA	
Supervision required			NA	
Driven pile (certificate required)	Y			
Special conditions	Y			
Recommendations (correctly shown on plans)	Y			
Retaining walls (specific design /other)			NA	Engineers calculations may be required
Retaining walls (construction details)			NA	
Retaining walls surcharge (slope >20° / driveway)			NA	
Retaining walls (barrier if on access route)			NA	
Foundation – concrete				**Comments**
Specific design	Y			
PS1 / PS2 (register checked)	Y			
Recommendations (correctly shown on plans)	Y			
Footings (depth / width)	Y			
Reinforcing (steel size, type, c/s)	Y			
Concrete strength (20 / 25 mPa)	Y			
Point loads (depth / size)	Y			
Columns and posts (depth / size)	Y			
Steps (sloping sites)				
Foundation - timber				**Comments**
Specific design			NA	
PS1 / PS2 (register checked)			NA	
Recommendations (correctly shown on plans)			NA	
Pile layout / spacing (check for point loads)			NA	
Pile (Size / treatment / height)			NA	
Footing (depth / size / punch pad)			NA	
Connections - type (galvanised / stainless)			NA	

Continued.....

Foundation – timber, continued				Comments
Ordinary (size / connections)			N/A	
Anchor (size / connections)	Y			
Braced (size / connections)			N/a	
Driven piles (NZS3604 / specific design)			N/A	
Driven pile (certificate required)			N/A	
DPC to piles (< 300mm)			N/A	
DPC to ground (limited clearance or cross-flow)			N/A	
Chimney foundation			N/A	
Columns and posts (depth / size)			N/A	
Foundations - walls				**Comments**
Block (size / type)			NA	
Block (height and dimensions)			NA	
Reinforcing - vertical (size / type / centres)			NA	
Reinforcing - horizontal (size / type / centres)			NA	
Block (Grade A / B / C)			NA	
Supervision required			NA	
Retaining (maximum height)			NA	
Retaining / split-level (waterproofing / protection)			NA	
Subfloor ventilation			N/A	
Subfloor access			N/A	
Slabs - standard				**Comments**
Granular fill (certificate required if >600mm)			NA	
Sand binding (25mm minimum)			NA	
Membrane (0.25 micron minimum)			NA	
Finished floor level (shown on plans)			NA	
Plumbing fixtures (position shown on plans)			NA	
Pads / thickenings (shown on plans)			NA	
Drainage pipes (floor thickenings)			NA	
Slab thickness			NA	
Saw-cuts (3.0m or 4.0m)			NA	
Mesh – 668 (12m max.) Mesh – 665 (24m max.)			NA	
Free joints (>24m)			NA	
Supplementary steel (internal corners)			NA	

Slabs – specialty				Comments
Specific design	Y			
PS1 / PS2 (register checked)	Y			PS1 by Wilton Jopubert Ltd.
Recommendations (correctly shown on plans)	Y			
Driven / bored pile (certificate required)	Y			
Membrane (0.25 micron minimum)	Y			
Finished floor level (shown on plans)	Y			
Plumbing fixtures (position shown on plans)	Y			
Pads / thickenings (shown on plans)	Y			
Drainage pipes (floor thickenings)	Y			
Subfloor				**Comments**
Timber treatment (schedule showing Grade and treatment)			NA	
Bearers (size / centres / span)			NA	
Bearers (cantilever / point loads)			NA	Engineer design required
Bearers (fixing to foundation walls)			NA	
Joist (size / centres / span / blocking)			NA	
Joist (blocking @ 1.8m over bearer)			NA	
Joist (cantilever / point loads)			NA	Engineer design required
Bracing layout (location and type)			NA	
Bracing (calculations)			NA	
Bracing (min. 4 / evenly spread)			NA	
Bracing (size / length / location)			NA	
Insulation (sisilation / polystyrene/ other)			NA	
Crawl space			NA	
Subfloor ventilation			NA	
Subfloor access			NA	
Split-floors (framing / insulation)			NA	
Flooring material (wet / dry areas)			NA	
Framing - wall				**Comments**
Timber treatment (schedule showing grade and treatment)	Y			
Wind and corrosion zones (to determine fixings)	Y			
Timber treatment (external / internal walls)	Y			

Continued....

Framing – wall, continued				Comments
Bottom plate (treatment, size, fixing details)	Y			
Stud / post (size, height, c/s)	Y			
Lintel (size / shown on plans)	Y			
Lintels (selection charts provided)	Y			
Lintel (point load)	Y			Engineer design required
Engineered beams (size / fixing)	Y			Engineer design required
Cantilevered lintels (construction details provided)	Y			Engineer design required
Engineer design (details shown on plans)	Y			Engineer design required
PS1 / PS2 (register checked)	Y		Y	
Top plate (size)	Y			
Ceiling battens (type / size / centres)	Y			
Wall linings (wet / dry areas)	Y			
Building wrap (type / compatibility)	Y			
Wind barrier (rigid / non-rigid)	Y			
Cavity battens (size / type / treatment / fixing)	Y			
Cavity (wrap, 20mm, vermin proof)	Y			
Chimney framing (framing / restraint)			NA	
Insulation (Type / R value)	Y			
Bracing calculations (provided for each floor level)	Y			
Bracing (type, height, length, location)	Y			
Bracing (evenly distributed)	Y			
Bracing (split levels / wet areas)	Y			
Diaphragms (ceiling / floor on plans)	Y			
Diaphragms (type, limitations, openings, size)	Y			
Mid-floor framing				**Comments**
Timber treatment and grade (external walls / wet areas)	Y			
Layout for each level (joist size, c/s, blocking)	Y			
Engineer designed beams (shown on plans)	Y			Engineer design required
Floor diaphragm (openings / size)	Y			
Floor lining (dry / wet areas)	Y			

Roof Framing				
Timber treatment (schedule detailing framing treatment)	Y			
Timber treatment (enclosed spaces)	Y			
Ceiling joists (size / centres / span)	Y			
Strongback / runners (size / centres / span)		N		
Rafter (size / centres / span)		N		
Ridge beam (size / span / fixing)		N		Engineer design may be required
Skillion roof (sarking thickness / type)		N		
Truss design Buildable Design	Y			Gangnail/ Mitek truss design
Bracing (type / fixings)	Y			
Building wrap (type / compatibility)	Y			
Insulation (Type / R value)	Y			
Under purlin (size / shown on plan)	Y			
Strutting beam (size / landing on L/B wall)			N/A	
Purlin / tile batten (size / fixing / span / c/s)	Y			
Eaves (width specified)	Y			
Cladding - wall				**Comments**
Type (specify type)	Y			Check for product approvals
Acceptable Solution	Y			
Alternative Solution	Y			Separate checklists have been completed –building paper
Specifications (maintenance / installation)	Y			
Bottom edge clearances (ground / decks / walls)	Y			
Installer required (condition of consent)	Y			
M/F guarantee (condition of consent)		N		
E2 risk matrix (provided / required)		N		
Flashing / air-seals (windows / doors/corners)	Y			
Flashing details (other penetrations)	Y			
Apron flashing (detailed)	Y			
Control joints (details / shown on plans)	Y			
Flashings (multiple claddings)	Y			
Solid plaster - on cavity (continuous foundation)			N/A	
Stud spacing (400 non-rigid, 600 rigid)	Y			
Plaster system (type / coats)			N/A	Check for product approvals

Continued.....

Cladding – wall, continued				Comments
Approved applicator required	Y			
PS3 required (condition of consent)	Y			
Brick veneer (height, type, cavity width, rebate)	Y			
Brick veneer (panel size, ties, angles, flashings)	Y			
2-storey (plans must be detailed and checked against M/F requirements)			N/A	
Cladding - roof				**Comments**
Type (specify type/s)		N		To specify roof cladding type
Minimum roof pitch	Y			
Specifications (maintenance / installation)		N		
Substrate (suitable for cladding)		N		
Roof penetrations (flashings detailed)		N		
Discharge (spreaders)			N/A	
Internal gutter (size / capacity/ timber treatment)	Y			
Parapets (slope / capping / framing)	Y			
Installer guarantee - roof (condition of consent)	Y			
M/F guarantee (condition of consent)			N/A	
Installer guarantee - other (condition of consent)	Y	N	N/A	
M/F guarantee (condition of consent)	Y	N	N/A	
Fire / Acoustic				**Comments**
Walls and ceilings (details shown on plans)			N/A	
Design checked (system specified - GBTL30a)			N/A	Engineer design maybe required
Plans detailed (fixings, stopping, etc)			N/A	
Paths (open path 60m max, dead end 24m max)			N/A	
External FRR wall (30/30/30 – 200mm min. return))	Y			Engineers specific detail supplied
Penetrations FRR (pipes / electrical outlets)			N/a	
No openings within 1.0m			N/A	
Stability (gable ends)			N/A	
Non-combustible claddings on external walls			N/A	
Multi-units (continuous to underside of roofing)			N/A	
200mm return each end of wall			N/A	
Acoustics design checked (system specified)			N/A	

Wet areas				Comments
Timber treatment (walls and floors)	Y			
Showers (framed and lined or / modular unit)	Y			
Waterproofing (type / substrate)	Y			To confirm type on plans
Installer guarantee (condition of consent)	Y			
Floor lining (substrate / waterproofing)	Y			
Wall lining (substrate / waterproofing)	Y			
Minimum 1 door between kitchen and WC	Y			
Basin in WC (except where adjacent to bathroom)	Y			
Mechanical light and ventilation	Y			
Laundry space (floor coverings if in garage)			NA	
Glazing (showers / joinery / skylights)		N		
Kitchen				**Comments**
Oven / Fridge / Storage (floor coverings)	Y			
Stairs / entry				**Comments**
Internal / external	Y			To provide external stairs
Tread / Rise / Pitch		N		To provide details for external stairs
Slip resistance		N		
Landings		N		
Clearance at doors		N		
Max rise 4.0m			NA	
Handrails		N		To provide details
Barriers (900mm internal / 1.0m external)		N		
Heating				**Comments**
M/F details provided			NA	
Location (seismic restraint clearances)			NA	
ARC requirements met for wood burners			N/A	
Installer guarantee (condition of consent)			NA	
Decks / balconies				**Comments**
Timber treatment (framing / substrate)			NA	
Finished floor level (clearances / air-gap)			NA	
Floor joists (size / c/s / cantilever)			NA	
Waste / overflow (if internal)			NA	
Saddle flashings (construction details)			NA	
Decking (material / membrane)			NA	

Continued.....

Decks / balconies, continued				Comments
Installer guarantee (condition of consent)			N/A	
Slip resistance			N/A	
Landings			N/A	
Steps/ handrail / barrier Tread / Rise / Pitch			N/A	
Bracing calculations >2.0m wide (125 pile min)			N/A	
3-storey – balcony top floor - specific design			N/A	
Other				**Comments**
Smoke alarms (in or within 3.0m bedrooms / all exits)	Y			
Glazing (Safety glass / skylights)	Y			
Restrictors (<760mm to floor)	Y			
Light and visual awareness	Y			
Ventilation	Y			
Producer statements	Y			
Alternative solutions	Y			
Blanket approval	Y			
Specialist components (all inputs identified)	Y			
Plans – sets collated and stamped	Y			
Conditions entered into computer	Y			
Inspection requirements identified	Y			
Checklist completed in full standards referenced, etc	Y			
Rational for all decision making steps recorded	Y			

INSPECTIONS

BO1 X	Siting & Foundation	BO8	Bld Wrap, Cavity X	B15	Final X	PO1	Prefloor Plumbing
BO2 X	Reinforced Concrete & Block work	BO9	Cladding Plaste	DEM	Demolition	PO2	Preline Plumbing
BO3	Tanking	B10	Cladding BV X	FO1	Pre-Pool Fencing	PO3	Drainage
BO4	Floor Slab	B11	Cladding Other X	FO2	Pool Fencing	PO4	Pre On-site Waste Water Disp
BO5 X	Specialty Slab	B12	Pre-line Building X	MISC	Miscellaneous	PO5	On-Site Waste Water Install'n
BO6	Timber Sub-floor	B13 X	Waterproof Membranes	PS3	Producer Stat. req'd	PO6	Final Plumbing & Drainage
BO7 X	Framing	B14	Gibnail X	PS4	Producer Stat. req'd		

CONDITIONS

130 X	Handrails & Barriers	139	Geotech PS4	161	Solid blocking	170	Reinforcing Steel	182	Demolition Site
131	Mechanical Vent	140	Add'l Inspection Fees	162	Sub floor venting	171	Cavity Plastering	PS3	Constructors PS
133	Tanking	141	Sub floor access	163	Impervious surfaces	172	High Wind Zone	PS4	Constn Review
134	Fill depth certificate	142	Driven Piles	164	Plaster system	173	VHW Zone		
135	12 Kn connections	143	Grade B Masonry	165	Sub-Floor Framing	174	100m S/Spray zone		
136	Height of FFL X	144	2nd Hand Bldng	166	Recessed Light Fittings	175	500m S/Spray Zone		

137	Heater Installation	145	Tie downs X	167	Window restrictors X	176	Monolithic Cladding		
138	Foundations PS4	160	Light & Ventilation	169	Smoke alarms X	177	Cavity fixings		

BCI-15

Checklist for assessing alternative solutions

Waitakere City Council
Te Taiao o Waitakere

Instructions

1. Provide written comments in each section where applicable.
2. Y = complies N = does not comply.
3. Refer to PR-25 Alternative Solutions for policy.
4. Record and attach all communications regarding the assessment.

1	**Property address**	**19, Titch Place**
	Consent number	**Com 2009-1374**

2 Describe the building method or product proposed.

Pallisade weatherboards

3 Record the manufacturer's name, address and contact details:

Name	**Dynex extrusions ltd.**		
Address			
Contact person			
Phone	Mobile	Fax	Email

4 Which Building Code clauses are involved?

B1	**B2**	C1	C2	C3	C4	D1
D2	E1	**E2**	E3	F1	F2	F3
F4	F5	F6	F7	F8	G1	G2
G3	G4	G5	G6	G7	G8	G9
G10	G11	G12	G13	G14	H1	

5 What type of documentation has the applicant provided for assessment?

Comparison to an acceptable solution	Y	
In-service history	Y	
Expert opinion / producer statement / peer review	Y	
Test / laboratory results		N
Determination		N
Appraisal	Y	
Technical data including maintenance and installation details	Y	N

Branz Appraisal

No: 491/2005

6 Assess the level of performance noting information relevant to the Building Code clauses covered by the building method or product proposed.

Wind region	L	**M**	H	VH	SP
Corrosion zone	**Zone 1**		Seaspray		
Complexity of design	Simple		Complex		

Is level and quality of detailing appropriate to level of risk?	Y	**N**

Comments:

7 Assess the expert's opinion.

Who is the expert?

Name:
_Branz_____

Has expert signed opinion?		N
Has expert dated opinion? (Opinion should be no older than 90 days to demonstrate currency)		N
Does opinion post date the referenced documents?	Y	

Comments

8 **Assess the expert's competence, (evidence must be provided and attached to application).**

Is expert known by Council? (must be reputable)	Y	
Has expert provided CV and referees who can attest to his competence? (N/A if CPENG)	Y	
CPENG registration checked?		N
Registration number _____		
Is expert an independent third party? (no conflict of interest)	Y	
Is the expert's opinion acceptable?	Y	

Comments

9 **Assess data supplied in support of application. Data should include laboratory and field tests, investigatory studies, case studies, calculations, comparison to standards, historical use, etc.**

Has independence of testing laboratories been demonstrated? (TELARC, IANZ, etc)		N
Are standards applicable to NZ conditions / environment	Y	
Is data relevant to the NZ Building Code clause proposed	Y	
Are assumptions made and methods		N

Comments

10 **Assess technical detail.**

Are construction details sufficient and appropriate?	Y	
Do the manufacturer's details clearly identify installation details?	Y	
Are maintenance requirements specified?	Y	
Are there any site specific features that need to be considered? (wind, corrosion, etc)		N

Comments

11 **Consider guidance information (list documents referenced)**

Determinations		N
Case law		N
Warnings / bans		N
Guidelines or other publications	Y	
Historical use	Y	

Comments

12 **Comparison to existing design (existing buildings) benchmarking**

If full compliance can not be achieved, assess reasonable practicality	Y	
Does proposal show the same level of performance?	Y	

Comments

13 **What are the limitations on its use? (list limitations, if any)**

14	Quality assurance		
	Are approved installer's required / nominated?	Y	
	Are completion certificates or producer statements required?	Y	
	Is construction supervision required?	Y	
	Will inspection records be provided on completion of work?	Y	
	Have special site instructions been identified?		N
	Are additional inspections required by the building consent authority? If yes, list below		N
	Comments		

15	Conditions of consent (list requirements)

16	Acceptability of Alternative Solution		
	Is the building method or product acceptable?	Y	
	On the balance of evidence is supporting documentation persuasive?	Y	
	Does evidence result in the same level of compliance as provided by the acceptable solutions?	Y	
	Comments		

17	Stamp each page of the plans "Alternative Solution" and identify what the Alternative Solution is.

Approving Officer: _____Radmila Ristic_____ Date6.10.09

Reviewing Officer: _____ Date: _____

Alternative Solutions - communications record

Log all communications and advise applicant if further information is required.
Medium: L=letter E = email T = telephone call F = facsimile O = other

Date / Time	Medium	Officer's initials	Summary of dialogue, requests for information, etc

Log all communications and advise applicant if further information is required. Medium: L=letter E = email T = telephone call F = facsimile O = other			
Date / Time	**Medium**	**Officer's initials**	**Summary of dialogue, requests for information, etc**

BCI-15

Checklist for assessing alternative solutions

Waitakere City Council
Te Tatao o Waitakere

Instructions

1. Provide written comments in each section where applicable.
2. Y = complies N = does not comply.
3. Refer to PR-25 Alternative Solutions for policy.
4. Record and attach all communications regarding the assessment.

1	**Property address**	**19, Titch Place**
	Consent number	**Com 2009-1374**
2	**Describe the building method or product proposed.**	
	Superflex Ardex	
3	**Record the manufacturer's name, address and contact details:**	
	Name	**Ardex NZ ltd.**
	Address	
	Contact person	
	Phone / Mobile / Fax / Email	

4 Which Building Code clauses are involved?

B1	B2	C1	C2	C3	C4	D1
D2	E1	**E2**	E3	F1	F2	F3
F4	F5	F6	F7	F8	G1	G2
G3	G4	G5	G6	G7	G8	G9
G10	G11	G12	G13	G14	H1	

5 What type of documentation has the applicant provided for assessment?

Comparison to an acceptable solution	Y	
In-service history	Y	
Expert opinion / producer statement / peer review	Y	
Test / laboratory results		N
Determination		N
Appraisal	Y	
Technical data including maintenance and installation details	Y	N

Branz Appraisal

No: 472/2005

6 Assess the level of performance noting information relevant to the Building Code clauses covered by the building method or product proposed.

Wind region	L	**M**	H	VH	SP
Corrosion zone	**Zone 1**		Seaspray		
Complexity of design	Simple		Complex		
Is level and quality of detailing appropriate to level of risk?	Y	**N**			

Comments:

7 Assess the expert's opinion.

Who is the expert?

Name:
_Branz_____

Has expert signed opinion?		N
Has expert dated opinion? (Opinion should be no older than 90 days to demonstrate currency)		N
Does opinion post date the referenced documents?	Y	

Comments

8 **Assess the expert's competence, (evidence must be provided and attached to application).**

Is expert known by Council? (must be reputable)	Y	
Has expert provided CV and referees who can attest to his competence? (N/A if CPENG)	Y	
CPENG registration checked?		N
Registration number _____		
Is expert an independent third party? (no conflict of interest)	Y	
Is the expert's opinion acceptable?	Y	

Comments

9 **Assess data supplied in support of application. Data should include laboratory and field tests, investigatory studies, case studies, calculations, comparison to standards, historical use, etc.**

Has independence of testing laboratories been demonstrated? (TELARC, IANZ, etc)		N
Are standards applicable to NZ conditions / environment	Y	
Is data relevant to the NZ Building Code clause proposed	Y	
Are assumptions made and methods		N

Comments

10 **Assess technical detail.**

Are construction details sufficient and appropriate?	Y	
Do the manufacturer's details clearly identify installation details?	Y	
Are maintenance requirements specified?	Y	
Are there any site specific features that need to be considered? (wind, corrosion, etc)		N

Comments

11 **Consider guidance information (list documents referenced)**

Determinations		N
Case law		N
Warnings / bans		N
Guidelines or other publications	Y	
Historical use	Y	

Comments

12 **Comparison to existing design (existing buildings) benchmarking**

If full compliance can not be achieved, assess reasonable practicality	Y	
Does proposal show the same level of performance?	Y	

Comments

13 **What are the limitations on its use? (list limitations, if any)**

14	Quality assurance		
	Are approved installer's required / nominated?	Y	
	Are completion certificates or producer statements required?	Y	
	Is construction supervision required?	Y	
	Will inspection records be provided on completion of work?	Y	
	Have special site instructions been identified?		N
	Are additional inspections required by the building consent authority? If yes, list below		N
	Comments		

15	Conditions of consent (list requirements)

16	Acceptability of Alternative Solution		
	Is the building method or product acceptable?	Y	
	On the balance of evidence is supporting documentation persuasive?	Y	
	Does evidence result in the same level of compliance as provided by the acceptable solutions?	Y	
	Comments		

17	Stamp each page of the plans "Alternative Solution" and identify what the Alternative Solution is.

Approving Officer: _____Radmila Ristic_____ Date:6.10.09

Reviewing Officer: _____ Date: _____

Alternative Solutions - communications record

Log all communications and advise applicant if further information is required.
Medium: L=letter E = email T = telephone call F = facsimile O = other

Date / Time	Medium	Officer's initials	Summary of dialogue, requests for information, etc

Log all communications and advise applicant if further information is required. Medium: L=letter E = email T = telephone call F = facsimile O = other			
Date / Time	**Medium**	**Officer's initials**	**Summary of dialogue, requests for information, etc**

BCI-15

Checklist for assessing alternative solutions

Waitakere City Council
Te Taiao o Waitakere

Instructions

1. Provide written comments in each section where applicable.
2. Y = complies N = does not comply.
3. Refer to PR-25 Alternative Solutions for policy.
4. Record and attach all communications regarding the assessment.

1	**Property address**	**19 Titch PLace**
	Consent number	**Com 2009-1374**
2	**Describe the building method or product proposed.**	
	Thermacraft Diflex 130- building paper	
3	**Record the manufacturer's name, address and contact details:**	
	Name	**Thermacraft NZ ltd.**
	Address	
	Contact person	
	Phone / Mobile / Fax / Email	

4 Which Building Code clauses are involved?

B1	B2	C1	C2	C3	C4	D1
D2	E1	**E2**	E3	F1	F2	F3
F4	F5	F6	F7	F8	G1	G2
G3	G4	G5	G6	G7	G8	G9
G10	G11	G12	G13	G14	H1	

5 What type of documentation has the applicant provided for assessment?

Comparison to an acceptable solution	Y	
In-service history	Y	
Expert opinion / producer statement / peer review	Y	
Test / laboratory results		N
Determination		N
Appraisal	Y	
Technical data including maintenance and installation details	Y	N

6 Assess the level of performance noting information relevant to the Building Code clauses covered by the building method or product proposed.

Wind region	L	**M**	H	VH	SP
Corrosion zone	**Zone 1**		Seaspray		
Complexity of design	Simple		Complex		
Is level and quality of detailing appropriate to level of risk?	Y	**N**			

Comments:

7 Assess the expert's opinion.

Who is the expert?

Name:

Has expert signed opinion?		N
Has expert dated opinion? (Opinion should be no older than 90 days to demonstrate currency)		N
Does opinion post date the referenced documents?	Y	

Comments

8 **Assess the expert's competence, (evidence must be provided and attached to application).**

Is expert known by Council? (must be reputable)	Y	
Has expert provided CV and referees who can attest to his competence? (N/A if CPENG)	Y	
CPENG registration checked?		N
Registration number _____		
Is expert an independent third party? (no conflict of interest)	Y	
Is the expert's opinion acceptable?	Y	

Comments

9 **Assess data supplied in support of application. Data should include laboratory and field tests, investigatory studies, case studies, calculations, comparison to standards, historical use, etc.**

Has independence of testing laboratories been demonstrated? (TELARC, IANZ, etc)		N
Are standards applicable to NZ conditions / environment	Y	
Is data relevant to the NZ Building Code clause proposed	Y	
Are assumptions made and methods		N

Comments

10 **Assess technical detail.**

Are construction details sufficient and appropriate?	Y	
Do the manufacturer's details clearly identify installation details?	Y	
Are maintenance requirements specified?	Y	
Are there any site specific features that need to be considered? (wind, corrosion, etc)		N

Comments

11 **Consider guidance information (list documents referenced)**

Determinations		N
Case law		N
Warnings / bans		N
Guidelines or other publications	Y	
Historical use	Y	

Comments

12 **Comparison to existing design (existing buildings) benchmarking**

If full compliance can not be achieved, assess reasonable practicality	Y	
Does proposal show the same level of performance?	Y	

Comments

13 **What are the limitations on its use? (list limitations, if any)**

14	**Quality assurance**		
	Are approved installer's required / nominated?	Y	
	Are completion certificates or producer statements required?	Y	
	Is construction supervision required?	Y	
	Will inspection records be provided on completion of work?	Y	
	Have special site instructions been identified?		N
	Are additional inspections required by the building consent authority? If yes, list below		N
	Comments		

15	**Conditions of consent (list requirements)**

16	**Acceptability of Alternative Solution**		
	Is the building method or product acceptable?	Y	
	On the balance of evidence is supporting documentation persuasive?	Y	
	Does evidence result in the same level of compliance as provided by the acceptable solutions?	Y	
	Comments		

17	Stamp each page of the plans "Alternative Solution" and identify what the Alternative Solution is.

Approving Officer: Radmila Ristic Date:6.10.09

Reviewing Officer: _____ Date: _____

Alternative Solutions - communications record

Log all communications and advise applicant if further information is required.
Medium: L=letter E = email T = telephone call F = facsimile O = other

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Date / Time	**Medium**	**Officer's initials**	**Summary of dialogue, requests for information, etc**

BCI-15

Checklist for assessing alternative solutions

Waitakere City Council
Te Taiao o Waitakere

Instructions

1. Provide written comments in each section where applicable.
2. Y = complies N = does not comply.
3. Refer to PR-25 Alternative Solutions for policy.
4. Record and attach all communications regarding the assessment.

1	**Property address**	**109, Lake Panorama Drive**
	Consent number	**Com 2009-1374**
2	**Describe the building method or product proposed.**	
	Therma craft –Building paper	
3	**Record the manufacturer's name, address and contact details:**	
	Name	**Thermacraft Industries NZ ltd.**
	Address	
	Contact person	
	Phone / Mobile / Fax / Email	

4 Which Building Code clauses are involved?

B1	**B2**	C1	C2	C3	C4	D1
D2	E1	**E2**	E3	F1	F2	F3
F4	F5	F6	F7	F8	G1	G2
G3	G4	G5	G6	G7	G8	G9
G10	G11	G12	G13	G14	H1	

5 What type of documentation has the applicant provided for assessment?

Comparison to an acceptable solution	**Y**	
In-service history	**Y**	
Expert opinion / producer statement / peer review	**Y**	
Test / laboratory results		**N**
Determination		**N**
Appraisal	**Y**	
Technical data including maintenance and installation details	**Y**	**N**

BRANZ APRRAISAL

6 Assess the level of performance noting information relevant to the Building Code clauses covered by the building method or product proposed.

Wind region	L	**M**	H	VH	SP
Corrosion zone	**Zone 1**		Seaspray		
Complexity of design	Simple		Complex		
Is level and quality of detailing appropriate to level of risk?			Y		**N**

Comments:

7 Assess the expert's opinion.

Who is the expert?

Name: BRANZ

Has expert signed opinion?		N
Has expert dated opinion? (Opinion should be no older than 90 days to demonstrate currency)		N
Does opinion post date the referenced documents?	Y	

Comments

8 **Assess the expert's competence, (evidence must be provided and attached to application).**

Is expert known by Council? (must be reputable)	Y	
Has expert provided CV and referees who can attest to his competence? (N/A if CPENG)	Y	
CPENG registration checked?		N
Registration number _____		
Is expert an independent third party? (no conflict of interest)	Y	
Is the expert's opinion acceptable?	Y	

Comments

9 **Assess data supplied in support of application. Data should include laboratory and field tests, investigatory studies, case studies, calculations, comparison to standards, historical use, etc.**

Has independence of testing laboratories been demonstrated? (TELARC, IANZ, etc)		N
Are standards applicable to NZ conditions / environment	Y	
Is data relevant to the NZ Building Code clause proposed	Y	
Are assumptions made and methods		N

Comments

10 **Assess technical detail.**

Are construction details sufficient and appropriate?	Y	
Do the manufacturer's details clearly identify installation details?	Y	
Are maintenance requirements specified?	Y	
Are there any site specific features that need to be considered? (wind, corrosion, etc)		N

Comments

11 **Consider guidance information (list documents referenced)**

Determinations		N
Case law		N
Warnings / bans		N
Guidelines or other publications	Y	
Historical use	Y	

Comments

12 **Comparison to existing design (existing buildings) benchmarking**

If full compliance can not be achieved, assess reasonable practicality	Y	
Does proposal show the same level of performance?	Y	

Comments

13 **What are the limitations on its use? (list limitations, if any)**

14	Quality assurance		
	Are approved installer's required / nominated?	Y	
	Are completion certificates or producer statements required?	Y	
	Is construction supervision required?	Y	
	Will inspection records be provided on completion of work?	Y	
	Have special site instructions been identified?		N
	Are additional inspections required by the building consent authority? If yes, list below		N
	Comments		

15	Conditions of consent (list requirements)

16	Acceptability of Alternative Solution		
	Is the building method or product acceptable?	Y	
	On the balance of evidence is supporting documentation persuasive?	Y	
	Does evidence result in the same level of compliance as provided by the acceptable solutions?	Y	
	Comments		

17	Stamp each page of the plans "Alternative Solution" and identify what the Alternative Solution is.

Approving Officer: Radmila Ristic Date:16.10.09

Reviewing Officer: _____ Date: _____

Alternative Solutions - communications record

Log all communications and advise applicant if further information is required.
Medium: L=letter E = email T = telephone call F = facsimile O = other

Date / Time	Medium	Officer's initials	Summary of dialogue, requests for information, etc

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Date / Time	**Medium**	**Officer's initials**	**Summary of dialogue, requests for information, etc**

BCI-15

Checklist for assessing alternative solutions

Waitakere City Council
Te Tatau o Waitakere

Instructions

1. Provide written comments in each section where applicable.
2. Y = complies N = does not comply.
3. Refer to PR-25 Alternative Solutions for policy.
4. Record and attach all communications regarding the assessment.

1	**Property address**	**19, Titch place**
	Consent number	**Com 2009627**

2 Describe the building method or product proposed.

Particle board flooring

3 Record the manufacturer's name, address and contact details:

Name	**Laminex group**		
Address			
Contact person			
Phone	Mobile	Fax	Email

4 Which Building Code clauses are involved?

B1	B2	C1	C2	C3	C4	D1
D2	E1	**E2**	E3	F1	F2	F3
F4	F5	F6	F7	F8	G1	G2
G3	G4	G5	G6	G7	G8	G9
G10	G11	G12	G13	G14	H1	

5 What type of documentation has the applicant provided for assessment?

Comparison to an acceptable solution	Y	
In-service history	Y	
Expert opinion / producer statement / peer review	Y	
Test / laboratory results		N
Determination		N
Appraisal	Y	
Technical data including maintenance and installation details	Y	N

6 Assess the level of performance noting information relevant to the Building Code clauses covered by the building method or product proposed.

Wind region	L	**M**	H	VH	SP
Corrosion zone	**Zone 1**		Seaspray		
Complexity of design	Simple		Complex		
Is level and quality of detailing appropriate to level of risk?	Y	**N**			

Comments:

7 Assess the expert's opinion.

Who is the expert?

Name: _

Has expert signed opinion?		N
Has expert dated opinion? (Opinion should be no older than 90 days to demonstrate currency)		N
Does opinion post date the referenced documents?	Y	

Comments

8 **Assess the expert's competence, (evidence must be provided and attached to application).**

Is expert known by Council? (must be reputable)	Y	
Has expert provided CV and referees who can attest to his competence? (N/A if CPENG)	Y	
CPENG registration checked?		N
Registration number _____		
Is expert an independent third party? (no conflict of interest)	Y	
Is the expert's opinion acceptable?	Y	

Comments

9 **Assess data supplied in support of application. Data should include laboratory and field tests, investigatory studies, case studies, calculations, comparison to standards, historical use, etc.**

Has independence of testing laboratories been demonstrated? (TELARC, IANZ, etc)		N
Are standards applicable to NZ conditions / environment	Y	
Is data relevant to the NZ Building Code clause proposed	Y	
Are assumptions made and methods		N

Comments

10 **Assess technical detail.**

Are construction details sufficient and appropriate?	Y	
Do the manufacturer's details clearly identify installation details?	Y	
Are maintenance requirements specified?	Y	
Are there any site specific features that need to be considered? (wind, corrosion, etc)		N

Comments

11 **Consider guidance information (list documents referenced)**

Determinations		N
Case law		N
Warnings / bans		N
Guidelines or other publications	Y	
Historical use	Y	

Comments

12 **Comparison to existing design (existing buildings) benchmarking**

If full compliance can not be achieved, assess reasonable practicality	Y	
Does proposal show the same level of performance?	Y	

Comments

13 **What are the limitations on its use? (list limitations, if any)**

14	Quality assurance		
	Are approved installer's required / nominated?	Y	
	Are completion certificates or producer statements required?	Y	
	Is construction supervision required?	Y	
	Will inspection records be provided on completion of work?	Y	
	Have special site instructions been identified?		N
	Are additional inspections required by the building consent authority? If yes, list below		N
	Comments		

15	Conditions of consent (list requirements)

16	Acceptability of Alternative Solution		
	Is the building method or product acceptable?	Y	
	On the balance of evidence is supporting documentation persuasive?	Y	
	Does evidence result in the same level of compliance as provided by the acceptable solutions?	Y	
	Comments		

17	Stamp each page of the plans "Alternative Solution" and identify what the Alternative Solution is.

Approving Officer: _____Radmila Ristic_____ Date:25..6.09

Reviewing Officer: _____ Date: _____

Alternative Solutions - communications record

Log all communications and advise applicant if further information is required.
Medium: L=letter E = email T = telephone call F = facsimile O = other

Date / Time	Medium	Officer's initials	Summary of dialogue, requests for information, etc

Log all communications and advise applicant if further information is required. Medium: L=letter E = email T = telephone call F = facsimile O = other			
Date / Time	**Medium**	**Officer's initials**	**Summary of dialogue, requests for information, etc**

BCI-99

District Plan Checklist
Living Environment

Waitakere City Council
Te Taiao o Waitakere

Applic. No.	LUC 2009-374	**Date:**	13/10/09
Planner:	Ben Geldenhuys	**Proposal:**	New Dwelling
Street Address:	19 HITCH PLACE	**Site Area:**	349.
Map Reference:		**File checked:**	Yes / No

Related Project Information Memo.? YES	PIM-		
Related Land Use Consent?	LUC- 2008/107	Gtd	Iss'd
Related Subdivision? ✓ yes **S.224 (c) issued?** **S.221 Consent Notice conditions?**	SUB- 1078	Gtd	Iss'd
S.357 Objection?	Yes / No		
Plans Cross Check?	Yes / No		
Conditions relevant to Building Consent Stage?	Yes / No		
Site within boundaries of the Waitakere Ranges Heritage Area?	Yes / No		
General Noise Standards: - High Noise Route - Future High Noise Route	Yes / No Yes / No		
Natural Hazards:	Yes / None Known - geotech		
Designations: **Appendix reference**	N/A		
Hazardous Facilities & Contaminated Sites:	Nothing apparent		
Heritage Appendix reference:	N/A		
Natural Area:	Ben		
Landscape Element: **(Sensitive Ridge/Headland Scarp/Cliff etc.)**	N/A		
Human Environment:	LE		
Relevant Plan Change?:	Yes / No PC26		
Map Appendices: **Roading Hierarchy (DP Map Appendix I)**	Local		
Second Vehicle Crossing?	Yes / No		
Vehicle Crossing/Street Damage Deposit?	Yes / No		
Development Contribution?	Yes / No		
Within radius from Town Centre Central Point/Train Station?	Yes / No		
Medium Density Housing Criteria Apply? (Site >2000m2)	Yes / No		

Rule No.	Provision	OK/ Permitted	Not OK	PC26 OK	PC26 Not OK	Comments/Activity	N/A
2	Density/MDH						
3	Building Location/ Natural landscape elements		helper		WC		
4	Building height (8m)						
5	Height in relation to Boundaries						
	North (2.5m + 55°)						

	Provision	OK/ Permitted	Not OK	PC26 OK	PC26 Not OK	Comments/Activity	N/A
	South (2.5m + 35^0)						
	East (2.5m + 45^0)						
	West (2.5m + 45^0)						
	Transport (2.5m + 55^0)	N/A	N/A				
6	Front Yards (3m)						
7	Building Coverage (35%)						
8	Building Location/Privacy & Amenity						
9	Outdoor Space						
	$25m^2$ per bedroom						
	6.0m line						
	Bearing						
	3.0m min dim						
	Slope						
	Accessible from Main Living Room	N/A	N/A				

Rule No.	Provision	OK/ Permitted	Not OK	Comments/Activity	N/A
10	Non Residential Activities (NRA)				
11	Traffic Generation, NRA				
12	Carparking & Driveways				
	Number of spaces				
	Dimensions				
	Driveway access				
	Gradient				
	On site turning				
	Service strip				
13	Noise (NRA)				
14	Air Discharges, Odour, Dust, Glare & Vibration				
15	Signs				
16	Relocated Buildings				
17	Infrastructure				

BCI-183

Structural Engineer Checklist

Waitakere City Council
Te Tatau o Waitakere

Address: 19 Titch Place, Glen Eden, Lot 32			Consent Number: COM2009-1374
CHECK ITEM	**Y / N**	**NA**	**COMMENTS**
DE Assessment Completed	Y		
Check for Comments & Letters by Other Staff Members	Y		
External Peer review Required/ Provided (Check WCC Register, Acceptable Provider, Check for Limitations)		N/A	Not required.
Producer Statement PS1 (Check WCC Register, Acceptable Provider, Check for Limitations)	Y		PS1 for Rib-raft Foundation slab by Wilton Jubert.
Geotechnical Issues (Slope Stability, Design Parameters)	Y		Geotechnical Assessment Provided.
Close Proximity to Public Drains (Check for Foundation Bridging Details, Refer Any Comments From Ecowater)	Y		Ecowater to investigate further.
Retaining Walls on Boundary (Design Surcharge)		N/A	Not part of this consent.
Retaining Walls (Design Parameters, Surcharge, Timber, Masonry, Concrete-Observation))		N/A	Not part of this consent.
Confirm Live Load, Seismic Coefficient (Check Loadings to Current Loadings Codes)	Y		
Roof Framing (Purlins, Rafters, Trusses & Their Fixings)	Y		
Roof Bracing (Ceiling Diaphragm, Cross-Bracing)	Y		
Wall Framing (Girts, posts, studs, lintels)	Y		
Wall Bracing (Sheeting, Cross Bracing, Portals)	Y		
Addition of Mezzanine Floor (Bracing & Footings)		N/A	
Addition of New Floor (Bracing , Footings & Check Existing Footings))		N/A	
Racking System (Blanket Approval, Structural Check-Observation)		N/A	
Racking System (Existing Slab for New Loads)		N/A	
Firewall Stability (Precast Panels-Observation)		N/A	
Boundary Walls (Clearance for Deflection)		N/A	
Masonry Walls (Grade A/ B –Observation)	Y		Grade B
Timber Floor (Joists, Beams, Diaphragms Outside NZS3604 Only)	Y		
General Observation of Items Covered by NZS3604	Y		

BCI-183

Structural Engineer Checklist

Waitakere City Council
Te Tatau o Waitakere

CHECK ITEM	Y / N	NA	COMMENTS
Concrete Floor (Slab, Beams, Connections & Observations)		N/A	
Ground Floor RC Slab-on-Grade (Thickness, Joints, Reinforcement, Reinf Cover)		N/A	
RC Footings, Beams, Columns, Tilt-up Panels-Observation)	Y		
Compaction of Hard fill Over 600mm Deep-Observation		N/A	
Foundations (Shallow, Deep- Observations)	Y		
Ribraft Slab (Firth, Others or Specific Design- Observations)	Y		**Specific designed Rib-raft Foundation Slab.**
Internal Footings (Slab thickening etc)	Y		
Complies With Clause B1 of NZBC (Alternate Solutions identified & Calculations Stamped With Details)	Y		***Alternative Solution:*** **AS2870:1996**
Observation Requirements Entered & Sign-0ff Pathways	Y		**150** **152** **153** **168-Rib-raft Foundation Slab**

Comments:

1. **Final.**

WCC Structural Engineer: Saby Virdi

Date 5/ October / 09

Reviewed by:

Comments:

BCI-79

P&D Processing Plan Checklist

Waitakere City Council
Te Tatau o Waitakere

Instructions
1. Provide written comments in each section where applicable.
2. Y = complies N = does not comply N/A = not applicable
3. Complete all sections
4. If application includes an Alternative Solution, attach completed checklist AS-01 in accordance with PR-25
5. Record and attach all communications regarding the assessment.

Address	19 TITCH PL									
Date	12/10/09	**Consent number**		2009/1374	**Checked by:**					
Building Cat.	1	(2)	3	**Comp. level**	1	2	(3)	4	5	

Minor P&D only

Site issues				**Comments (describe how compliance achieved)**
Sewer connections	(Y)	N	N/A	
Stormwater connections	(Y)	N	N/A	
Drains (bridging & close proximity)	Y	N	(N/A)	
Scale	(Y)	N	N/A	
Retaining walls /split levels – cess pits	(Y)	N	N/A	
Finished floor level	(Y)	N	N/A	
Existing Drainage	Y	N	(N/A)	
Drains – public				**Comments (describe how compliance achieved)**
Public drains inverts shown	(Y)	N	N/A	
Location of drainage laterals	(Y)	N	N/A	
Drains – private				**Comments (describe how compliance achieved)**
System	(Y)	N	N/A	(G13) AS3500 Other
Total number of discharge units	(Y)	N	N/A	
TV <10m head of drain size	(Y)	N	N/A	
GT / ORG Below floor level and fixtures	(Y)	N	N/A	
Backflow (pools, spa baths, etc)	Y	N	(N/A)	
On-site disposal				**Comments (describe how compliance achieved)**
Septic tank – Effluent design	Y	N	N/A	
Septic tank – Type	Y	N	N/A	
Septic tank – Size	Y	N	N/A	
Septic tank – Location plan	Y	N	N/A	
Stormwater soakage (Design / details provided)	Y	N	N/A	
Potable water				**Comments (describe how compliance achieved)**
Town/tank/bore/other	(Y)	N	N/A	
New – application attached	(Y)	N	N/A	ECO
Water reuse	Y	N	(N/A)	
Backflow Prevention Device required?	Y	N	(N/A)	
Compliance Schedule	Y	N	(N/A)	
Water reticulation (Commercial / Industrial Only)				**Comments (describe how compliance achieved)**
System	Y	N	(N/A)	G12 AS3500 Other
Diagrammatical layout	Y	N	(N/A)	(including location of plumbing fixtures shown on plans)

Pipe	Size	Y	N	N/A	
	Material	Y	N	N/A	
HWC Noted in spec.	Size	Y	N	N/A	
	Restraint	Y	N	N/A	
	Valves	Y	N	N/A	
	Type	Y	N	N/A	
Water reticulation (Domestic)					**Comments (describe how compliance achieved)**
Wet back – fires (open vented)		Y	N	N/A	
Solar heating		Y	N	N/A	
Cladding – roof					**Comments (describe how compliance achieved)**
Type		Y	N	N/A	
Minimum roof pitch		Y	N	N/A	
Material compatibility		Y	N	N/A	
Roof penetrations (flashings detailed)		Y	N	N/A	
Discharge (spreaders)		Y	N	N/A	
Internal gutter / valley (size / capacity / timber treatment / overflow)		Y	N	N/A	
Overflows for internal spouting (Taylor fascia, etc)		Y	N	N/A	
Item checked					**Comments (describe how compliance achieved)**
D/P	Size	Y	N	N/A	80
	Number	Y	N	N/A	6
Plumbing sanitary					**Comments (describe how compliance achieved)**
Diagrammatical or schematic layout		Y	N	N/A	
System		Y	N	N/A	GT3 / AS3500 / Other
Individual waste pipes	Discharge units	Y	N	N/A	
	Length	Y	N	N/A	
	Pipe size	Y	N	N/A	
	Venting	Y	N	N/A	
Soil waste & overflow stacks	Discharge units	Y	N	N/A	
	Pipe sizes	Y	N	N/A	
	Venting	Y	N	N/A	
Floor waste gully (recommended 2-storey)		Y	N	N/A	
Slabs					**Comments (describe how compliance achieved)**
Finished floor level (shown on plans)		Y	N	N/A	
Plumbing fixtures (shown on plans)		Y	N	N/A	
No pipes running through slab thickenings		Y	N	N/A	
Pipe Layout (shown on plans)		Y	N	N/A	
Wet Areas					**Comments (describe how compliance achieved)**
Basin in WC (except where adjacent to bathroom)		Y	N	N/A	
Enclosed Decks / balconies					**Comments (describe how compliance achieved)**
Waste / outlet overflow – size (same as outlet)		Y	N	N/A	
Other					**Comments (describe how compliance achieved)**

Domestic fire sprinkler system	Y	N	N/A	
Alternative solutions	Y	N	N/A	
ECO-Water approval required	Y	N	N/A	
Time recorded accurately for processing	Y	N	N/A	
Time entered	Y	N	N/A	
Conditions entered into computer	Y	N	N/A	
Inspection requirements identified	Y	N	N/A	
Checklist completed in full standards referenced, etc	Y	N	N/A	

Approval and review			
Approval Granted / Refused	State outcome and reasons		
Checked by:		Date	
Reviewed by:		Date	

Log all communications and advise applicant if further information is required.
Medium: L = letter E = email T = telephone F = facsimile I = in person

Date / Time	Medium	Officer's initials	Summary of dialogue, requests for information, etc

Date / Time	Medium	Officer's initials	Summary of dialogue, requests for information, etc

Waitakere City Council
Te Taiao o Waitakere

Memorandum

To

From

Date

Subject COM-2009-1374 - 19 Titch Place, Glen Eden
New 5 Bedroom Dwelling with attached (internal access) garage. Cat 2.

Information provided as at 02 October 2009:

Hazard / Special Features
Geotech

a. The Owner shall not carry out any development nor place, erect, construct or permit to remain any buildings on any part of the land unless the foundations of all buildings have been the subject of specific design by a registered engineer who is familiar with the content of the Geotechnical Completion Report prepared by Babbage Consultants Reference 42608/GE and dated October 2007 (held in Council's records under RMA20061078) (hereinafter referred to as "the said Geotechnical Completion Reports)

b. All earthworks, development and construction on any part of the land shall be carried out in accordance with:

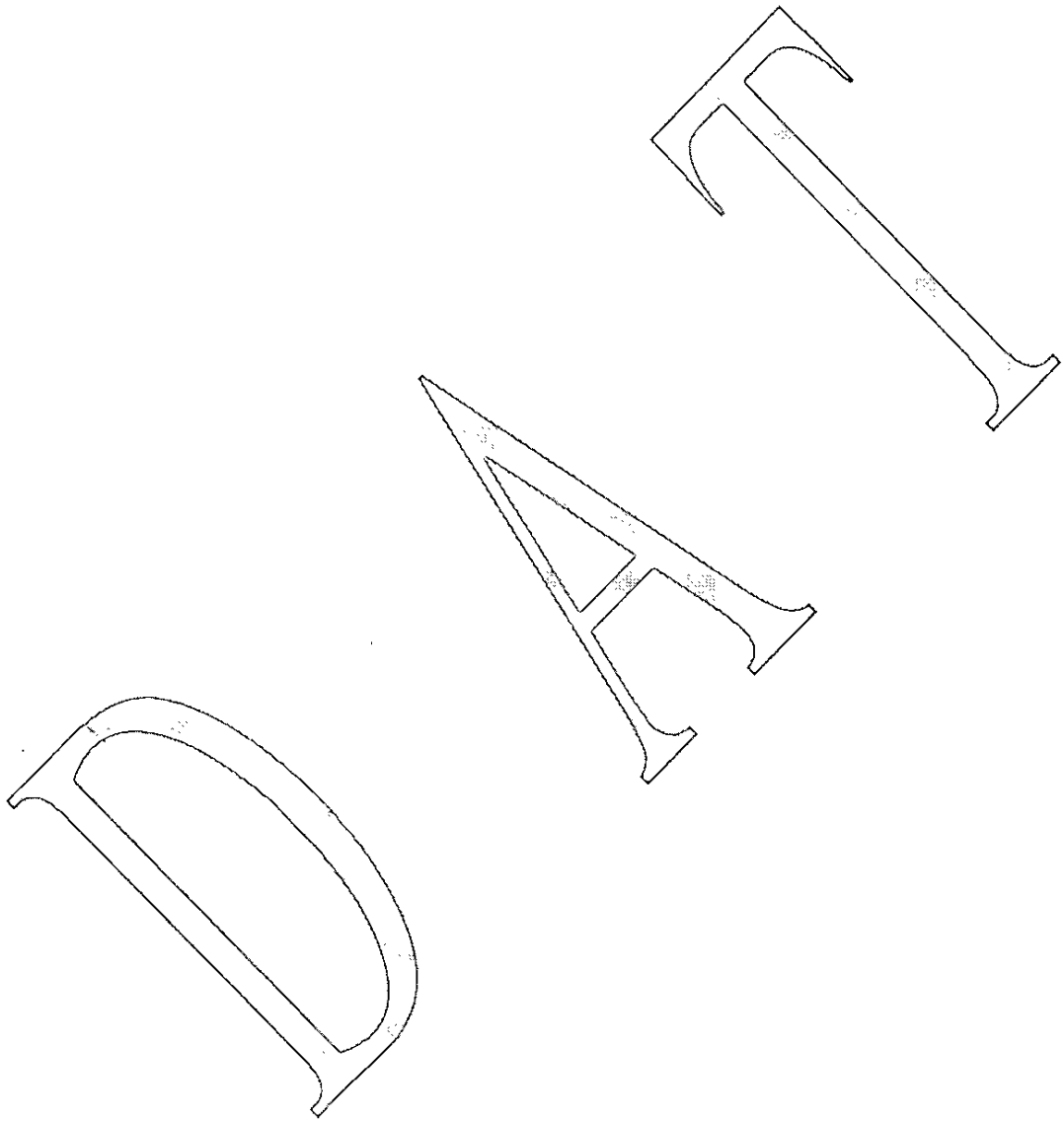
(i) The report referred to herein where applicable; and

(ii) All specific design requirements referred to herein where applicable; and

(iii) To the entire satisfaction of the Waitakere City Council.

Wind Zone: Low

Sea Spray Zone: No


DRAFT

EWI-01

EcoWater (Network Utility Operator) Checklist for Building & Resource Consents

Waitakere City Council

Application Address:	19 Tetch Pl	LUC-	
Applicant Name:		SUB-	
Type of Development:		ABA-	
		COM-	2009 - 1376
Checklist Completed By:	Jason	Date:	9/10/09
Assets & Network Approvals By:		Date:	
Quality Check & Approvals By:		Date:	

	CHECKLIST ITEM	DP, COP, POLICY (Specification)	ASSESSMENT (Fill in Data or Circle One Option)			
APPLICATION & SITE INFORMATION	Infringement Types (relating to EcoWater)	Consent Document / Planner				
	Notified Consent	Consent Document / Planner	yes	no	n/a	if yes, Team Leader sign-off
	Pre-Application - RMA Number	PRE-	yes	no	n/a	
	Pre-Application - OSS Advice	DS Database/Pathway Property Memo	yes	no	n/a	
	Requisitions (relating to EcoWater)	Pathway / InfoBase	yes	no	n/a	
	Hansen Jobs	Hansen	yes	no	n/a	
	EcoWater Property File	relevant documents or advice	yes	no	n/a	
	Human Environment	GIS - human environment layer	Living			
	Natural Environment	GIS - natural environment layer	General			
	Special Subdivision Area (eg Structure Plan)	DP Maps & Variations	yes	no	specify:	
	Riparian Margin	GIS - natural environment layer	yes	no	n/a	
	Stability Sensitive	requires Geotech report	yes	no	n/a	
	Hazards & Special Features	Pathway Property Conditions	yes	no	n/a	geotech
OTHER APPROVALS REQUIRED	**WATERCARE SERVICES LTD**					
	Works within 10m of WSL WW or WS lines.	WSL approval given in writing	yes	no	n/a	if no, applicant must provide
	Trade Waste Dischare Consent	WSL approval for industrial discharge	yes	no	n/a	if no, applicant must provide
	AUCKLAND REGIONAL COUNCIL					
	WCC comprehensive discharge consent	application complies with CMP	yes	no	n/a	if no, amend proposal or apply to ARC
	Urban - new impermeable >1000m²	pipe discharges to coast / tidal area	yes	no	n/a	SWQT, energy dissipation
		pipe discharges to fresh water stream	yes	no	n/a	SWQT, energy dissipation, detention
	New pipe outlet to coastal or stream environ.		yes	no	n/a	
	Rural - more than 5 Lot subdivision		yes	no	n/a	
	Filling in 1%AEP floodplain		yes	no	n/a	
	Downstream flooding or erosion		yes	no	n/a	
	Works within 50m of a watercourse		yes	no	n/a	
	Culvert more than 20m long		yes	no	n/a	
	WCC ASSETS & NETWORK					
	Building over/near >150mm WW drain	approval given	yes	no	n/a	if no, amend proposal
	Building over/near >350mm SW drain	approval given	yes	no	n/a	if no, amend proposal
	Building platform clear of large drains	(build over, reroute, amend boundaries)	yes	no	n/a	if no, discuss with Team Leader
	Stream crossing	approval given (bridge or culvert)	yes	no	n/a	
	Esplanade reserve if stream >3m wide	check if required by Parks	yes	no	n/a	
	Drainage reserve	required by Assets	yes	no	n/a	
	Utility reserve	required by Assets	yes	no	n/a	
	Twin Streams property purchase	property identified for purchase	yes	no	n/a	if yes, discuss with Team Leader
	NEIGHBORING PROPERTIES					
	Services connection points located in neighbouring properties	Private agreement for access (no Council involvement)	yes	no	n/a	Add to SPECDE report & alert planner. Condition - cannot commence consent until connections in place.
EARTHWORKS & GEOTECH	Earthworks near stream / overland flowpath	inside 1%AEP flood area	yes	no	n/a	if yes, discuss with Team Leader
	Earthworks over drains	minimum coverage 1200mm roads	yes	no	n/a	
		minimum coverage 750mm other	yes	no	n/a	
		max. coverage 2000mm (class 2)	yes	no	n/a	
		raise manhole lid level & access	yes	no	n/a	
		lower manhole lid level & access	yes	no	n/a	
	retaining walls over/within 2m of drains	bridging piles - min. clearance 1m	yes	no	n/a	
	Geotech Report	instability, slips, stream erosion	yes	no	n/a	
		specific stormwater disposal	yes	no	n/a	
		specific wastewater disposal	yes	no	n/a	
		specific pipe/trench design	yes	no	n/a	
		specific bridge/foundation design	yes	no	n/a	

	CHECKLIST ITEM	DP, COP, POLICY (Specification)	ASSESSMENT (Fill In Data or Circle One Option)				
CATCHMENT INFORMATION	Supercatchment name	GIS - project table - StwSupCatShp	Henderson Creek South				
	Catchment Management Plan	proposal complies with CMP	yes	no	n/a		
	Integrated Catchment Management Plan	proposal complies with ICMP	yes	no	n/a		
	WCC - Comprehensive Discharge Consent	proposal complies with CDC	yes	no	n/a		
	Site affected by flooding or overland flow	close to stream or large dia SW pipes	yes	no	n/a		
	Flooding assessment provided (open stream)	check rainfall, catchment area etc	yes	no	n/a		
	Geotech assessment of stream bank erosion	check, setback required	yes	no	n/a		
	Riparian Margin	refer GIS natural areas map	yes	no	specify:		
	Overland flowpath assessment provided	check rainfall, catchment area etc	yes	no	n/a		
	Easements required for flood areas		yes	no	n/a		
	Crossing major stream - bridge required	check abutments, x-section, velocity	yes	no	n/a		
	Driveways <200mm flood during 1%AEP		yes	no	n/a		
	Private culverts - 5yr capacity & condition	as-built, cctv, calcs, erosion, upgrade	yes	no	n/a	adequate	upgrade
	Fish Passage on culverts / outlets	complies with TP131	yes	no	n/a		
	Piping of stream proposed	not allowed, not in accord with policy	yes	no	n/a	if yes, discuss with Team Leader	
	Buildings entirely outside 1%AEP floodplain	refer DP, Hazards	yes	no	n/a	if no, discuss with Team Leader	
	Minimum floor level required	Manukau Coastal - R.L. 2.74m + 1.0m	yes	no	n/a		
		Waitemata Coastal - R.L. 2.25m + 1.0m	yes	no	n/a		
		All Streams - 0.5m freeboard	yes	no	n/a		
		OLFP Catchment >2Ha - 0.5m freeboard	yes	no	n/a		
		OLFP Catchment <2Ha - 0.2m freeboard	yes	no	n/a		
		specified in Flood Report	yes	no	n/a		
INFRASTRUCTURE - WATER SUPPLY	WS - existing connection	GIS, Pathway Water Billing	yes	no	n/a	new connection	
	WS - separate meters for each Unit/Lot	check Pathway, manifold for units	yes	no	n/a	new connection	
	WS - backflow prevention required	check COP and ByLaw	yes	no	n/a		
	WS - building over waterpipes	not allowed - reroute waterpipes	yes	no	n/a		
	WS - pressure zones	change at approx R.L. 60.0m	yes	no	n/a		
	WS - pressure to long/steep driveways	check HGL minus R.L. is >35m	yes	no	n/a		
	WS - new public water main	not under driveway/carriageway	yes	no	n/a		
	WS - tank supply only	reduce mitigation requirements	yes	no	n/a		
	Fire hydrant within 270m / 135m / 90m / 65m	GIS - use ruler (along roads/driveways)	yes	no	n/a	existing	new
	Fire hydrant - flow available for NZFS Class		Res-25l/s	schl-50l/s	ind-100l/s	lge comm-200l/s	
	Domestic sprinkler system for fire coverage	check water supply system capacity	yes	no	n/a		
	Rural / Urban fire districts	GIS - project tbl - RuralFire... / UrbanFire..	Urban	Huia	Piha	Waiatarua	Rural
	Urban fire district without fire coverage	design provided to NZFS COP	yes	no	n/a		
INFRASTRUCTURE - WASTE WATER	WW - inner drainage area (reticulated)	GIS - project table - InnerDmBdy	yes	no	n/a		
	WW - works over/within 2m of drains/MHs	1m clear, cctv, no build over connections	yes	no	n/a		
	WW - pipe material earthenware	automatic relay required (no CCTV)	yes	no	n/a	(for building consent)	
	WW - pipe material AC/PVC/PE	CCTV - relay if bad condition	yes	no	n/a	(for building consent)	
	WW - existing connection/disconnect	GIS - Infrastructure Layer	yes	no	n/a	dry chamber	new
	WW - all of site served by gravity	1m above invert of public drain or pump	yes	no	n/a	if no, discuss with Team Leader	
	WW - new public drainage	refer COP, no conflict with trees	yes	no	n/a	if yes, discuss with Team Leader	
	WW - new public drainage	serve upstream catchment	yes	no	if yes:	construct	easement
	WW - privately owned drains	check ownership in GIS	yes	no	if yes:	can't authorise - need owners approval	
	WW - on-site disposal (septic systems)	GIS - Infrastructure Layer	yes	no	n/a	existing	new
INFRASTRUCTURE - STORM WATER	SW - works over/within 2m of drains/MHs	1m clear, cctv, no build over connections	yes	no	n/a		
	SW - existing connection/disconnect	GIS - Infrastructure Layer	yes	no	n/a	wet chamber	new
	SW - all of site served by gravity	1m above soffit of public drain	yes	no	n/a	if no, discuss with Team Leader	
	SW - downstream capacity for MPD	check GIS modelling	under	over	unknown	if under, require SW mitigation	
	SW - new public drainage	within 100m of bdy, no conflict with trees	yes	no	n/a	if yes, discuss with Team Leader	
	SW - new public drainage	serve upstream catchment	yes	no	if yes:	construct	easement
	SW - privately owned drains	check ownership in GIS	yes	no	if yes:	can't authorise - need owners approval	
	SW - existing discharge point	check GIS, as-builts, consent plans etc	pipe	kerb	soakage	watercourse	coast
	SW - approved discharge point	stormwater pipe connection (reticulated)	yes	no	if yes:	may be subject to conditions	
	SW - approved discharge point	kerb & channel (non-reticulated)	yes	no	if yes:	mitigation required	
	SW - approved discharge point	soakage (non-reticulated)	yes	no	if yes:	mitigation required	
	SW - approved discharge point	watercourse (new outfall)	yes	no	if yes:	mitigation required	
	SW - approved discharge point	coastal outfall	yes	no	if yes:	stormwater quality treatment required	

	CHECKLIST ITEM	DP, COP, POLICY (Specification)	ASSESSMENT (Fill In Data or Circle One Option)				
STORMWATER MANAGEMENT / LOW IMPACT DESIGN / TUSC	Stormwater mitigation for storm events	refer CMP, pipe modelling, COP, ARC	(2)	10	100	34.5mm/24hrs	
	Impermeable Surfaces allowed	refer District Plan Rules	10%	15%	20%	(60%)	90%
	Impermeable Surfaces restricted	refer Consent Notice / previous SUB	specify:				
	Impermeable Surfaces exceed allowable %	refer site plan - actual _____ %	yes	no	n/a	if yes, require SW mitigation	
	ICMP Req Low Impact Design (LID)		yes	no	n/a		
	TUSC - Dev Con Remission	outline mitigation requirements below	yes	no	n/a	TUSC score:	
	Bush Planting	mitigate 1%AEP or pay Twin Streams	yes	no	area:		
	Twin Streams Payment	mitigate 1%AEP or pay Twin Streams	yes	no	amount:		
	Rain Water Reuse Tank (full or partial)	mitigates $^1/_2$ roof area, max 100m^2	yes	no	size:		
	Detention Tank	mitigation level required	yes	no	size:		
	Low Flow Water Saving Devices		yes	no	size:		
	Rain Garden		yes	no	size:		
	Permeable Paving		yes	no	size:		
	Downstream Stormwater Quality Device	check pipe system discharge point	yes	no	size:		
	Stormwater Quality Treatment Required	roads, driveways, industrial roofs, coast	yes	no	size:		
	Dual Strip Driveway		yes	no	size:		
	Swale / Vegetated Filter Strip		yes	no	size:		
	Dispersion Trench		yes	no	size:		

CONTRIBUTIONS	Development Contribution - TUSC Remission		yes	no	n/a	remission:	$
	Financial (RMA) - Water Supply	GIS project tbl - Developer Contr.	yes	no	n/a		$
	Financial (RMA) - Wastewater	GIS project tbl - Developer Contr.	yes	no	n/a		$
	Financial (RMA) - Stormwater Quantity	GIS project tbl - Developer Contr.	yes	no	n/a		$
	Financial (RMA) - Stormwater Quality	GIS project tbl - Developer Contr.	yes	no	n/a		$
	Financial (RMA) - Twin Streams Oratia	zone/proposal (credit bush planting)	med.dens	resid.	foothills	commercial	$
	Financial (RMA) - Twin Streams Opanuku	zone/proposal (credit bush planting)	med.dens	resid.	foothills	commercial	$
	WCC contribution towards cost of asset	discuss with Assets and T.L.	yes	no	specify:	%	$ (max)

MEDIUM DENSITY & APARTMENT DEVELOPMENTS	Building over public drains	not allowed - reroute drains	yes	no	n/a	
	Public drains in front yards (not under drive)		yes	no	n/a	
	Avoid retaining walls over new public drains		yes	no	n/a	
	Private drainage or devices	body corporate rules - maintenance	yes	no	n/a	only private if no upstream catchment
	Cutoff drains & fall from basement parking		yes	no	n/a	
	Basement - cesspits pump to sewer/SWQT	no SWQT for basement parking	yes	no	n/a	
	Check public watermains capacity/pressure	may need to upgrade public mains	yes	no	n/a	
	Internal fire sprinkler system	check flow rates available	yes	no	n/a	
	Water supply pressure zones per floor		yes	no	n/a	
	Bulk Council water meter & private meter/unit	body corporate rules - water charging	yes	no	n/a	
	SW contribution charged by impermeable m^2		yes	no	n/a	

SUBDIVISION	Unit title subdivision (will have body corp.)	private devices and drains OK	yes	no	n/a	
	Cross lease	separate private drainage	yes	no	n/a	
		consent notice re shared drainage	yes	no	n/a	
	Freehold subdivision	platform free of hazards/large drains	yes	no	n/a	if no, discuss with Team Leader
		all public devices and drains	yes	no	n/a	if no, discuss with Team Leader
		culvert under shared drive - private	yes	no	n/a	if no, discuss with Team Leader
		boundaries over manholes	yes	no	n/a	if no, amend plans
		ICT Infrastructure on new public road	yes	no	n/a	condition to require ICT
		sites large enough for on-site WW	yes	no	n/a	if no, amend plans
		on-site WW disposal all within bdy	yes	no	n/a	if yes, amend plans or move WW
	Urban Design (liase with Parks/Roads etc)	road next to stream or reserve	yes	no	n/a	
		integrated SW devices/amenity	yes	no	n/a	

BCI-01

LODGEMENT CHECKLIST – BUILDING CONSENT APPLICATIONS

Please provide this checklist with your application

Waitakere City Council
Te Tatao o Waitakere

1. Your application will only be accepted if the information outlined in this checklist is provided.
2. Please work through this checklist and circle the information that you have provided.
3. Two (2) sets of plans and other documents are required; include a third copy of floor plans.
4. Drawings must be produced on a minimum A3 sheet size.
5. Only original copies will be accepted.
6. All drawings must meet the minimum requirements of the Technical Drawings standard AS/NZS1100 with equivalent Microsoft Word text size 11 **(free-handed drawings will not be accepted)**
7. If a Project Information Memorandum (PIM) has already been issued for this project, please provide a copy with this application.
8. 2nd hand building report is required if using second-hand materials or buildings.
9. If building is positioned over two or more allotments, a third set of plans is required.

Declaration

This section must be completed by applicant (*Please cross-out what is not applicable from the following statements*):

1. This work ~~is~~ / **is not** covered by a WHRS claim.
2. This work ~~does~~ / **does not** involve re-cladding as a result of leaking.
3. This work ~~includes~~ / **excludes** monolithic cladding.
4. This application ~~includes~~ / **excludes** a swimming pool or spa pool.
5. This property ~~is~~ / **is not** known to be in a flood affected area.
6. The building ~~does~~ / **does not** involve building over an existing boundary or two lots.
7. This building work ~~is~~ / **is not** as a result of a notice to fix.

Applicant's Signature: _____ Date: 24/9/09

For Council Use only:

Consent Number:

PIM Number:

Other Relevant Consent Number/s:

Wind Zone: Low

District Plan: Human Environment Living

District Plan: Natural Area Greenbelt.

Natural Hazards

Hazardous Facilities / Contaminated Sites

Stability Sensitive (Waitemata District Scheme)

Heritage Status

Impact on Waahi tapu? Yes / No

Archaeological Site? Yes / No

Customer Use					Council Use Only			
Circle as appropriate			Doc reference/ Page #					Comments
(Y)	N	NA		Application form completed in full and signed	(Y)	N	NA	
(Y)	N	NA		Water meter connection and location plan	(Y)	N	NA	
(Y)	N	NA		Vehicle crossing form (if applicable)	(Y)	N	NA	
(Y)	N	NA		Street damage exists – notification received	Y	N	(NA)	
Y	N	(NA)		*Application for septic tank (if applicable)*	Y	N	(NA)	
Y	N	(NA)		Second hand building materials	Y	N	(NA)	
Y	N	(NA)		Road Opening Notices (RON)	Y	N	(NA)	
Y	N	(NA)		Compliance Schedule	Y	N	(NA)	

Customer Use				Council Use Only			
Check as appropriate		Item required				Comments	
Y	N	NA		Swimming Pool Registration	Y	N	NA	
Y	N	NA		Approval from Parks Department to build on Council Reserve	Y	N	NA	
Y	N	NA		Application to erect a structure on a road reserve	Y	N	NA	
Proof of Ownership								
Y	N	NA		Certificate of title and flats plan (no older than 90 days)	Y	N	NA	
Y	N	NA		Sale and purchase agreement (full copy)	Y	N	NA	
Y	N	NA		Letter from owner if applicant / agent is not owner (state details of the Authorisation from the owner to make the application on the owner's behalf)	Y	N	NA	
Y	N	NA		If application is submitted on behalf of company/trust include copy of authorising documents for the company/trust.	Y	N	NA	
Resource Consents (1 copy only)								
Y	N	NA		Copy of approved resource consent or reference number if application has been lodged (record consent number in comments)	Y	N	NA	RMA 2006 1077
District Plan / Site Plan Requirements (2 x copies of each of the following plans)								
Y	N	NA		**Cross-lease property** (minimum scale 1:100)	Y	N	NA	
Y	N	NA		Show entire property including boundaries for each unit and any common areas	Y	N	NA	
Y	N	NA		**Rural property** Full site plan (note: smaller scale may be used for large sites)	Y	N	NA	
Y	N	NA		o Source of potable water supply	Y	N	NA	
Y	N	NA		o Test Report required if bore water being used	Y	N	NA	
Y	N	NA		**All other property** (minimum scale 1:100)	Y	N	NA	
Y	N	NA		Show all existing and proposed building and eaves line	Y	N	NA	
Y	N	NA		Legal description and street address	Y	N	NA	
Y	N	NA		Vehicle access and manoeuvring, finished levels of driveway. Each car park space must have dimensions of at least 2.5 x 5.0m and slope not exceeding 1 in 16 (6.25%)	Y	N	NA	
Y	N	NA		Designated space (i.e. outdoor space – in living and rural villages only)	Y	N	NA	
Y	N	NA		Site area and boundary dimensions	Y	N	NA	
Y	N	NA		Building set-out (yard dimensions)	Y	N	NA	
Y	N	NA		Calculations for building coverage	Y	N	NA	
Y	N	NA		Calculations for existing and proposed impermeable surfaces (totals for each)	Y	N	NA	
Y	N	NA		North point, boundary bearings	Y	N	NA	

Y	N	NA		Datum and contours (or spot levels) Provide spot levels at corners of new building work and on the site boundaries immediately adjacent and at any point from which a height to boundary recession plane is measured.	Y	N	NA	
Y	N	NA		Volume of earthworks including cut and fill, including provision for silt control	Y	N	NA	Sites are already "benched" as per the Resource Consent. Existing.
Y	N	NA		Differentiate between the earthworks within the building eaves line and outside the eaves line	Y	N	NA	
Y	N	NA		Retaining walls – proposed heights	Y	N	NA	
Y	N	NA		Site management plan showing: *Provisions for the protection of public*, suppression of dust, disposal of debris, disconnection from public utilities and suppression of noise, traffic management	Y	N	NA	
Y	N	NA		Identify any tress protected by the District Plan, location, species, height, girth, extent of drip-line of all trees (incl. overhanging from neighbouring property and clearance required)	Y	N	NA	
Y	N	NA		Watecare Services Ltd. Approval if building within 10m of WSL line	Y	N	NA	
Y	N	NA		Show vehicle crossing – show 50 meters of roadway in each direction	Y	N	NA	
Y	N	NA		Finished floor level (relative to ground levels)	Y	N	NA	
Drainage Plan								
Y	N	NA		Existing drainage	Y	N	NA	
Y	N	NA		New private and public drainage/water course if to be used including manholes / invert levels	Y	N	NA	
Y	N	NA		Septic tank and effluent	Y	N	NA	
Y	N	NA		Protection of public drains (if bridging or in close proximity a video maybe required) Buildings over or within 1.0m of a public sewer require a bridging design including actuak invert levels	Y	N	NA	
Y	N	NA		o Stormwater disposal	Y	N	NA	
Y	N	NA		o Detention / retention tanks	Y	N	NA	
Y	N	NA		o Location of HWC, if external	Y	N	NA	
Y	N	NA		Retaining Walls	Y	N	NA	
Y	N	NA		o Show provisions for drainage	Y	N	NA	
Floor Plan (minimum scale 1:50 / Please provide extra copy)								
Y	N	NA		Proposed use of all spaces e.g. kitchen, bathrooms, toilets, etc.	Y	N	NA	
Y	N	NA		All rooms fully dimensioned	Y	N	NA	
Y	N	NA		Drawings must show key for elevations and include floor areas	Y	N	NA	
Y	N	NA		Smoke alarms and locations	Y	N	NA	
Y	N	NA		Window location / size	Y	N	NA	
Y	N	NA		*Lintel / specific designed beams sizes*	Y	N	NA	As marked on specific lintel Plan
Y	N	NA		Bracing type, location and length	Y	N	NA	As Marked on specific Bracing Pl
Y	N	NA		Location and type of hot water cylinder	Y	N	NA	

Customer Use				Council Use Only		
(tick as appropriate)	Date received by Council				Comments	

Y	N	NA		Location and type of heating – solid fuel / gas	Y	N	NA	
Y	N	NA		**Alterations**	Y	N	NA	
Y	N	NA		Existing floor plan and use of space	Y	N	NA	
Y	N	NA		Proposed floor plan and use of space	Y	N	NA	
Y	N	NA		New work must be clearly defined	Y	N	NA	
Foundation – fully dimensioned (scale 1:100 or 1:50)								
Y	N	NA		**Timber** – pile type, size, location, fixing details	Y	N	NA	
Y	N	NA		Sub-floor bracing, location, type, fixing details	Y	N	NA	
Y	N	NA		Bracing calculations and layout	Y	N	NA	
Y	N	NA		Bearer size and connection details	Y	N	NA	
Y	N	NA		Floor joist layout and size	Y	N	NA	
Y	N	NA		**Concrete** – width and depth of footing	Y	N	NA	
Y	N	NA		Masonry and reinforcing details	Y	N	NA	- Specific design
Y	N	NA		Slab dimensions, point loads, pads, eg. Plumbing fixtures	Y	N	NA	- Specific design
Y	N	NA		Mesh size and type	Y	N	NA	- Specific design
Y	N	NA		*Damp proof membranes*	Y	N	NA	
Y	N	NA		Raft floor – engineers design and calculations	Y	N	NA	Specific design attached.
Elevations (scale 1:100 or 1:50)								
Y	N	NA		Each external face of the building	Y	N	NA	
Y	N	NA		Existing and finished ground levels	Y	N	NA	
Y	N	NA		Ground clearances and cladding clearance	Y	N	NA	
Y	N	NA		Joinery openings	Y	N	NA	
Y	N	NA		Roof cladding and pitch	Y	N	NA	
Y	N	NA		Eaves overhang	Y	N	NA	
Y	N	NA		Gutter	Y	N	NA	
Y	N	NA		Cladding type	Y	N	NA	
Y	N	NA		Control joint location (if applicable)	Y	N	NA	
Y	N	NA		Subfloor access and ventilation	Y	N	NA	
Y	N	NA		Deck, balconies, chimney, and pergolas	Y	N	NA	
Y	N	NA		Height in relation to boundary – building in relation to site boundaries. Spot levels on elevation drawings	Y	N	NA	As per Resource Consent
Y	N	NA		Maximum height. Demonstrate compliance by rolling height or mean ground level method. Calculations may be required. (8 metre maximum height in Living Environment Zone)	Y	N	NA	As per Resource Consent
Cross-sections (minimum scale 1:50) referencing all details and sheet numbers to full demonstrate scope of work								
Y	N	NA		Cross-sections and long-sections	Y	N	NA	
Y	N	NA		Foundation / slab details showing	Y	N	NA	
Y	N	NA		o piles, footing depth and width	Y	N	NA	
Y	N	NA		o *damp proof membrane*	Y	N	NA	
Y	N	NA		Timber floor construction details	Y	N	NA	
Y	N	NA		o treatment level and type and fixing details	Y	N	NA	
Y	N	NA		o insulation (type and R value)	Y	N	NA	

p. 8, 9. H1 calculation.

Customer Use				Council Use Only			
Check if appropriate		Doc reference Ref #					Comments

Y	N	NA		o ground clearance in sub-floor space	Y	N	NA	
Y	N	NA		Wall framing construction details	Y	N	NA	
Y	N	NA		o treatment level and type (grade)	Y	N	NA	
Y	N	NA		o wall lining / insulation / building paper	Y	N	NA	
Y	N	NA		o wall cladding / cavity	Y	N	NA	
Y	N	NA		o finished floor levels	Y	N	NA	
Y	N	NA		Roof framing construction details	Y	N	NA	
Y	N	NA		o roof pitch	Y	N	NA	
Y	N	NA		o ceiling lining / insulation / building paper	Y	N	NA	
Y	N	NA		o roof cladding	Y	N	NA	
Y	N	NA		Retaining walls and drainage design	Y	N	NA	
Y	N	NA		Structural components and fixings	Y	N	NA	
Y	N	NA		Stairs ~~and decks~~	Y	N	NA	
Y	N	NA		o barrier construction details	Y	N	NA	
Y	N	NA		o pitch, tread, riser heights	Y	N	NA	
Roof framing (scale 1:100 or 1:50)								
Y	N	NA		Truss or rafter layout shown as a buildable design	Y	N	NA	
Y	N	NA		Spacing and dimensions of all roof framing	Y	N	NA	
Y	N	NA		Roof catchments area, fall direction and gutter size	Y	N	NA	
Y	N	NA		Downpipe sizes and location	Y	N	NA	
Y	N	NA		Roof bracing	Y	N	NA	
Y	N	NA		Area and type of all membrane roofs	Y	N	NA	
Y	N	NA		Outfall and overflow locations	Y	N	NA	
Y	N	NA		Lintels & specific design beams	Y	N	NA	- See Specific lintel plan.
Floor framing (minimum scale 1:50) required for each level of the building								
Y	N	NA		**Subfloor and decks**	Y	N	NA	
Y	N	NA		Pile type, size and location	Y	N	NA	
Y	N	NA		Sub-floor braces (location and direction)	Y	N	NA	
Y	N	NA		Bearer size, span and spacing	Y	N	NA	
Y	N	NA		Floor joist size, span and spacing	Y	N	NA	
Y	N	NA		Bracing calculations	Y	N	NA	
Y	N	NA		o subfloor	Y	N	NA	
Y	N	NA		o deck if > 2.0m wide	Y	N	NA	
Y	N	NA		Exposed deck fixings to be stainless steel or hot dipped galvanised with eproxy coating	Y	N	NA	
Y	N	NA		**Timber mid-floor** - joist layout, spacing, size, stairwell openings, treatment type and level	Y	N	NA	
Y	N	NA		**Concrete mid floor** - reinforcing, mesh, shrinkage control joints, damp proof membrane and thickness, point loads pads and thickenings	Y	N	NA	
Y	N	NA		**Floor framing plans must also show** - plumbing and drainage fixtures, pipe sizes and location	Y	N	NA	

Customer Use			Council Use Only	
Circle as appropriate	Use referenced			Comments

Cladding details (scale 1:10 or 1:5) Drawings should be of sufficient scale and detail to enable construction								
(Y)	N	NA		Flashing details for window, doors and other openings including	(Y)	N	NA	
(Y)	N	NA		o head, jamb and sill	(Y)	N	NA	
Y	N	(NA)		o parapets	Y	N	(NA)	
Y	N	(NA)		o balconies / decks	Y	N	(NA)	
Y	N	(NA)		o balustrades	Y	N	(NA)	
(Y)	N	NA		o apron flashings	(Y)	N	NA	
(Y)	N	NA		o junctions and interfaces	(Y)	N	NA	
(Y)	N	NA		o roof penetrations	(Y)	N	NA	
(Y)	N	NA		o meter box, pipes, penetrations, flashings	(Y)	N	NA	
Y	N	(NA)		Control joint design and location (monolithic only)	Y	N	(NA)	
(Y)	N	NA		Manufacturer's technical installation details / data	(Y)	N	NA	
(Y)	N	NA		Product accreditation or appraisal certificates for claddings	(Y)	N	NA	
(Y)	N	NA		E2 risk matrix for each wall face	(Y)	N	NA	– Risk Matrix worst case.
Plumbing and schematic								
(Y)	N	NA		Type of system - AS3500 or NZ Standards	(Y)	N	NA	
(Y)	N	NA		Plumbing schematic (if 2 or more storeys)	(Y)	N	NA	
(Y)	N	NA		Fixtures identified	(Y)	N	NA	
(Y)	N	NA		Vent, waste sizes and materials	(Y)	N	NA	
(Y)	N	NA		Floor finishes (wet and dry areas)	(Y)	N	NA	
Internal elevations NOTE: to be provided where the cross-sections or floor plans do not show the finishes and materials for walls and floors.								
(Y)	N	NA		Wall finishes (wet and dry areas)	(Y)	N	NA	
(Y)	N	NA		Benches – surface finish	(Y)	N	NA	
(Y)	N	NA		Shower / bath – construction and waterproofing details	(Y)	N	NA	
Specifications (2 copies minimum) Generic specifications will not be accepted.								
(Y)	N	NA		Specification relevant to project	(Y)	N	NA	
(Y)	N	NA		Appropriate standards referenced	(Y)	N	NA	
(Y)	N	NA		All technical sections or trades covered	(Y)	N	NA	
(Y)	N	NA		Types of materials, finishes and fixings to be used	(Y)	N	NA	
Y	N	(NA)		Heating (manufacturer's details)	Y	N	(NA)	
(Y)	N	NA		Hot water (manufacturer's details and seismic restraint)	(Y)	N	NA	
Product Literature (2 copies minimum)								
(Y)	N	NA		Technical data sheets for products to be used	(Y)	N	NA	
(Y)	N	NA		Installations instructions	(Y)	N	NA	
(Y)	N	NA		Product certification / appraisal certificates	(Y)	N	NA	
(Y)	N	NA		Maintenance schedule	(Y)	N	NA	
Bracing Calculations (2 copies minimum)								
(Y)	N	NA		Wind zone defined	(Y)	N	NA	
(Y)	N	NA		Wall bracing layout showing length and type of brace - must be shown on plans)	(Y)	N	NA	– See Specific bracing plan.

Customer Use					Council Use Only			
Circle as appropriate			Site referenced Ref etc					Comments
Y	N	NA		Wall bracing calculation sheets (required for each floor level)	Y	N	NA	- in spec
Y	N	NA		Sub-floor bracing calculations	Y	N	NA	
Y	N	NA		Deck sub-floor bracing calculations if > 2.0m wide	Y	N	NA	
Design Reports and calculations (2 copies minimum) Note: All Engineers issuing a producer statement must be registered with the Waitakere City Council.								
Y	N	NA		Engineering design calculations	Y	N	NA	PS1 original copy Attached
Y	N	NA		*Engineering must be detailed on plans* and show fixing details	Y	N	NA	
Y	N	NA		o beams and lintels	Y	N	NA	
Y	N	NA		o retaining walls	Y	N	NA	
Y	N	NA		o other	Y	N	NA	
Y	N	NA		Geotechnical report - a geotechnical report must be provided for sites steeper than 1:4 or where there are fill or stability issues	Y	N	NA	Geotech report attached.
Y	N	NA		Swimming pool design and fencing	Y	N	NA	
Y	N	NA		Fire report	Y	N	NA	
Y	N	NA		Septic tank and effluent design	Y	N	NA	
Y	N	NA		Soakage reports and construction details	Y	N	NA	
Y	N	NA		Material compatibility schedule	Y	N	NA	
Y	N	NA		Where glazing exceeds 30% of wall area an alternative solution must be provided	Y	N	NA	- Schedule Method glazing under 30%
Y	N	NA		Acoustic reports (high noise route or Whenuapai Airbase contours, living accommodation in the working/community environment)	Y	N	NA	

Comments:

Lodgement Officer: Danny Khan Date: 28/9/09.

Please Note:

This document has been produced to assist in the preparation of the documents required in the application of the Building Consent and is not in any way or form a Technical Processing Checklist.

Once processing commences, information may still be requested to ensure compliance with the Building Act 2004, the NZ Building Code, and the Waitakere City council District Plan.

We strongly recommend adhering to standard drafting practice (as outlined in NZ/AS 1100) and refer to the Department of Building and Housing (DBH) – "Guidelines to applying for a Building Consent". This can be found on the DBH website (www.dbh.govt.nz) or hard copies are available at our offices.

The Building Consent Authority (BCA) requires all construction information and details to be provided on the relevant drawings, using clear scales and presented in a manner that can be efficiently processed.

This Application Checklist may change due to our ongoing commitment to quality and education.

COMPUTER FREEHOLD REGISTER
UNDER LAND TRANSFER ACT 1952

Search Copy

R.W. Muir
Registrar-General
of Land

Identifier	**163628**
Land Registration District	**North Auckland**
Date Issued	02 September 2004

Prior References
NA117B/312

Estate	Fee Simple
Area	4.9336 hectares more or less
Legal Description	Lot 2 Deposited Plan 339810

Proprietors
New Zealand Housing Foundation

Interests

Subject to a pipeline right over part marked B on DP 339810 created by Transfer B344219.1 - 30.10.1984 at 10.55 am

Subject to an oil and gas supply right (in gross) over part marked B on DP 339810 in favour of Natural Gas Corporation of New Zealand Limited created by Transfer B344219.1 - 30.10.1984 at 10.55 am

6135712.2 Consent Notice pursuant to Section 221 Resource Management Act 1991 - 2.9.2004 at 9:00 am

Subject to a drainage easement (in gross) over part marked K, B & G on DP 339810 in favour of the Waitakere City Council created by Easement Instrument 6135712.4 - 2.9.2004 at 9:00 am

The easements created by Easement Instrument 6135712.4 are subject to Section 243 (a) Resource Management Act 1991

6551320.5 Mortgage to Housing New Zealand Corporation - 29.8.2005 at 9:00 am

IMPORTANT NOTICE

All Building Consent documents must be kept on site during construction.
Unless the siting of the proposed building is certified by a registered surveyor all boundary pegs are to be flagged prior to work commencing.
A fence on an established site may be taken as the boundary on the written agreement of all neighbours.

NOTES:

- All details shown are as per information provided.
- Confirm all Public Drains
  Based on design drawings provided
  Confirm all details when "As Builts" complete.
- The building platform has been prepared to an advised level of RL: 23.20
  CONFIRM ON SITE
- Proposed FL of 23.35
- Refer to page 2 for specific details of plumbing and drainage.

TOTAL SITE LEGAL DESCRIPTION

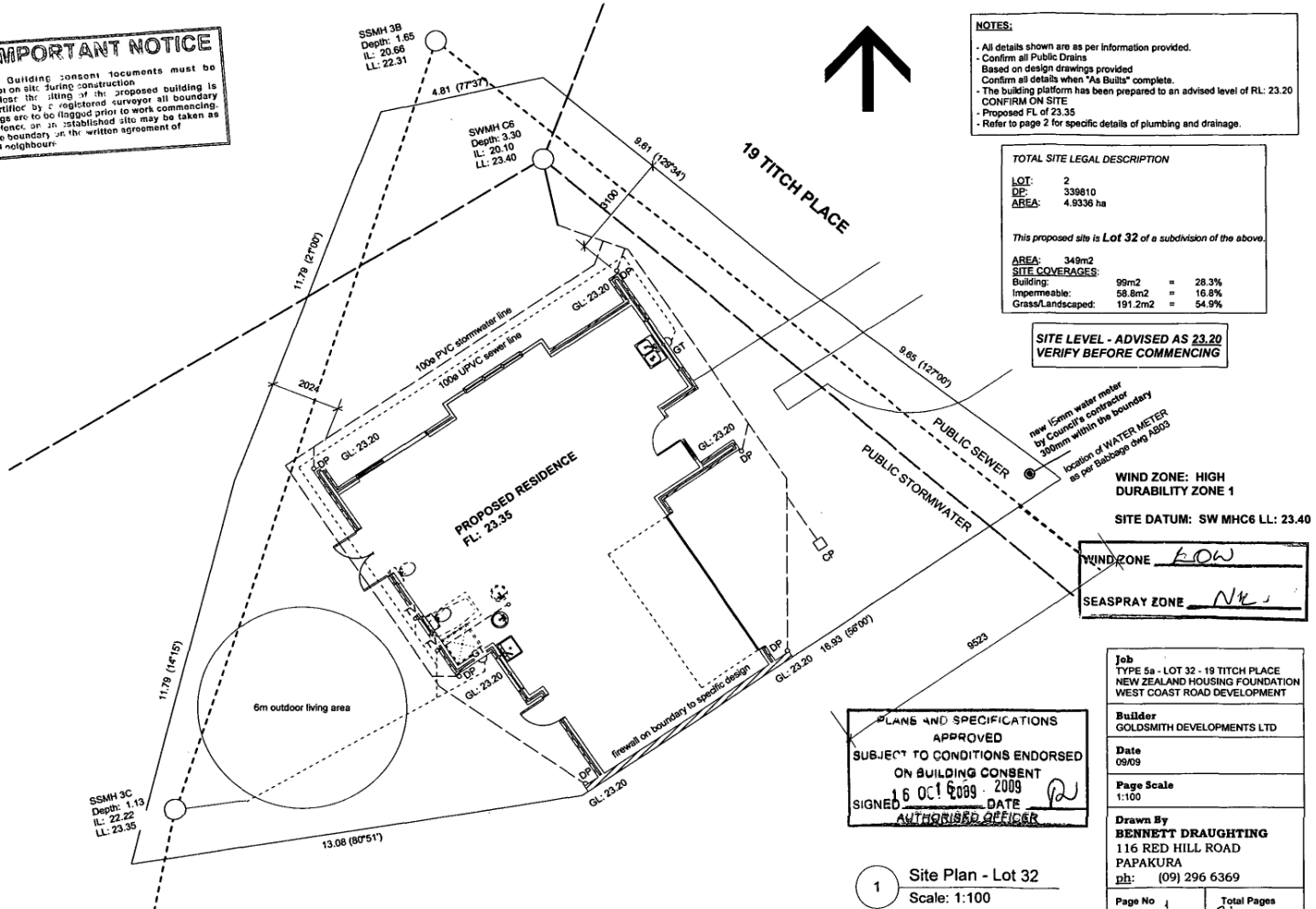
LOT: 2
DP: 339810
AREA: 4.9336 ha

This proposed site is ***Lot 32*** *of a subdivision of the above.*

AREA: 349m2
SITE COVERAGES:

Building:	99m2	=	28.3%
Impermeable:	58.8m2	=	16.8%
Grass/Landscaped:	191.2m2	=	54.9%

SITE LEVEL - ADVISED AS 23.20
VERIFY BEFORE COMMENCING



WIND ZONE LOW

SEASPRAY ZONE NIL

PLANS AND SPECIFICATIONS
APPROVED
SUBJECT TO CONDITIONS ENDORSED
ON BUILDING CONSENT
SIGNED 16 OCT 2009 DATE
AUTHORISED OFFICER

1 Site Plan - Lot 32
Scale: 1:100

Job
TYPE 5a - LOT 32 - 19 TITCH PLACE
NEW ZEALAND HOUSING FOUNDATION
WEST COAST ROAD DEVELOPMENT

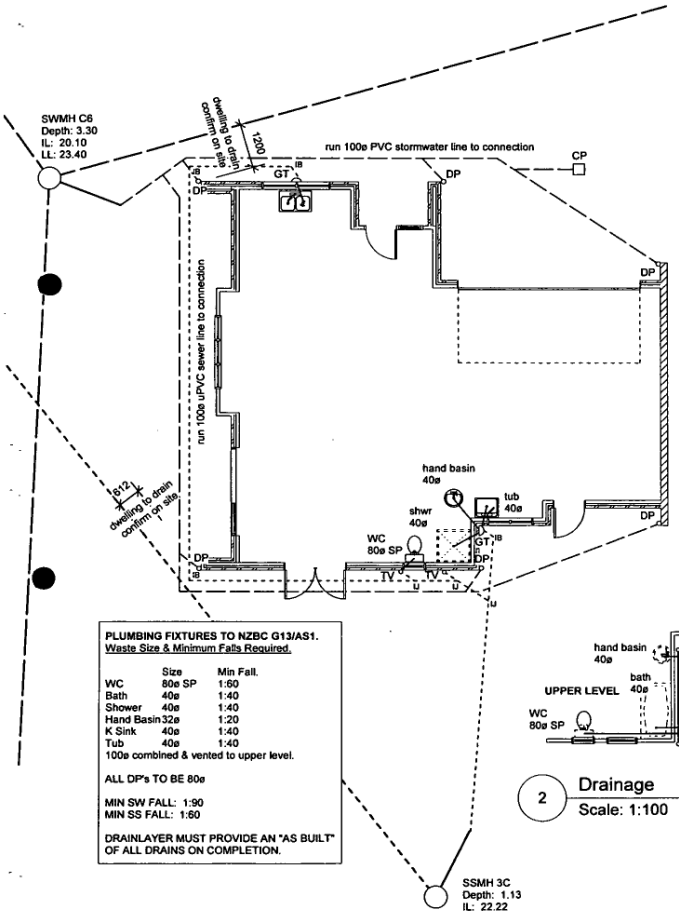
Builder
GOLDSMITH DEVELOPMENTS LTD

Date
09/09

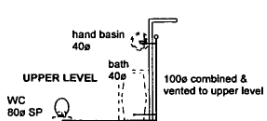
Page Scale
1:100

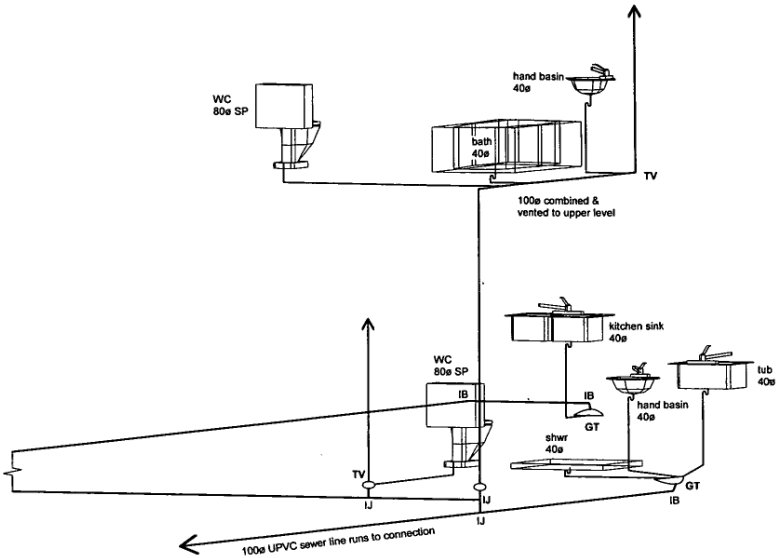
Drawn By
BENNETT DRAUGHTING
116 RED HILL ROAD
PAPAKURA
ph: (09) 296 6369

Page No 1 | Total Pages 21



2 Drainage
Scale: 1:100





2a Schematic
Plumbing to NZBC G13

PLUMBING FIXTURES TO NZBC G13/AS1.
Waste Size & Minimum Falls Required.

	Size	Min Fall.
WC	80ø SP	1:60
Bath	40ø	1:40
Shower	40ø	1:40
Hand Basin	32ø	1:20
K Sink	40ø	1:40
Tub	40ø	1:40

100ø combined & vented to upper level.

ALL DP's TO BE 80ø

MIN SW FALL: 1:90
MIN SS FALL: 1:60

DRAINLAYER MUST PROVIDE AN "AS BUILT" OF ALL DRAINS ON COMPLETION.

NOTES:

- All details shown are as per information provided by NZHF.
- Confirm all public drains & connections on site before commencing any work.
- Public drains & connections plotted as per Babbage "As Built" dwgs: AB08 & AB09
- The building platform has been prepared to an advised level of RL: 23.20
  A FL: 23.35 is proposed for the new dwelling.
  CONFIRM RL ON SITE BEFORE COMMENCING.

PLANS AND SPECIFICATIONS
APPROVED
SUBJECT TO CONDITIONS ENDORSED
ON BUILDING CONSENT
SIGNED 16 OCT 2009 DATE
AUTHORISED OFFICER

Job
TYPE 5a - LOT 32 - 19 TITCH PLACE
NEW ZEALAND HOUSING FOUNDATION
WEST COAST ROAD DEVELOPMENT

Builder
GOLDSMITH DEVELOPMENTS LTD

Date
09/09

Page Scale
1:100

Drawn By
BENNETT DRAUGHTING
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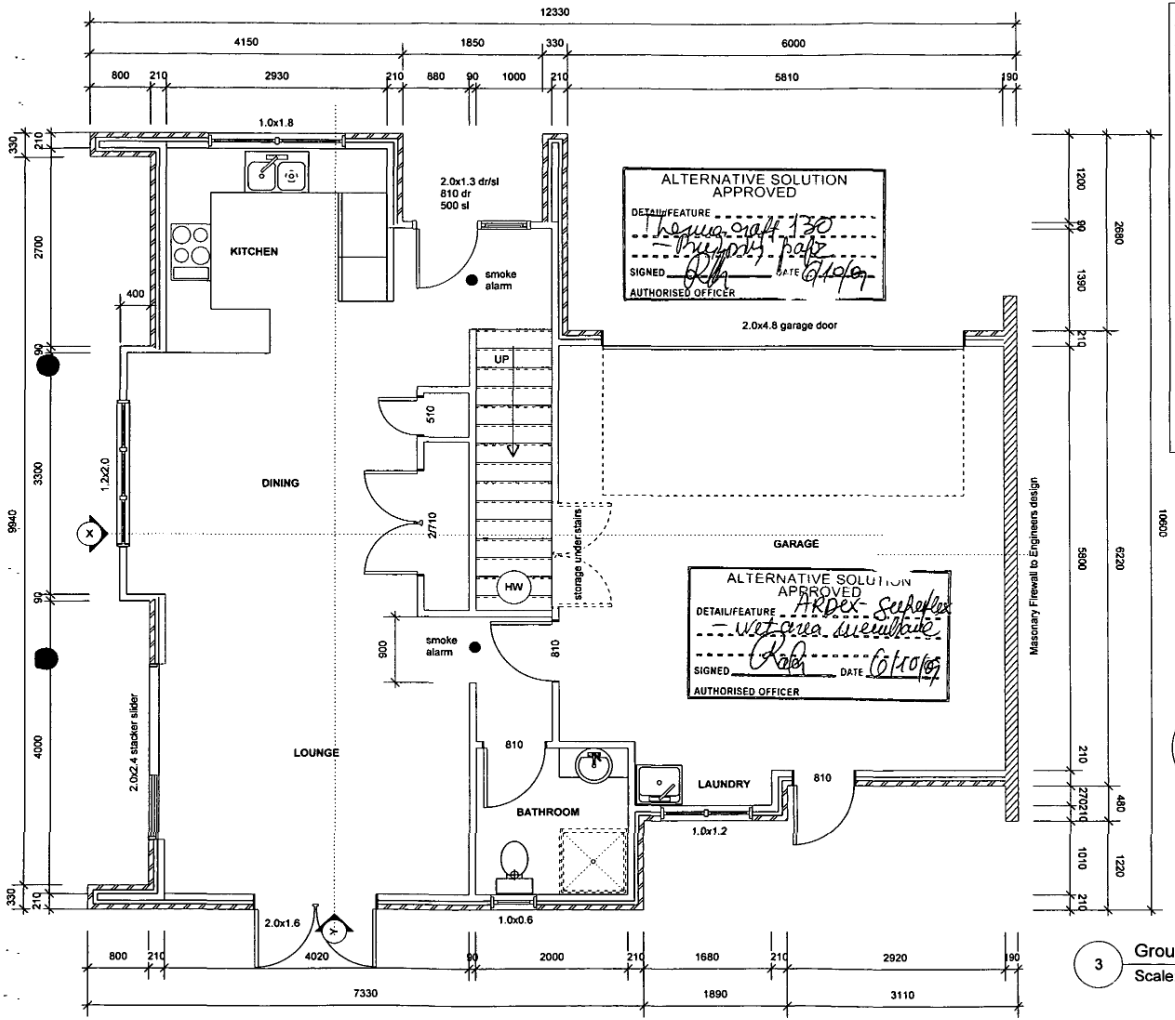
PAPAKURA
ph: (09) 296 6369

Page No 2 **Total Pages** 21



FLOOR NOTES:

- All work must comply with the NZ Building Code & approved documents including NZS 3604.1999.
- Kitchen facilities to NZBC G3
- Laundry Facilities to NZBC G2
- All "wet" areas must comply with NZBC E3
- Safety glass to Bathrooms & WC to NZBC F2
- Seismic Strapping & Tempering valve to NZBC G12
- Equipotential Bonding to NZBC G.12
- Framing & Lintels to NZS 3604 - High Wind Zone. Lintels & beams outside NZS 3604 are sized ex the Gangnail Charts - see spec.

ALL STRUCTURAL TIMBER MUST BE MSG8 MIN GRADE

Exterior Loadbearing Studs in Lower Level must be at 480 cts
Other Loadbearing Studs -
90x45 @ 600 cts - nogs @ 800 cts
90x45 top & bottom plates to NZS 3604
140x35 over all top plates
Non Loadbearing Studs -
90x45 or 70x45 @ 600 cts - nogs @ 800 cts
90x45 or 70x45 top & bottom plates to NZS 3604
140x35 over all top plates

- All timber must comply with NZBC B2 - All framing to walls, ceiling & roof to be H-1.2 min with H-3.1 bottom plates. (note: use H-3.1 in all wet areas).
- Ground Floor cladding will be 70 Series Brick Veneer with 40mm cavity to E2/AS1.
- Top Floor cladding will be Palliside Weatherboards on a cavity system to E2/AS1.
- "Thermokraft Diflex 130" building paper, *fixed with staples to manufacturers details.*
- Provide domestic smoke alarms to comply with the NZBC.
- Refer to specific layout for bracing & lintel information.
- Refer to page 8 for insulation calcs - H1/AS1 - Schedule Method.
- CHECK ALL DIMENSIONS, LEVELS & DETAILS ON SITE.

PLANS AND SPECIFICATIONS
APPROVED
SUBJECT TO CONDITIONS ENDORSED
ON BUILDING CONSENT
SIGNED 16 OCT 2009 DATE
AUTHORISED OFFICER

Ground Floor Area:	99m2
Top Floor Area:	83m2
Total Floor Area:	180m2

3 Ground Floor
Scale: 1:50

1 2 3 4
ELEVATIONS

Job
TYPE 5a HOUSE
NEW ZEALAND HOUSING FOUNDATION
WEST COAST ROAD DEVELOPMENT

Builder
GOLDSMITH DEVELOPMENTS LTD

Date
09/09

Page Scale
1:50

Drawn By
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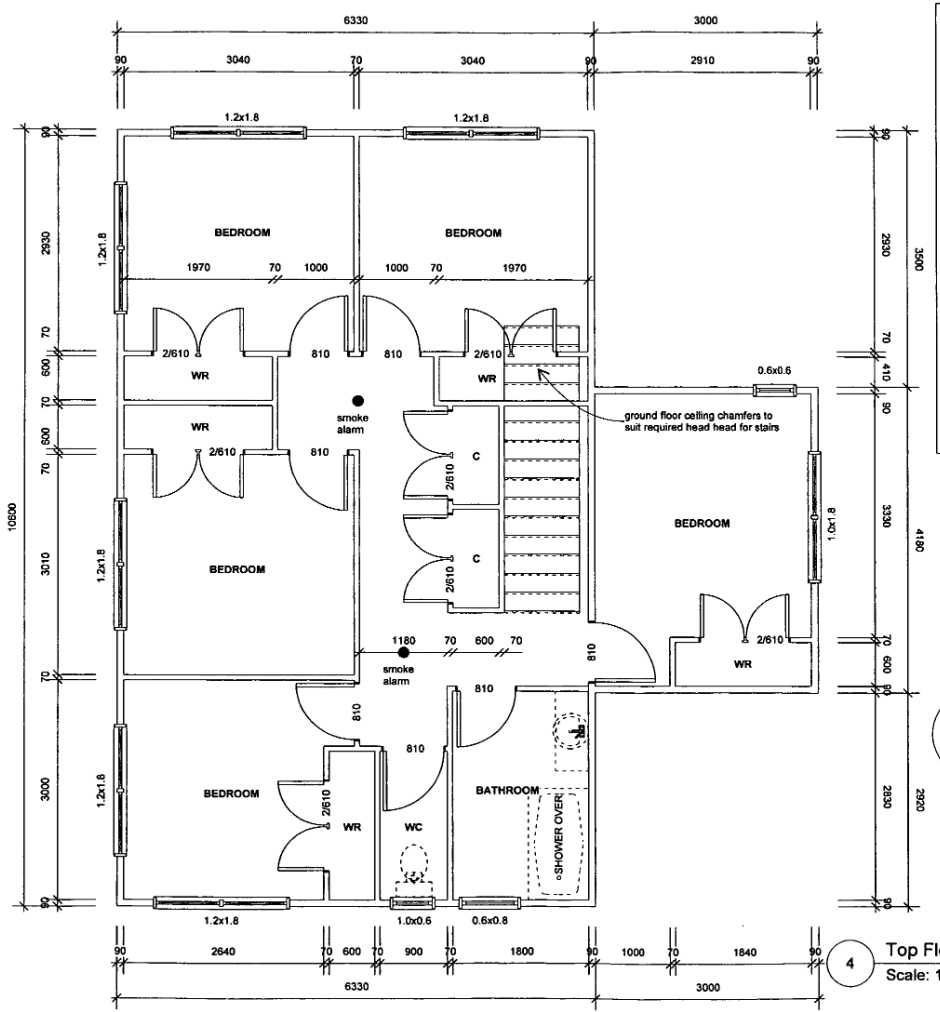
PAPAKURA
ph: (09) 296 6369

Page No	Total Pages
3	21



4 Top Floor
Scale: 1:50

FLOOR NOTES:

- All work must comply with the NZ Building Code & approved documents including NZS 3604.1999.
- Kitchen facilities to NZBC G3
- Laundry Facilities to NZBC G2
- All "wet" areas must comply with NZBC E3
- Safety glass to Bathrooms & WC to NZBC F2
- Seismic Strapping & Tempering valve to NZBC G12
- Equipotential Bonding to NZBC G.12
- Framing & Lintels to NZS 3604 - High Wind Zone. Lintels & beams outside NZS 3604 are sized ex the Gangnail Charts - see spec.
  ALL STRUCTURAL TIMBER MUST BE MSG8 MIN GRADE
  Exterior Loadbearing Studs in Lower Level must be at 480 cts
  Other Loadbearing Studs -
  90x45 @ 600 cts - nogs @ 800 cts
  90x45 top & bottom plates to NZS 3604
  140x35 over all top plates
  Non Loadbearing Studs -
  90x45 or 70x45 @ 600 cts - nogs @ 800 cts
  90x45 or 70x45 top & bottom plates to NZS 3604
  140x35 over all top plates
- All timber must comply with NZBC B2 - All framing to walls, ceiling & roof to be H-1.2 min with H-3.1 bottom plates. (note: use H-3.1 in all wet areas).
- Ground Floor cladding will be 70 Series Brick Veneer with 40mm cavity to E2/AS1.
- Top Floor cladding will be Palliside Weatherboards on a cavity system to E2/AS1.
- "Thermokraft Diflex 130" building paper, fixed with staples to manufacturers details.
- Provide domestic smoke alarms to comply with the NZBC.
- Refer to specific layout for bracing & lintel information.
- Refer to page 8 for insulation calcs - H1/AS1 - Schedule Method.
- CHECK ALL DIMENSIONS, LEVELS & DETAILS ON SITE.

PLANS AND SPECIFICATIONS
APPROVED
SUBJECT TO CONDITIONS ENDORSED
ON BUILDING CONSENT
SIGNED 16 OCT 2009 DATE
AUTHORISED OFFICER

Ground Floor Area:	99m2
Top Floor Area:	83m2
Total Floor Area:	180m2

1 2 3 4 *ELEVATIONS*

Job
TYPE 5a HOUSE
NEW ZEALAND HOUSING FOUNDATION
WEST COAST ROAD DEVELOPMENT

Builder
GOLDSMITH DEVELOPMENTS LTD

Date
09/09

Page Scale
1:50

Drawn By
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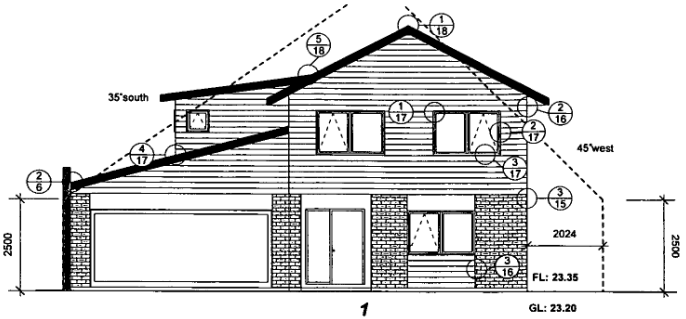
PAPAKURA
ph: (09) 296 6369

Page No 4 | Total Pages 21

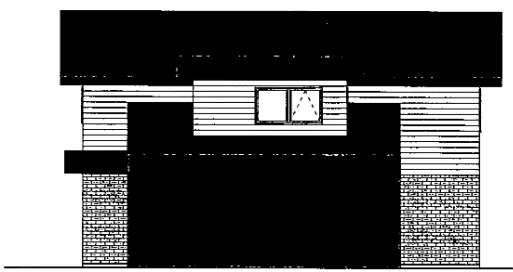


1

- 28 upper roof pitch.
- 15 & 8°lower roof pitch.
- Colourstеel Longrun roofing.
- Lower cladding - 70 Series Brick Veneer.
- Upper cladding - Pallside Weatherboards.

ALL SITES HAVE BEEN BENCHED TO THE RL STATED (23.20). ALL HIRB REFERENCES ARE AS PER THE RESOURCE CONSENT, A COPY OF THIS IS ATTACHED WITH THE APPLICATION.

PLANS AND SPECIFICATIONS
APPROVED
SUBJECT TO CONDITIONS ENDORSED
ON BUILDING CONSENT
19 OCT 2009
SIGNED 16 OCT 2009 DATE
AUTHORISED OFFICER



2

3

ALTERNATIVE SOLUTION
APPROVED
DETAIL/FEATURE Fall Slope
Weatherboards
SIGNED DATE 6/10/09
AUTHORISED OFFICER

4

1 2 3 4
ELEVATIONS

5 Elevations
Scale: 1:100

Job
TYPE 5a HOUSE
NEW ZEALAND HOUSING FOUNDATION
WEST COAST ROAD DEVELOPMENT

Builder
GOLDSMITH DEVELOPMENTS LTD

Date
09/09

Page Scale
1:100

Drawn By
BENNETT DRAUGHTING
116 RED HILL ROAD
PAPAKURA
ph: (09) 296 6369

Page No	Total Pages
5	21

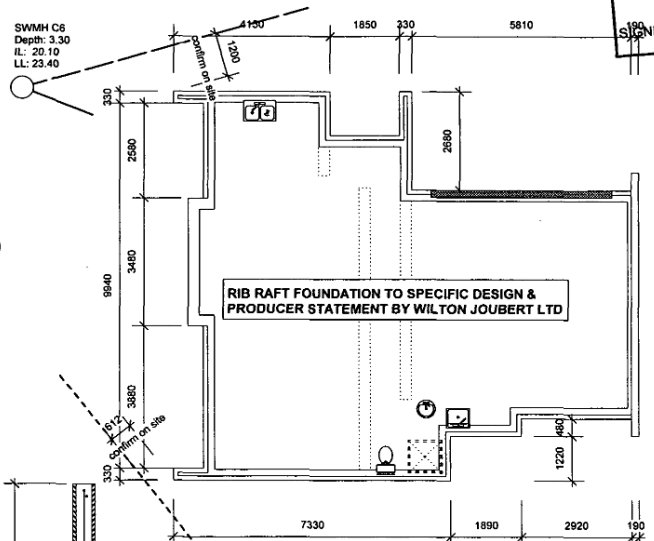
FOUNDATION NOTES:

- All ground is assumed to be "good ground" to NZS 3604.1999.
  If any variations occur or unusual conditions are encountered consult Wilton Joubert Ltd immediately.
- All concrete must be 20 MPA min.
- 0.25 MU polythene to underside of slab.
- Confirm all levels, setout dimensions etc on site before commencing.
- **Foundation to specific design & producer statement by Wilton Joubert Ltd.**

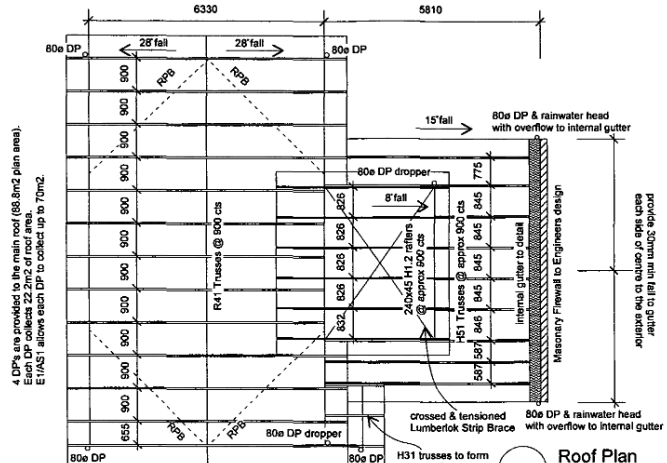
PLANS AND SPECIFICATIONS APPROVED SUBJECT TO CONDITIONS ENDORSED ON BUILDING CONSENT
SIGNED 16 OCT 2009 DATE
AUTHORISED OFFICER

ROOF NOTES:

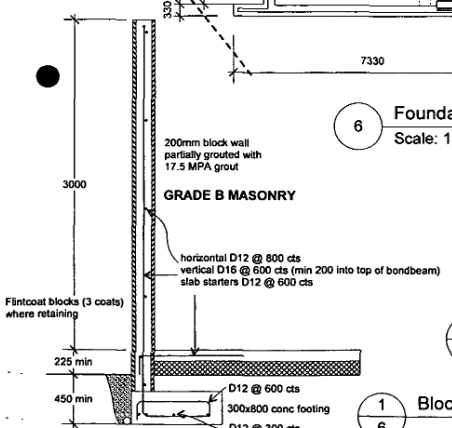
- Lower Roof - 15°pitch. Coloursteel Corrugated Profile fixed strictly to manufacturers specs & E2/AS1
- Upper Roof - 28°pitch. Coloursteel Corrugated Profile fixed strictly to manufacturers specs & E2/AS1
- Dormer Roof - 8°pitch. 200x50 rafters. Coloursteel Corrugated Profile fixed strictly to manufacturers specs & E2/AS1
- Gangnail/Mitek truss system - all trusses @ 900 max cts.
- 70x45 H1.2 purlins @ 900 cts
- Thermakraft 215 self supporting roofing underlay.
- All trusses must be manufactured by an approved fabricator who must confirm all designs.
- The fabricator must provide a Producer Statement covering all trusses & fixings.
- Any changes to this layout will require a reassessment of affected Beams & Lintels.
- All structural timber must be MSG8 min grade.
- Truss Fixings: - Subject to verification by fabricator.
  To Plate - 2 wire dogs each end.
  To Truss - L.L Joist bkt.
- Roof Bracing to NZS 3604 - "Light Gable".



6 Foundation Layout
Scale: 1:100



6a Roof Plan
Scale: 1:100

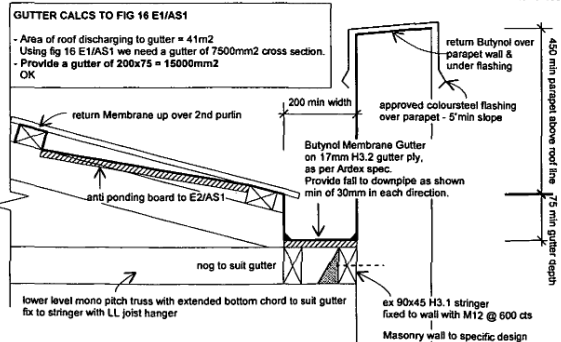


2/6 Internal Gutter Detail
ALSO REFER TO PAGE 19 FOR
RAINWATER HEAD & LAPPING DETAILS

1/6 Blockwall Detail

GUTTER CALCS TO FIG 16 E1/AS1

- Area of roof discharging to gutter = 41m2
  Using fig 16 E1/AS1 we need a gutter of 7500mm2 cross section.
- **Provide a gutter of 200x75 = 15000mm2**
  OK



Job
TYPE 5a HOUSE
NEW ZEALAND HOUSING FOUNDATION
WEST COAST ROAD DEVELOPMENT

Builder
GOLDSMITH DEVELOPMENTS LTD

Date
09/09

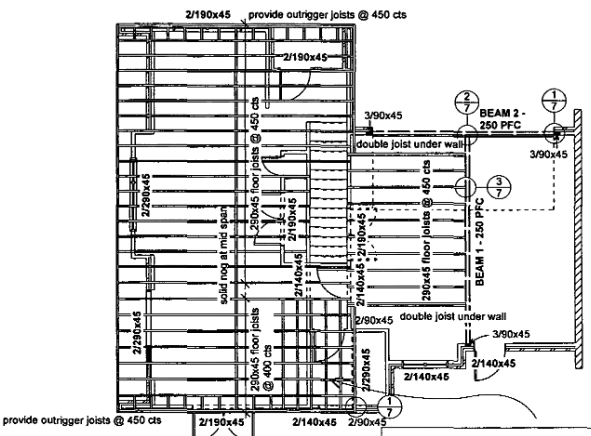
Page Scale
1:100

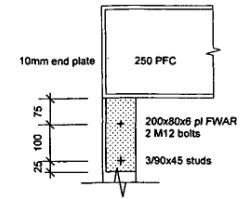
Drawn By
BENNETT DRAUGHTING
116 RED HILL ROAD
PAPAKURA
ph: (09) 296 6369

Page No 6 | **Total Pages** 21

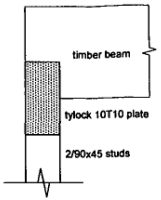
MID FLOOR NOTES:

- All floor joists 290x45 @ 450 cts.
- Solid nog all joists to NZS 3604.1999.
- *All structural timber to be MSG8 min grade.*
- JOISTS MUST BE 290x45 MSG8 TO SUIT CANTILEVER (1.0 max to NZS 3604)
- Use H-1.2 joists thoughout with H-3.1 joists in "Wet Areas".
- Use H-3 ply flooring in "Wet Areas".

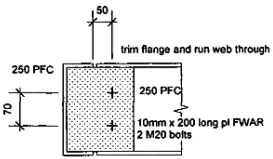




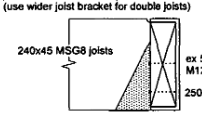
1/7 Steel Beam / Timber Post Detail



1/7 Timber Beam / Timber Post Detail



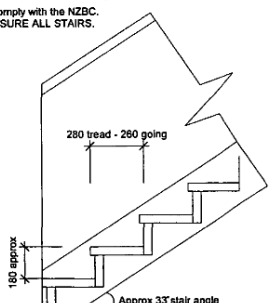
2/7 Steel Beam / Steel Beam Detail



3/7 Floor Joist / Steel Beam

graspable handrail to comply with the NZBC & D1/AS1.
Packed 50mm off wall, 1000 high ex stair nosing.

Stairs to comply with the NZBC.
SITE MEASURE ALL STAIRS.

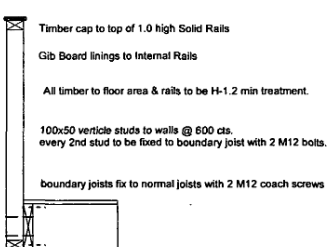


Internal Stairs Detail

PLANS AND SPECIFICATIONS
APPROVED
SUBJECT TO CONDITIONS ENDORSED
ON BUILDING CONSENT
SIGNED 16 OCT 2009 DATE
AUTHORISED OFFICER

WET AREA FLOOR FRAMING:

Plywood must be a minimum of 17mm thich complying with AS/NZS 2269, CD Grade Structural with sanded C face upwards and treated to H3 (CCA treated).
LOSP treated plywood must not be used.
The plywood must be supported with nogs or joists with a maximum span of 400mm in each direction, fixed with 10g x 50mm stainless steel countersunk head screws at 150mm cts on the edges & 200mm through the body of the sheets.



Internal rail detail

7 Mid Floor
Scale: 1:100

Job TYPE 5a HOUSE NEW ZEALAND HOUSING FOUNDATION WEST COAST ROAD DEVELOPMENT	
Builder GOLDSMITH DEVELOPMENTS LTD	
Date 09/09	
Page Scale 1:100	
Drawn By **BENNETT DRAUGHTING** 116 RED HILL ROAD PAPAKURA ph: (09) 296 6369	
Page No 7	**Total Pages** 21

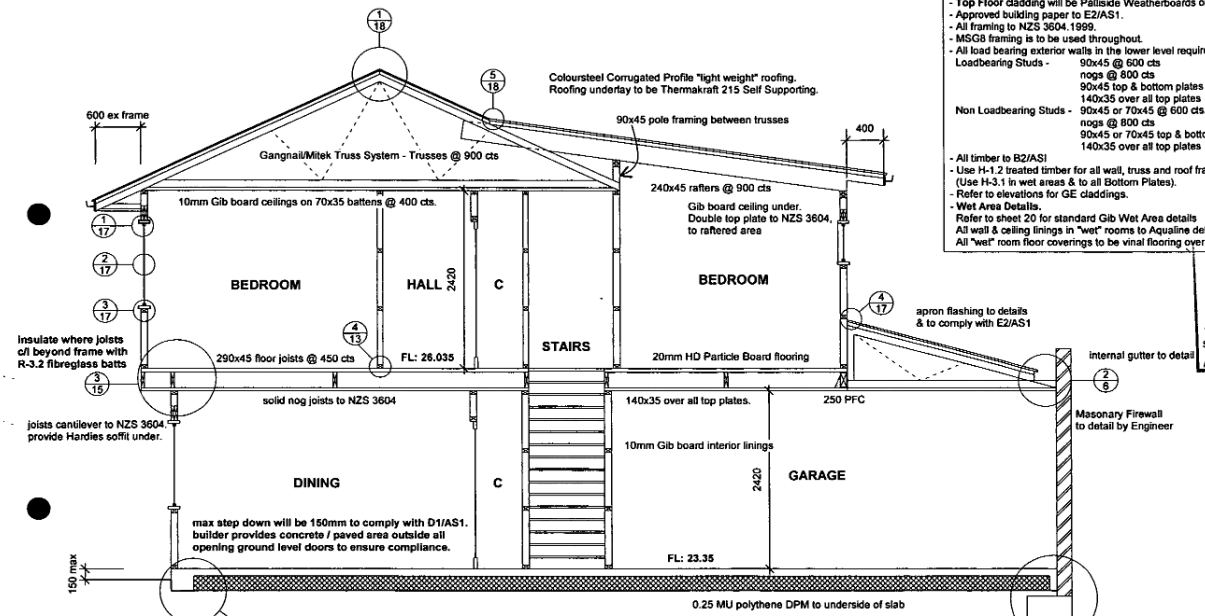
X SECTION NOTES:

- Lower Roof - 15° pitch. Coloursteel Corrugated Profile fixed strictly to manufacturers specs & E2/AS1
- Upper Roof - 26° pitch. Coloursteel Corrugated Profile fixed strictly to manufacturers specs & E2/ASI
- Dormer Roof - 6° pitch. 250x50 rafters. Coloursteel Corrugated Profile fixed strictly to manufacturers specs & E2/AS1
- Gangnail / Mitek trusses @ 900.
- Design no. R41
- 70x45 purlins @ 900 max cts.
- External fascia / gutter.
- Hardies soffit.
- Ground Floor cladding will be 70 Series Brick Veneer with 40mm cavity to E2/ASI.
- Top Floor cladding will be Pallside Weatherboards on a cavity system to manufacturers spec & E2/AS1.
- Approved building paper to E2/AS1.
- All framing to NZS 3604.1999.
- MSG8 framing is to be used throughout.
- All load bearing exterior walls in the lower level require studs @ 480 max cts.

Loadbearing Studs - 90x45 @ 600 cts
nogs @ 800 cts
90x45 top & bottom plates to NZS 3604
140x35 over all top plates

Non Loadbearing Studs - 90x45 or 70x45 @ 600 cts.
nogs @ 800 cts
90x45 or 70x45 top & bottom plates to NZS 3604
140x35 over all top plates

- All timber to B2/ASI
- Use H-1.2 treated timber for all wall, truss and roof framing. (Use H-3.1 in wet areas & to all Bottom Plates).
- Refer to elevations for GE claddings.
- **Wet Area Details.**
  Refer to sheet 20 for standard Gib Wet Area details
  All wall & ceiling linings in "wet" rooms to Aqualine details.
  All "wet" room floor coverings to be vinal flooring over Supaflex sealant.



Particle board

SIGNED ... DATE 6/10/09

AUTHORISED OFFICER

PLANS AND SPECIFICATIONS
APPROVED
SUBJECT TO CONDITIONS ENDORSED
ON BUILDING CONSENT
16 OCT 2009
SIGNED ... DATE
AUTHORISED OFFICER

SOLUTION
APPROVED
Thermakraft 215
SIGNED ... DATE 6/10/09
AUTHORISED OFFICER

H1 Energy Efficiency
Insulation to comply with H1/AS1 - Zone 2
See full calcs in specification.
Required "R" values - Zone 2

Ceiling / Roof	=	R-2.9
Exterior Walls	=	R-1.9
Floor	=	R-1.3
Vertical Glazing	=	R-0.26

Wall seperating garage / dwelling = R-1.9

Vertical Glazing Requirement.
(lower level - garage walls excluded from calcs)

East / West / South	=	37.37m2 / 8.2m2 glazing	= 21.9%
North	=	25.07m2 / 7.2m2 glazing	= 28.7%
Total including North	=	62.44m2 / 15.4m2	= 24.6%

(upper level)

East / West / South	=	70.79m2 / 9.72m2 glazing	= 13.7%
North	=	25.65m2 / 6.48 glazing	= 25.2%
Total including North	=	96.44m2 / 16.2 glazing	= 16.7%

Upper & Lower Total

East / West / South	=	110.16m2 / 17.92 glazing	= 16.2%
North	=	50.72m2 / 13.68 glazing	= 26.9%
Total including North	=	160.88m2 / 31.60 glazing	= 19.64%

As glazing is under 30% use Schedule Method.
(R values as per Pink Batts R value installation guide)

Ceilings / Roof	=	R-3.2 batts
Exterior Walls	=	R-2.6 batts
Floor	=	R-1.3
Vertical Glazing	=	R-0.26 (use double glazing)

8 X Section
Scale: 1:50

Job
TYPE 5a HOUSE
NEW ZEALAND HOUSING FOUNDATION
WEST COAST ROAD DEVELOPMENT

Builder
GOLDSMITH DEVELOPMENTS LTD

Date
09/09

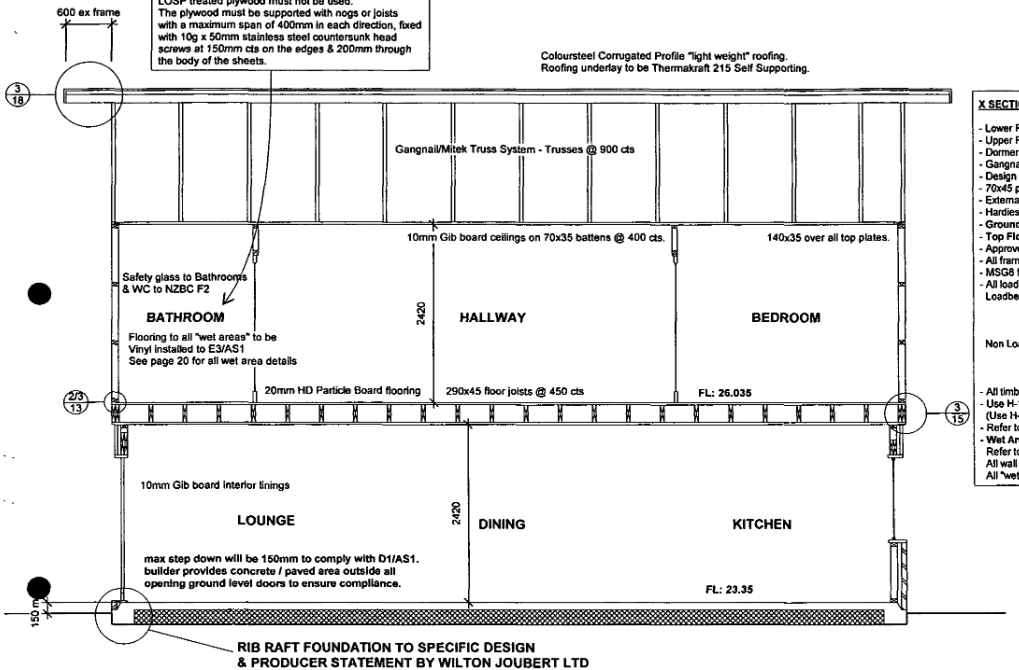
Page Scale
1:50

Drawn By
BENNETT DRAUGHTING
116 RED HILL ROAD
PAPAKURA
ph: (09) 296 6369

Page No 8 **Total Pages** 21

WET AREA FLOOR FRAMING:

Plywood must be a minimum of 17mm thick complying with AS/NZS 2269, CD Grade Structural with sanded C face upwards and treated to H3 (CCA treated). LOSP treated plywood must not be used.
The plywood must be supported with nogs or joists with a maximum span of 400mm in each direction, fixed with 10g x 50mm stainless steel countersunk head screws at 150mm cts on the edges & 200mm through the body of the sheets.



X SECTION NOTES:

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- Dormer Roof - 8°pitch. 250x50 rafters. Coloursteel Corrugated Profile fixed strictly to manufacturers specs & E2/AS1
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- External fascia / gutter.
- Hardies soffit.
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- Approved building paper to E2/AS1.
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- MSG8 framing is to be used throughout.
- All load bearing exterior walls in the lower level require studs @ 480 max cts.

Loadbearing Studs -	90x45 @ 600 cts nogs @ 800 cts 90x45 top & bottom plates to NZS 3604 140x35 over all top plates
Non Loadbearing Studs -	90x45 or 70x45 @ 600 cts. nogs @ 800 cts 90x45 or 70x45 top & bottom plates to NZS 3604 140x35 over all top plates

- All timber to B2/AS1
- Use H-1.2 treated timber for all wall, truss and roof framing. (Use H-3.1 in wet areas & to all Bottom Plates).
- Refer to elevations for GE claddings.
- **Wet Area Details.**
  Refer to sheet 20 for standard Gib Wet Area details
  All wall & ceiling linings in "wet" rooms to Aqualine details.
  All "wet" room floor coverings to be vinal flooring over Supaflex sealant.

PLANS AND SPECIFICATIONS
APPROVED
SUBJECT TO CONDITIONS ENDORSED
ON BUILDING CONSENT
SIGNED 16 OCT 2009 DATE
AUTHORISED OFFICER

H1 Energy Efficiency
Insulation to comply with H1/AS1 - Zone 2
See full calcs in specification.
Required "R" values - Zone 2

Ceiling / Roof	=	R-2.9
Exterior Walls	=	R-1.9
Floor	=	R-1.3
Vertical Glazing	=	R-0.26

Wall seperating garage / dwelling = R-1.9

Vertical Glazing Requirement.
(lower level - garage walls excluded from calcs)

East / West / South	=	37.37m2 / 8.2m2 glazing	= 21.9%
North	=	25.07m2 / 7.2m2 glazing	= 28.7%
Total including North	=	62.44m2 / 15.4m2	= 24.6%

(upper level)

East / West / South	=	70.79m2 / 9.72m2 glazing	= 13.7%
North	=	25.65m2 / 6.48 glazing	= 25.2%
Total Including North	=	96.44m2 / 16.2 glazing	= 16.7%

Upper & Lower Total

East / West / South	=	110.16m2 / 17.92 glazing	= 16.2%
North	=	50.72m2 / 13.68 glazing	= 26.9%
Total including North	=	160.88m2 / 31.60 glazing	= 19.64%

As glazing is under 30% use Schedule Method.
(R values as per Pink Batts R value installation guide)

Ceilings / Roof	=	R-3.2 batts
Exterior Walls	=	R-2.6 batts
Floor	=	R-1.3
Vertical Glazing	=	R-0.26 (use double glazing)

9 Y Section
Scale: 1:50

Job
TYPE 5a HOUSE
NEW ZEALAND HOUSING FOUNDATION
WEST COAST ROAD DEVELOPMENT

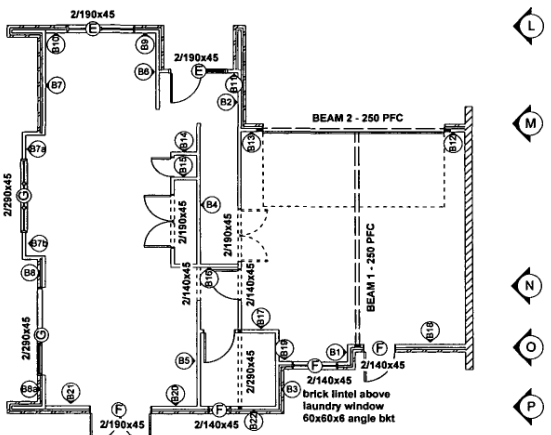
Builder
GOLDSMITH DEVELOPMENTS LTD

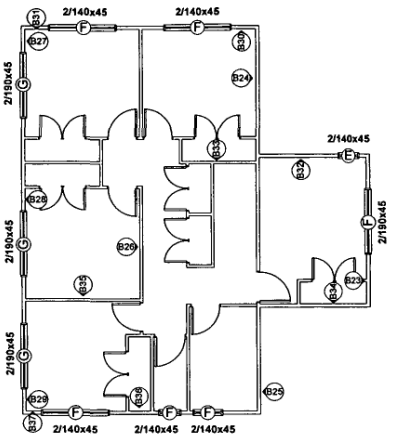
Date
09/09

Page Scale
1:50

Drawn By
BENNETT DRAUGHTING
116 RED HILL ROAD
PAPAKURA
ph: (09) 296 6369

Page No 9 | Total Pages 21





GROUND LEVEL			GROUND LEVEL		
ALONG			ACROSS		
A			L		
MASONARY WALL			B9	BLP	0.6
(Engineer design)			B10	BLP	0.6
			B11	BL1	0.4
B			M		
B1	BL1	0.48	B12	BLP	0.6
			B13	BLP	0.6
C			B14	BLG	0.6
B2	BLP	1.6	B15	BLG	0.6
B3	SP1	1.2			
B4	BLG	3.6	N		
			B16	BL1a	1.8
D			B17	BL1	1.0
B5	GS1a	2.4			
B6	BL1a	1.8	O		
			B18	BLP	1.8
E			B19	BL1	0.4
B7	BLP	2.7			
B7a	BL1	0.6	P		
B7b	BL1	0.6	B20	BLP	1.2
B8	BLP	0.6	B21	BLP	1.2
B8a	BLP	0.6	B22	SP1	1.2

UPPER LEVEL			UPPER LEVEL		
ALONG			ACROSS		
A			L		
B23	BL1	1.4	B30	BL1	0.6
			B31	BL1	0.6
B					
B24	GS1a	2.4	M		
B25	SP1	1.2	B32	GS1a	1.8
			B33	GS1a	1.8
C					
B26	GS2	3.0	N		
			B34	BL1	1.8
D			B35	GS2	2.4
B27	BL1	0.6			
B28	BL1	0.6	O		
B29	BL1	0.6	B36	BL1	0.6
			B37	BL1	0.4

TIMBER:

- All timber must comply with B2/AS1.
- Framing - All framing must be treated to H-1.2 min with H-3.1 bottom plates. "Wet" areas to have H-3.1 framing.
- Exterior Use Timber - All exterior use timber (decks etc) must be treated to H-3.2 min treatment.
- Ground Contact Timber - Timber in ground contact must be treated to H-5 min.

FIXINGS:

- Purlin/Truss - Min of 2 - 100x3.75 nails & 1 wire dog.
- Truss/Plate - Min of 2 wire dogs each end Fabricator must confirm.
- Top Plate/Stud - As noted refer to Lumberlok schedule (ALL TYPE C)
- Lintel Fixings - As noted refer to Lumberlok schedule (TYPE E or F or G)

- All lintels must be MSG8 min grade.
- Refer to supplementary sheet for bracing details
- Lintels sized ex NZS 3604.1999
- Beams 1 - 2 to specific design by Engineer

PLANS AND SPECIFICATIONS
APPROVED
SUBJECT TO CONDITIONS ENDORSED
ON BUILDING CONSENT
16 OCT 2009
SIGNED _____ DATE _____
AUTHORISED OFFICER

Job
TYPE 5a HOUSE
NEW ZEALAND HOUSING FOUNDATION
WEST COAST ROAD DEVELOPMENT

Builder
GOLDSMITH DEVELOPMENTS LTD

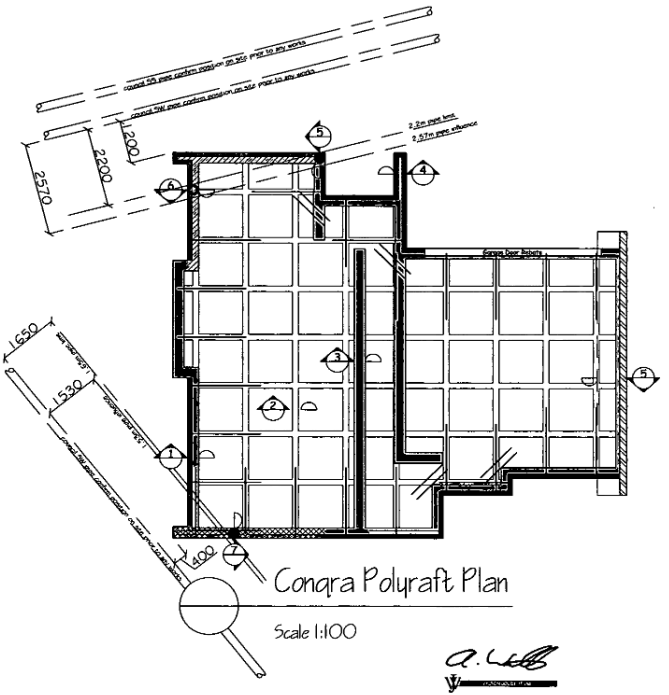
Date
09/09

Page Scale
1:100

Drawn By
BENNETT DRAUGHTING
116 RED HILL ROAD
PAPAKURA
ph: (09) 296 6369

Page No 10 | Total Pages 21

10 Bracing & Lintels
Scale: 1:100



Conqra Polyraft Plan

Scale 1:100

a. Wilton

NOTE:
Building platform shall be tested to ensure availability of min. 100kPa dependable bearing capacity

It is increasingly common for building consent authorities to require a "PS4" for specifically designed structures. For Wilton Joubert Ltd. to issue this, we need to inspect prior to concrete pour. Ring 09 579 1114 to arrange a booking. A local, qualified engineer may also be engaged to carry out the inspection & issue a PS4 subsequently
NO INSPECTION EQUALS
NO PS4 ISSUED.

PLANS AND SPECIFICATIONS
APPROVED
SUBJECT TO CONDITIONS ENDORSED
ON BUILDING CONSENT
16 [illegible] 2009 DATE
SIGNED
AUTHORISED OFFICER

Conqra Polyraft
Ref No ##
Date

NOTES:

Only Conqra polystyrene pods and R6 galvanised spacers to be used for this design.
Under no circumstances shall polystyrene spacers be used.
Where underfloor heating is installed, floor topping shall be increased to 120mm.
Unless otherwise noted;
All Concrete strength shall be minimum 25MPa in sea spary zone, 20MPa elsewhere (if in doubt check with local T.A.)
Do not scale from Drawings. Refer Architectural Drawings for overall dimensions.

Revision	Description	Date
2	total redesign	24-7-09

Structural Engineers
WILTON JOUBERT Ltd
P.O. BOX 11-381
ELLERSLIE
AUCKLAND

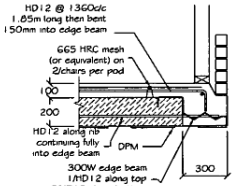
Ph (09) 579 1114
Fax (09) 579 7778

Job Title:
Proposed Residence
lot 32 of
Lot 2 : DP 339810
19 Titch Place

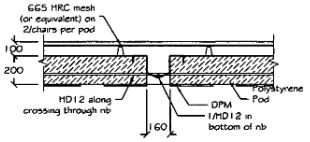
Sheet Title:
Conqra Polyraft Plan

Drawn	BR	Check	TE
Checked	DL		
Scale	1:100	Date	19-05-08
Job #	WJ15193		Sheet No S1

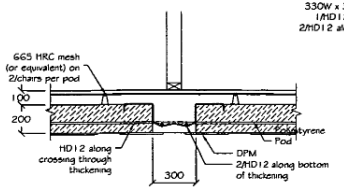
17/18 is revision 2



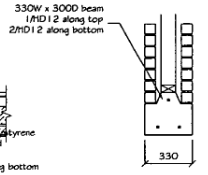
1 Detail
Conqra Polyraft
Perimeter Beam 300
Scale 1:25



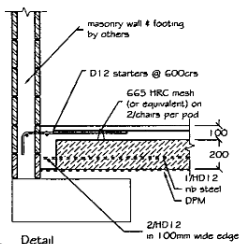
2 Detail
Conqra Polyraft
Internal Beam 160
Scale 1:25



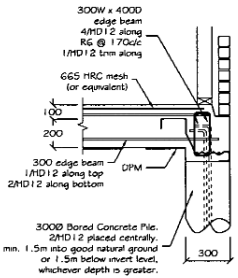
3 Detail
Conqra Polyraft
Internal Beam 300
Scale 1:25



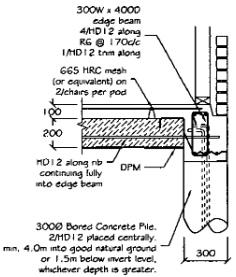
4 Detail
Wingwall Beam - 330
Scale 1:25



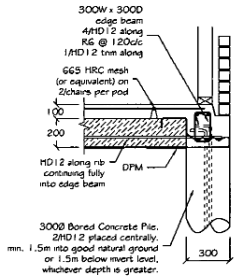
4 Detail
Raftfloor to Wall
Scale 1:25



5 Detail
Raftfloor Edge Beam - 300
on 300Ø BCP
Scale 1:25



6 Detail
Raftfloor Edge Beam - 300
on 300Ø BCP
Scale 1:25



7 Detail
Raftfloor Edge Beam - 300
on 300Ø BCP
Scale 1:25

PLANS AND SPECIFICATIONS
APPROVED
SUBJECT TO CONDITIONS ENDORSED
ON BUILDING CONSENT
16 OCT 2009
SIGNED _____ DATE _____
AUTHORISED OFFICER

Conqra Polyraft
Title: ##

NOTES:

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Revision	Description	Date
2	total redesign	24-7-09

Structural Engineers
WILTON JOUBERT Ltd
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Fax (09) 579 7778

Job title:
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lot 32 of
Lot 2 : DP 339810
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Sheet Title:
Conqra Polyraft
Details

Drawn	BR	Chkd	TE
Checked	DL		
Scale	1:25	Date	19-05-08
Job No.	JOB # WJ15193	Sheet No.	S2
Drawing No.	1718 in revision 2		

LUMBERLOK®

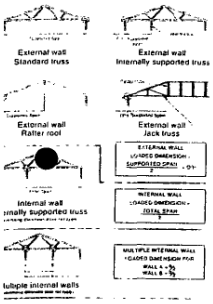
04/2008

STUD TO TOP PLATE FIXING SCHEDULE
ALTERNATIVE TO TABLE 8.18 NZS 3604:1999

NOTE:

All fixings are designed for vertical loads only. Dead loads include the roof weight and standard ceiling weight of 0.20 kPa
Refer to Table 8.18 NZS 3604:1999 for nailing schedule to resist horizontal loads
These fixings assume the correct choice of rafter/truss to top plate connections have been made
Gable end wall top plate/stud connections require only 2 x 90mm x 3.15 dia. nails driven vertically into stud through top plate
All fixings assume top plate thickness of 45mm maximum. Note: TYLOK options on timber species
Wall framing arrangements under girder trusses are not covered in this schedule
All timber selections are as per NZS 3604:1999

LOADED DIMENSION DEFINITION

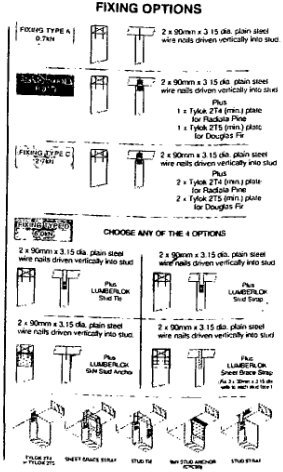


FIXING SELECTION CHART

Use for walls supporting roof members at 600, 900 or 1200mm ctrs.

Stud Centres mm	Loaded Dimension (See Fig. 8.3 NZS 3604:1999)	Light Roof Wind Zone L	M	H	VH	Heavy Roof Wind Zone L	M	H	VH
600	1.5	A	A			A	A		
	2.0	A	A			A	A		
	2.5	A	A			A	A		
	3.0	A	A			A	A		
	3.5	A	A			A	A		
	4.0	A	A			A	A		
	4.5	A	A			A	A		
	5.0	A	A			A	A		
	5.5	A	A			A	A		
	6.0	A	A			A	A		

FIXING OPTIONS

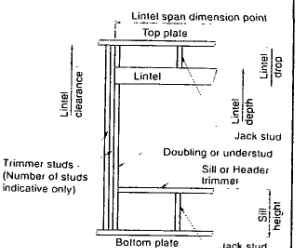


LINTEL FIXING SCHEDULE
ALTERNATIVE TO TABLE 8.14 & FIGURE 8.12 NZS 3604:1999

NOTE:

All fixings are designed for vertical loads only. Dead loads include the roof weight and standard ceiling weight of 0.20 kPa
Refer to Table 8.19 NZS 3604:1999 for nailing schedule to resist horizontal loads.
These fixings assume the correct choice of rafter/truss to top plate connections have been made
All fixings assume bottom plate thickness of 45mm maximum. Note: TYLOK options on timber species
Wall framing arrangements under girder trusses are not covered in this schedule
All timber selections are as per NZS 3604:1999

DEFINITIONS



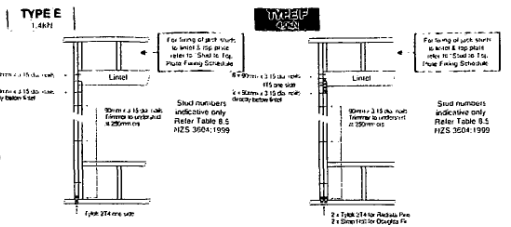
SELECTION CHART FOR LINTEL FIXING

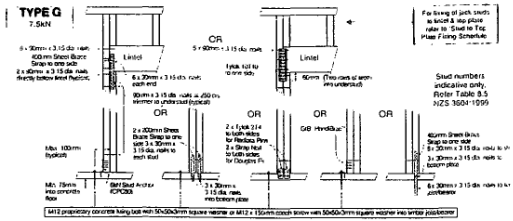
Lintel Span	Loaded Dimension (See Fig. 8.3 NZS 3604:1999)	Light Roof Wind Zone L	M	H	VH	Heavy Roof Wind Zone L	M	H	VH
1.5	2.0	E	E	E	G	E	E	G	G
	3.0	E	E	E	G	E	E	G	G
	4.0	E	E	E	G	E	E	G	G
	5.0	E	E	E	G	E	E	G	G
	6.0	E	E	E	G	E	E	G	G
2.0	2.0	E	E	E	G	E	E	G	G
	3.0	E	E	E	G	E	E	G	G
	4.0	E	E	E	G	E	E	G	G
	5.0	E	E	E	G	E	E	G	G
	6.0	E	E	E	G	E	E	G	G
2.4	2.0	E	E	E	G	E	E	G	G
	3.0	E	E	E	G	E	E	G	G
	4.0	E	E	E	G	E	E	G	G
	5.0	E	E	E	G	E	E	G	G
	6.0	E	E	E	G	E	E	G	G
3.0	2.0	E	E	E	G	E	E	G	G
	3.0	E	E	E	G	E	E	G	G
	4.0	E	E	E	G	E	E	G	G
	5.0	E	E	E	G	E	E	G	G
	6.0	E	E	E	G	E	E	G	G
3.6	2.0	E	E	E	G	E	E	G	G
	3.0	E	E	E	G	E	E	G	G
	4.0	E	E	E	G	E	E	G	G
	5.0	E	E	E	G	E	E	G	G
	6.0	E	E	E	G	E	E	G	G
4.2	2.0	E	E	E	G	E	E	G	G
	3.0	E	E	E	G	E	E	G	G
	4.0	E	E	E	G	E	E	G	G
	5.0	E	E	E	G	E	E	G	G
	6.0	E	E	E	G	E	E	G	G
4.8	2.0	E	E	E	G	E	E	G	G
	3.0	E	E	E	G	E	E	G	G
	4.0	G	G	G	H	G	G	H	H
	5.0	G	G	G	H	G	G	H	H
	6.0	G	G	G	H	G	G	H	H

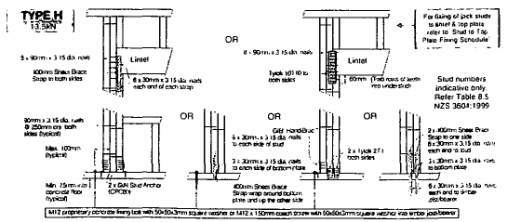
NOTES:

Lintels supporting Girder trusses for ALL load cases use
Fixing Type G where contributary area = 10m²
Fixing Type H where contributary area = 20m²
All cases outside this require specific design.

LINTEL FIXING OPTIONS







PLANS AND SPECIFICATIONS APPROVED SUBJECT TO CONDITIONS ENDORSED ON BUILDING CONSENT
SIGNED 16 OCT 2009 DATE
AUTHORISED OFFICER

Job	NEW ZEALAND HOUSING FOUNDATION WEST COAST ROAD DEVELOPMENT
Builder	GOLDSMITH DEVELOPMENTS LTD
Date	06/09
Page Scale	NTS
Drawn By	Lumberlok / Mitek
BENNETT DRAUGHTING	
Page No	11
Total Pages	21

Pink® Batts® R-value Insulation Guidelines for Small Buildings (Wall Framing)

(These guidelines are only applicable if read in conjunction with the NOTES)

Wall Cladding Details		Zone 1 & 2 (Minimum Construction R-value = R 1.9)	Zone 3 (Minimum Construction R-value = R 2.0)
Brick	Masonry Veneer	R 2.6	R 2.8
Weatherboard	Bevel Back Rusticated Fibre Cement (direct fixed only)	R 2.6	R 2.8
Monolithic	Stucco with Rigid Backing (cavity only)	R 2.8	R 2.8
	EIFS Direct fixed and Cavity	R 1.8*	R 1.8*
Metal	Vertical Profile (direct fixed only) Horizontal Profile (cavity only)	R 2.6	R 2.8
Sheet Cladding	Non Metal (direct fixed only)	R 2.8	R 2.8

NOTES

These insulation guidelines take into consideration Timber Framed Building designs (NZS 3604) and their respective framing spacing and cladding types to assist in meeting the minimum NZBC H1 Energy Efficiency (2007) requirements. To achieve higher performance, reference can be made to the better/best classification of PAS 4244.

This information is applicable if:
- the total glazing area is 30% or less than the total wall area,
- the sum of the glazing area is 30% or less than the external west, east and south facing wall area,
- total skylight area is less than 1.2m²,
- All residential buildings and building up to 300m²,
- non CA rated downlights used are less than 1 per 5m² of ceiling,
- insulation installed to NZS 4246.

If these criteria are not met, please consult with your building designer for Calculation and Modelling method (NZS 4218) to ensure compliance to the NZ Building Code.

The R-value guidelines determined from the Schedule Method (NZS 4218) are minimum insulation levels recommended by Tasman Insulation New Zealand to cover a range of similar framing systems. Lower levels of insulation R-value than those indicated may apply for some framing systems. We strongly recommend a detailed analysis specific to your construction is carried out by a building designer on alternative R-value solutions to the above recommendation to ensure compliance to the **NZ Building Code.**

*Eg. In some instances with R 1.8 insulation will generally result in construction R-values above the minimum, as EIFS has a R-value higher than most common cladding types.

comfort in style

Pink® Batts® R-value Insulation Guidelines for Small Buildings (Roof Framing)

(These guidelines are only applicable if read in conjunction with the NOTES)

Roof Cladding Details		Zone 1 & 2 (non solid wall) (Minimum Construction R-value = R 2.9)	Zone 3 (non solid wall) (Minimum Construction R-value = R 3.3)	Zone 3 (solid wall) (Minimum Construction R-value = R 3.5)
Profiled Steel	Pitched	R 3.2	R 3.8*	R 4.2
	Skillion	R 3.2	R 3.6	R 3.8
	Low Slope Timber Frame	R 3.2	R 3.6	R 3.8
Concrete / Clay Tiles	Pitched	R 3.2	R 3.8*	R 4.2
	Skillion	R 3.0	R 3.4	R 3.6
	Low Slope Timber Frame	-	-	-
Membrane	Pitched	-	-	-
	Skillion	-	-	-
	Low Slope Timber Frame	R 3.0	R 3.4	R 3.8

NOTES

These insulation guidelines take into consideration Timber Framed Building designs (NZS 3604) and their respective framing spacing and cladding types to assist in meeting the minimum NZBC H1 Energy Efficiency (2007) requirements. To achieve higher performance, reference can be made to the better/best classification of PAS 4244.

This information is applicable if:
- the total glazing area is 30% or less than the total wall area,
- the sum of the glazing area is 30% or less than the external west, east and south facing wall area,
- total skylight area is less than 1.2m²,
- All residential buildings and building up to 300m²,
- non CA rated downlights used are less than 1 per 5m² of ceiling,
- insulation installed to NZS 4246.

If these criteria are not met, please consult with your building designer for Calculation and Modelling method (NZS 4218) to ensure compliance to the NZ Building Code.

The R-value guidelines determined from the Schedule Method (NZS 4218) are minimum insulation levels recommended by Tasman Insulation New Zealand to cover a range of similar framing systems. Lower levels of insulation R-value than those indicated may apply for some framing systems. We strongly recommend a detailed analysis specific to your construction is carried out by a building designer on alternative R-value solutions to the above recommendation to ensure compliance to the **NZ** Building Code.

*eg. In some instances a R 3.6 will suffice.

Design Steps 4 and 5 - Bracing Units Achieved (Wind and Earthquake)

TABLE 1: Bracing Unit Ratings for 10mm GIB® Standard Plasterboard and any other 10mm and 13mm GIB® plasterboard.

Bracing System	Bracing Unit Rating per metre	Description of Bracing System	Stopping Required at Vertical Joints	Stopping Required at Perimeters	Stopping Required at Internal Linings
GS1a	1 B	10mm GIB® Standard Plasterboard one face fixed horizontal or vertical	yes	65	55
	2 I			75	65
GS2	1 Z	10mm GIB® Standard Plasterboard both sides fixed horizontal or vertical	no	70	60
	1 B			80	70
	2 4			90	80

TABLE 2: Bracing Unit Ratings for 10mm GIB Braceline®, 10mm and 13mm† GIB Noiseline® and 13mm† GIB Toughline® (fixed with GIB Braceline® screws or GIB Braceline® nails)

Bracing System	Bracing Unit Rating per metre	Description of Bracing System	Stopping Required at Vertical Joints	Stopping Required at Perimeters	Stopping Required at Internal Linings	
					600 crs	400 crs
BL1	0 4	GIB Braceline® one face fixed horizontal or vertical	no	yes	120	115
	0 6		no	yes	125	115
BL1a	1 8	GIB Braceline® one face fixed horizontal or vertical	yes	yes	130	115
BLP	0 6	GIB Braceline® one face fixed horizontal or vertical, 7mm D-D plywood on the other††	no	yes	145	135
	0 9				145	145
BLG	0 6	GIB Braceline® one face, 10mm GIB® Standard on the other face linings fixed horizontal or vertical†	no	yes	145	135
	1 2				150†	130

Notes:
1) Where linings are specified on both faces, each face must be fastened as a bracing element.
2) GIB Aqualine® can be used in place of GIB Braceline® in bracing elements 900mm or longer, provided the perimeter of the element is lined with GIB Braceline® nails or screw spaced at 100mm centres generally, using the GIB Braceline® corner fixing pattern.
3) A maximum of 150 BUm is recommended for any bracing system used over NZS 3604: 1999 timber foundation and slab details. If ratings exceed 150 BUm, hold downs and foundations must be the subject of specific structural engineering design.
4) Where 13mm GIB Noiseline® or 13mm GIB Toughline® is used in place of 10mm GIB Braceline® it is recommended that GIB Braceline® nails are used.

For your GIB® system to perform to rated, all components must be installed exactly as prescribed. Substitution of components or products in panels of any system will void the GIB® Systems Guarantee. Follow manufacturers specifications.

Copyright: Whilst all efforts to ensure that all the information, including drawings, details, specifications, drawings and the Publication® Specification "Bracing System" and the instructions contained therein, are protected by copyright.

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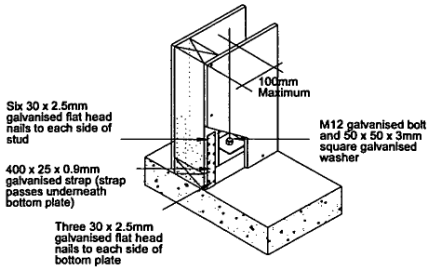
Date	06/09
Page Scale	NTS
Drawn By	Gib Bracing / Pink Batts
	BENNETT DRAUGHTING
Page No	12
Total Pages	21



1/13 Concrete Floor - Internal / External Walls Hold Down

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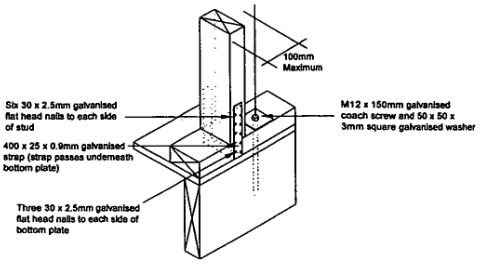

2/13 Timber Floor - External Walls Hold Down - Option 1

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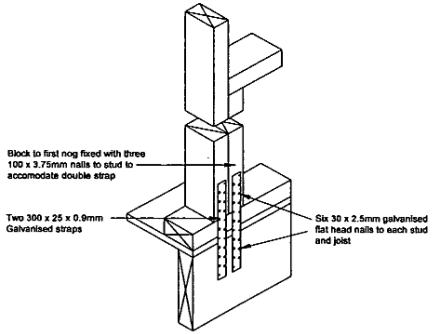
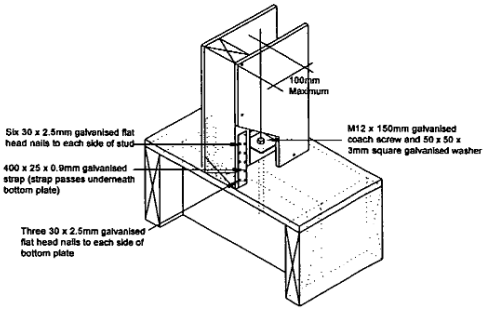


3/13 Timber Floor - External Walls Hold Down - Option 2

Scale: 1:10



4/13 Timber Floor - Internal Walls Hold Down

Scale: 1:10

PLANS AND SPECIFICATIONS
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13 Wall Hold Down Details

Scale: 1:10

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Builder GOLDSMITH DEVELOPMENTS LTD	
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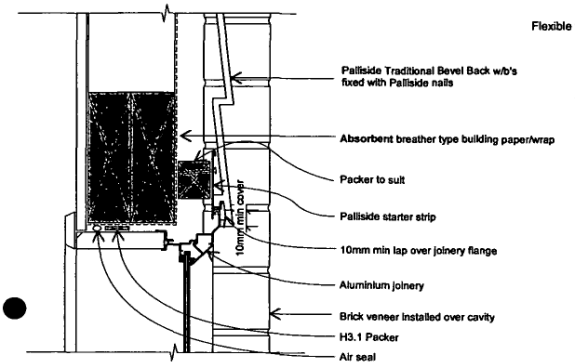
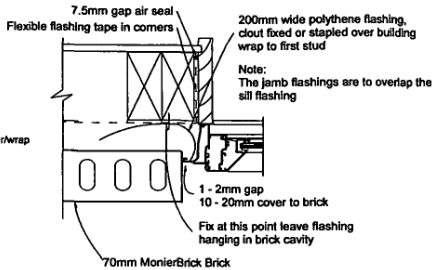
Page No 13	**Total Pages** 21

1 / 14 Window Head - Palliside Cladding Above
Scale: 1:5

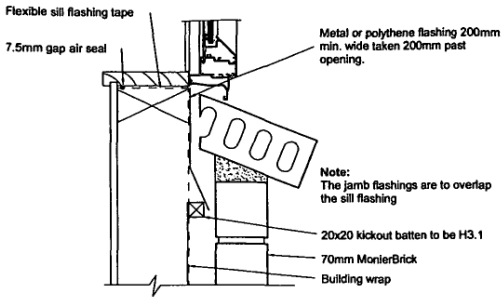


Weatherboard fixing length to be adjusted to suit cavity batten depth

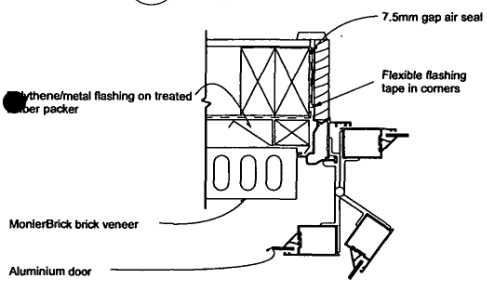
2 / 14 Window Jamb - Aluminium
Scale: 1:5



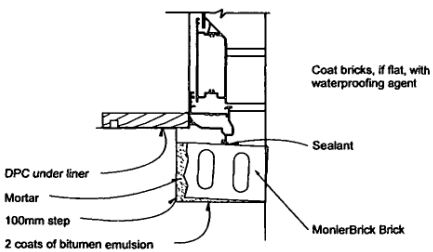
3 / 14 Window Sill - Aluminium
Scale: 1:5



4 / 14 Door Jamb - Aluminium
Scale: 1:5



5 / 14 Brick Door Sill
Scale: 1:5



Note:
If brick is to be sloped further, either increase the depth of the step or reduce the thickness of the brick.

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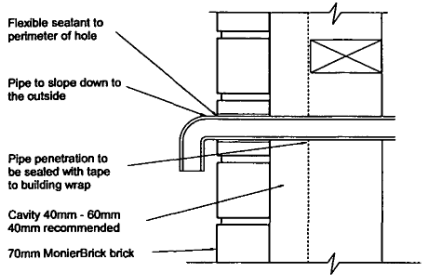
14 Monier Details
Scale: 1:5

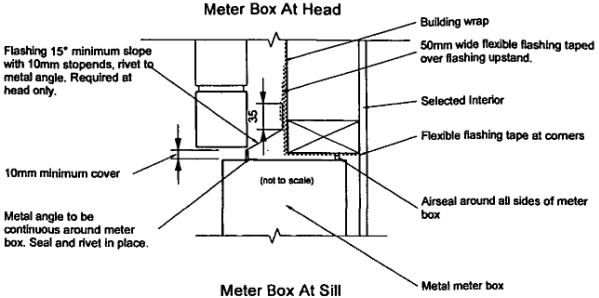
Job NEW ZEALAND HOUSING FOUNDATION WEST COAST ROAD DEVELOPMENT	
Builder GOLDSMITH DEVELOPMENTS LTD	
Date 06/09	
Page Scale 1:5	
Drawn By Monier Brick	
BENNETT DRAUGHTING	
Page No 14	**Total Pages** 21

1 / 15 Pipe Penetration
Scale: 1:5

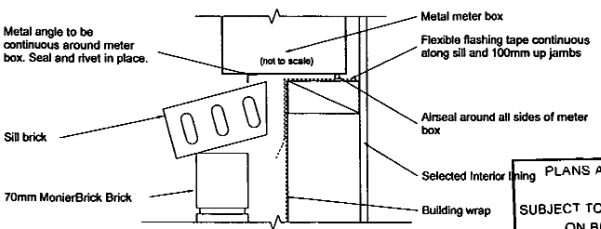


2 / 15 Meter Box Installation
Scale: 1:5

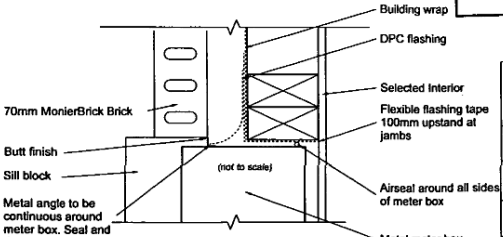
Meter Box At Head

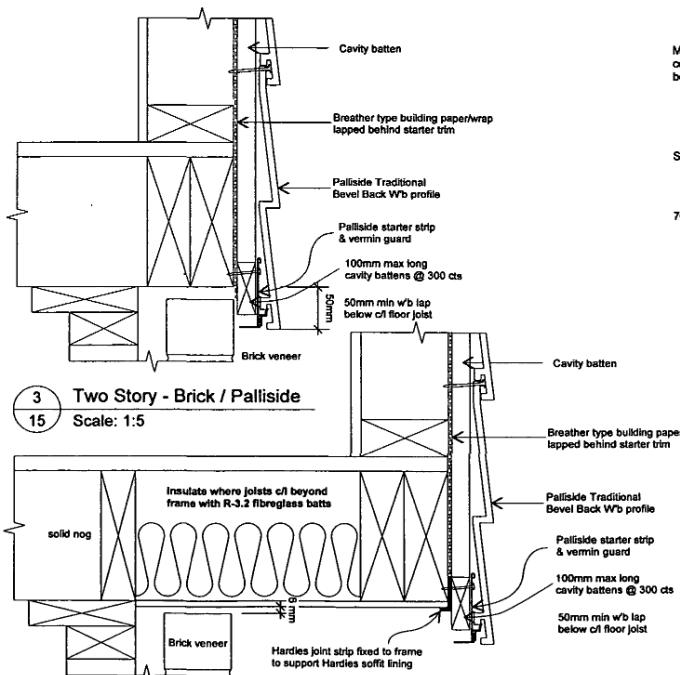


Meter Box At Sill



Meter Box At Jamb





3 / 15 Two Story - Brick / Palliside
Scale: 1:5

15 Monier Details
Scale: 1:5

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Job NEW ZEALAND HOUSING FOUNDATION WEST COAST ROAD DEVELOPMENT	
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BENNETT DRAUGHTING	
Page No 15	**Total Pages** 21

PLANS AND SPECIFICATIONS
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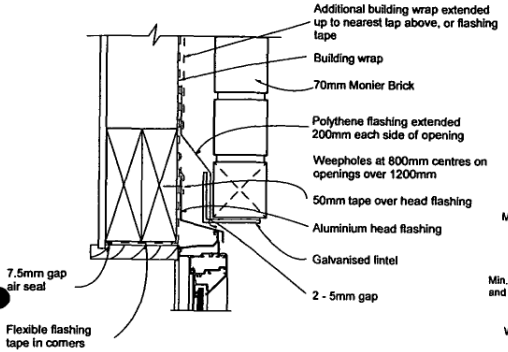
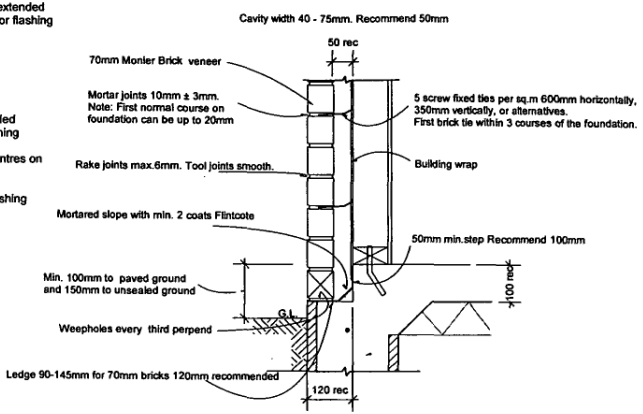
1 15a Window Head - Aluminium
Scale: 1:5



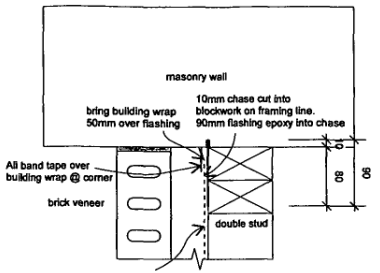
Note: Scale 1:5
a.2.28119; For openings greater than 2.0m, provide a landing for the lintel of 5.15289; 200mm for each side of the opening.
b.2.38664; For openings less than 2.0m allow 100mm each side of opening.

Important:
a.2.28119; All lintel bars must be propped until mortar is set (7 days).
b.2.38664; It is important to allow the first 3 courses of the brickwork over an opening to set before 5.15289; laying any more bricks above.
c.2.49384; Provide brick ties within the bottom two courses.

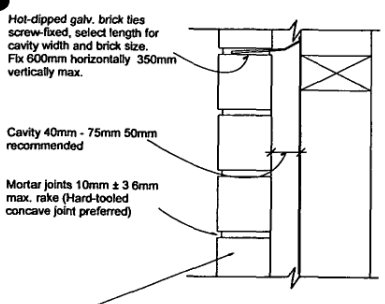
2 15a Brick Veneer - Standard Detail
Scale: 1:5



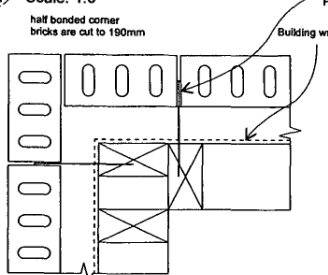
6 15a Brick Veneer / Blockwall Junction
Scale: 1:5



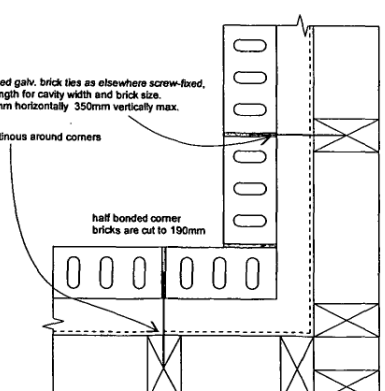
3 15a Brick Veneer - Typical Wall Section
Scale: 1:5



4 15a Brick Veneer - External Corner
Scale: 1:5

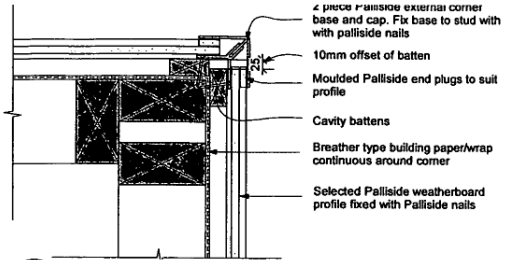


5 15a Brick Veneer - Internal Corner
Scale: 1:5

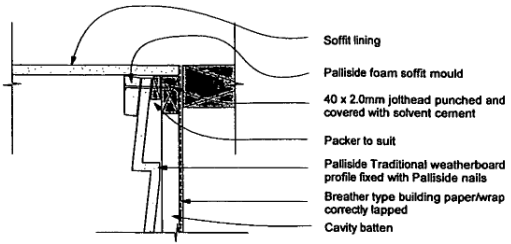


15a Monier Details
Scale: 1:5

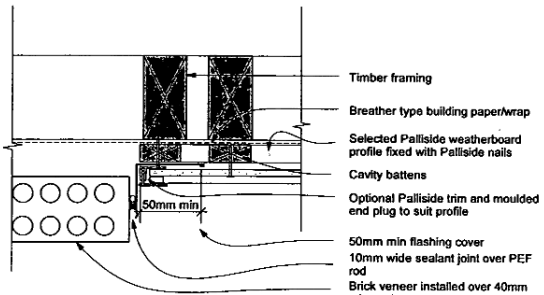
Job NEW ZEALAND HOUSING FOUNDATION WEST COAST ROAD DEVELOPMENT	
Builder GOLDSMITH DEVELOPMENTS LTD	
Date 06/09	
Page Scale 1:5	
Drawn By Monier Brick	
BENNETT DRAUGHTING	
Page No 15a	**Total Pages** 21



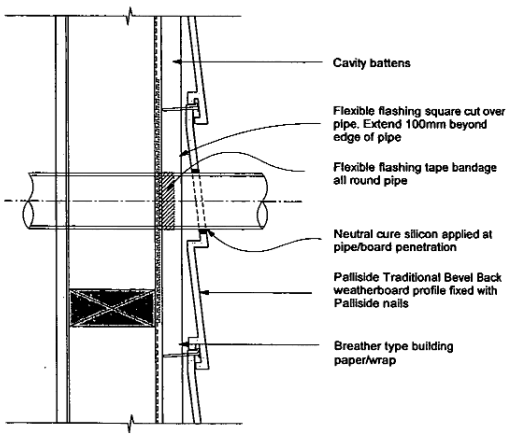
1/16 External 2 Part Boxed Corner



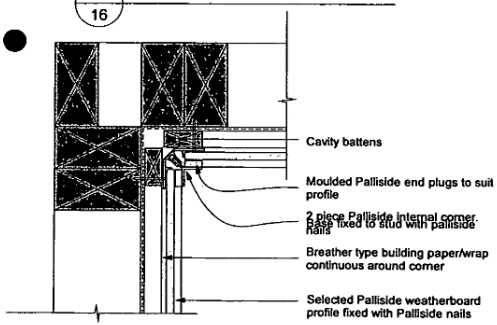
2/16 Finish at Soffit



3/16 Palliside / Brick - Verticle Join



4/16 Palliside - Pipe Penetration



5/16 Internal 2 Part Boxed Corner

PLANS AND SPECIFICATIONS APPROVED
SUBJECT TO CONDITIONS ENDORSED ON BUILDING CONSENT
SIGNED 16 OCT 2009 DATE
AUTHORISED OFFICER

AMENDED 04/08/09
AS PER RFI BY WCC

16 Palliside Details
1:5

Job NEW ZEALAND HOUSING FOUNDATION WEST COAST ROAD DEVELOPMENT	
Builder GOLDSMITH DEVELOPMENTS LTD	
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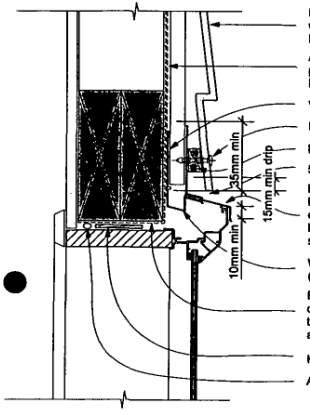
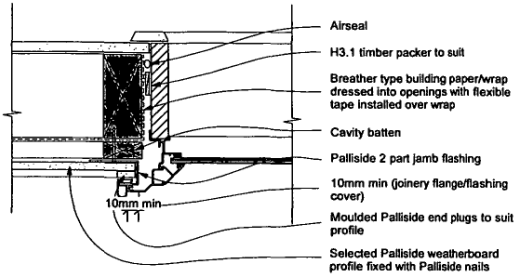
BENNETT DRAUGHTING	
Page No 16	**Total Pages** 21

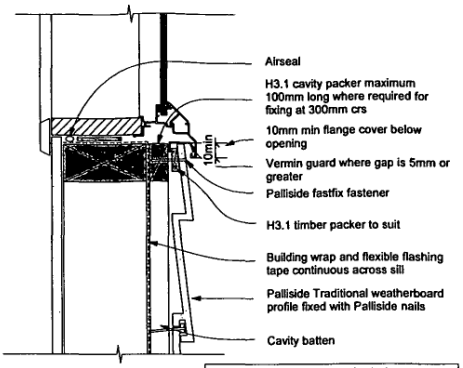
Detail covered by BRANZ Appraisal No. 491 (2005) for windows up to and including 2.4m For larger windows refer to the WANZ Window Specifications for guidance and verification.



1/17 Palliside - Window Head Detail

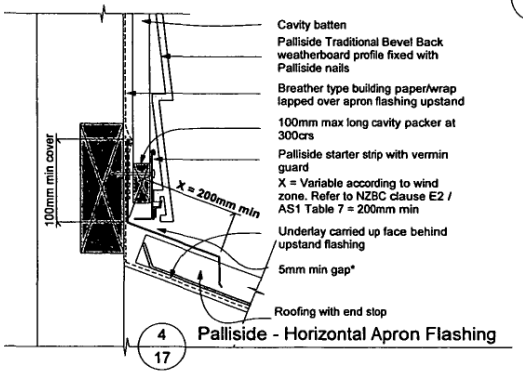


2/17 Palliside - Window Jamb Detail



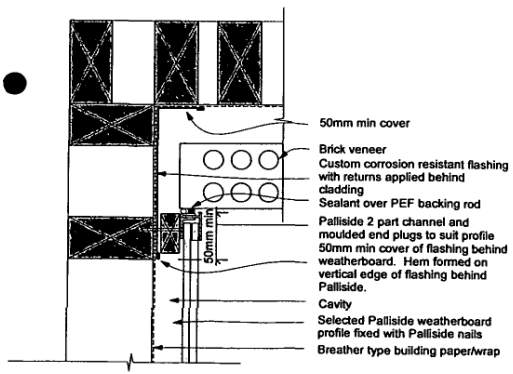
A sloping sill trimmer is required when the glazing pocket of the window or door joinery is positioned back past the line of the wall frame

3/17 Palliside - Window Sill Detail



4/17 Palliside - Horizontal Apron Flashing

*This detail may be used for roofs with a pitch of 12degrees minimum. Where the pitch is less than 12degrees 35mm min clearance is required between the underside of the cladding and the apron flashing



5/17 Palliside / Brick - Internal Corner Junction

PLANS AND SPECIFICATIONS
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AS PER RFI BY WCC

Job
NEW ZEALAND HOUSING FOUNDATION
WEST COAST ROAD DEVELOPMENT

Builder
GOLDSMITH DEVELOPMENTS LTD

Date
06/09

Page Scale
1:5

Drawn By
Palliside

BENNETT DRAUGHTING

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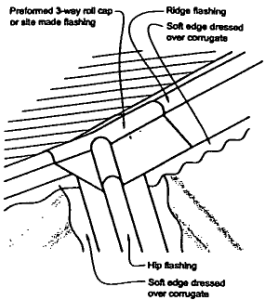
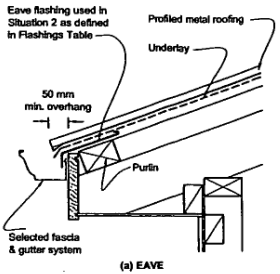
17	21

17 Palliside Details
1:5



1/18 Ridge Flashing

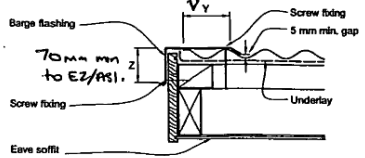


(a) EAVE

2/18 Eave Flashing

Return a minimum of 2 "roof crests" & finish in the third crest.

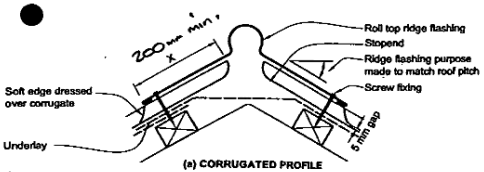
NOTE: (1) Y = variable according to *wind zone* – refer Table 7.
(2) Z = variable according to *wind zone* – refer Table 7.



(a) CORRUGATED PROFILE

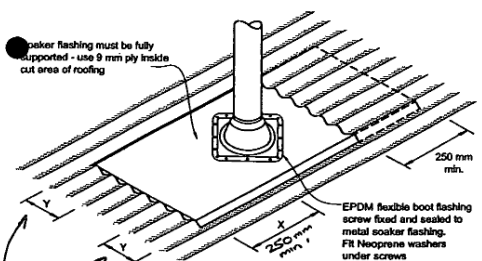
3/18 Barge Flashing

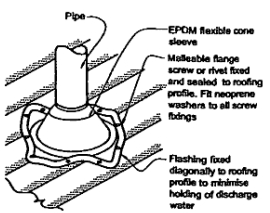
NOTE: X = variable according to *wind zone* – refer Table 7.



(a) CORRUGATED PROFILE

NOTE: (1) X = variable according to *wind zone* – refer Table 7.
(2) Y = to cover minimum of two crests – refer Table 7.
(3) Suitable for pipes from 60 mm to 200 mm diameter.
(4) Suitable only for roof pitches of 10° or higher.

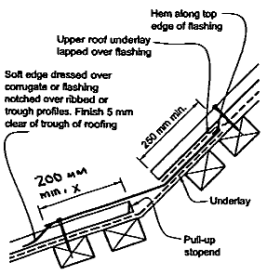




NOTE:
(1) Max. roof pitch for this flashing 45°, minimum pitch 10°.
(2) For pipes up to 60 mm diameter.

4/18 Pipe Penetration Details

min. of 2 "roof crest" & to finish in the third crest - strictly to EZ/AS1.



5/18 Change In Pitch

18 Roof Details 1:10

PLANS AND SPECIFICATIONS
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ON BUILDING CONSENT
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AUTHORISED OFFICER

Job NEW ZEALAND HOUSING FOUNDATION WEST COAST ROAD DEVELOPMENT	
Builder GOLDSMITH DEVELOPMENTS LTD	
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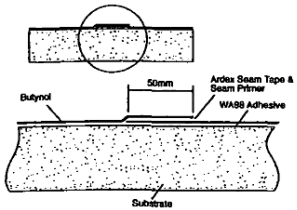
BONDING THE LAPS

Roofs with a pitch of less than 5°, all coloured membranes and all guttering and areas subjected to periodic ponding require special lap bonding.

Refer Acceptable Solution E2/AS1 8.5.5.2a.

All coloured membranes, irrespective of pitch require special lap bonding.



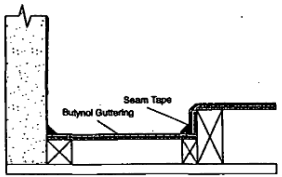
1. The top lap is positioned and the bottom sheet marked to indicate the edge of the top sheet.
2. The top sheet is folded back.
3. The Ardex Seam Primer is then applied to the Butynol in the area marked on the bottom sheet and 50mm in from the edge on the top sheet. The Ardex Seam Primer is applied to the mating surfaces using a synthetic scrubbing pad. Scrubbing pads should be replaced as they become dirty. Allow the primer to become 'touch dry'.
4. Position and unroll the 50mm Ardex Seam Tape along the seam. The edge of the seam tape should be aligned to the mark on the bottom membrane sheet. The see-through backing film makes this very simple.
5. Roll the length of the seam with backing film still in place.
6. Remove the backing film from the Ardex Seam Tape by pulling at a 45° angle away from the seam. Keep the backing film low to the roof surface as it is removed.
7. Fold into place the primed edge of the top sheet.
8. Roll the completed seam.

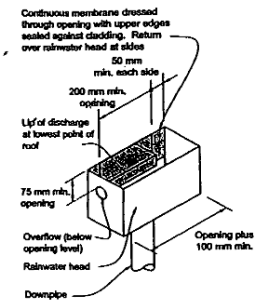
Black Butynol and roofs with minimum pitch of 5° and sufficient fall to prevent periodic ponding may be formed using the sheet bonding adhesive WA98. All laps must be wiped with WA98 solvent prior to bonding.

FORMING LAPS FOR GUTTERS

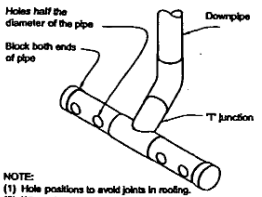
Laps are most important in gutter work and should be formed using Ardex seam tape and seam primer.

All internal boxed gutters can be easily formed to any shape or size using Butynol over any specified substrate.





1/19 Rainwater Head & Laps in Membrane Gutter



NOTE:
(1) Hole positions to avoid joints in roofing.
(2) When downpipe is located in corner, spreader to be L-shaped.

2/19 Spreader Detail

PLANS AND SPECIFICATIONS APPROVED
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Date 06/09
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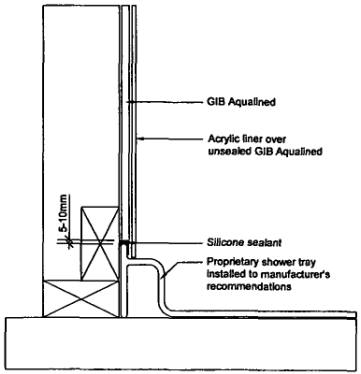
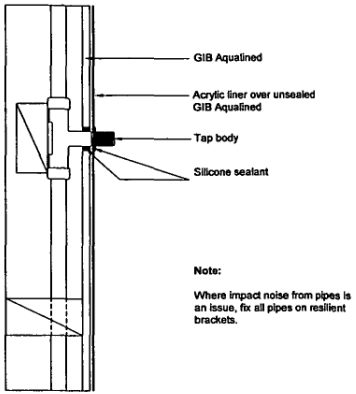
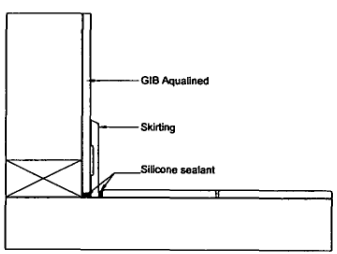
19 Gutter Details
1:10



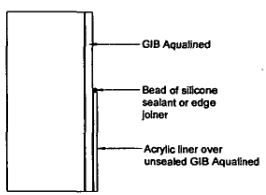
1/20 Shower Wall / Tray Detail
Scale: 1:5



2/20 Penetration Detail
Scale: 1:5



3/20 Wall / Floor Detail
Scale: 1:5



4/20 Liner Top Detail
Scale: 1:5

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20 Wet Area Details
Scale: 1:5

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BENNETT DRAUGHTING	
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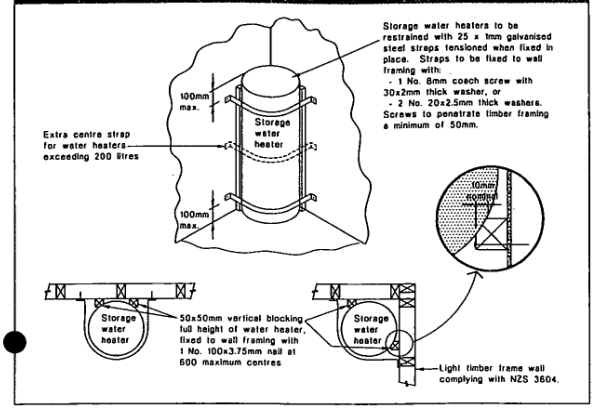
Figure 14: Seismic Restraint of Storage Water Heaters 90 – 360 litres
Paragraph 6.11.4



6.11.4 Structural Support

NZBC B1.3.2 requires *building elements* (including *storage water heaters)* to be adequately supported including support against earthquake forces. The method illustrated in Figure 14 is acceptable for *water heaters* up to 360 litre capacity. Where fittings and pipework are attached to the *water heater* through the supporting platform or floor a 50 mm minimum clearance shall be provided between the fitting and the support structure.

6.11.5 Another acceptable solution for securing *storage water heaters* against seismic forces is given in Section 203 of NZS 4603.

6.12 Hot water pipe sizes

6.12.1 The *diameter* of hot water supply pipes from *storage water heaters* and to *sanitary fixtures* shall be no less than those required by Table 4.

EXTERIOR CLADDING RISK SCORE ANALYSIS

ADDRESS Housing Foundation of New Zealand - Type 5 House
BUILDING FACE TYPICAL
ELEV ALL

RISK SCORE	LOW	MEDIUM	HIGH	VERY HIGH	SCORE
WIND ZONE	LOW	MEDIUM	HIGH	VERY HIGH	
	0	0	1	2	1
NUMER OF STOREY'S	1 STOREY	2 STOREY'S IN PART	2 STOREY'S	MORE THAN 2 STOREY'S	
	0	1	2	4	2
ROOF TYPE	HIP OR GABLE WITH EAVES	GABLE WITHOUT EAVES OR SIMPLE MONO-PITCH	COMPLEX SHAPES & DORMERS	MULTIPLE LEVELS COMPLEX SHAPES PARAPETS	
	0	1	3	5	0
EAVE WIDTH	GREATER THAN 600 MM @ FIRST FLOOR LEVEL	450-600 OR GREATER THAN 600 MM @ 2ND FLOOR LEVEL	100-450MM OR 450MM @ 2ND FLOOR LEVEL	0-100MM, 100-450MM @ 2ND FLOOR LEVEL 450-600MM @ 3RD FLOOR LEVEL	
	0	1	2	5	1
ENVELOPE CAPACITY	SIMPLE RECTANGULAR L, T OR BOOMERANG ALL WALLS COVERED BY EAVES.	BUILDINGS WITH ROOFS ABUTTING ADJACENT WALLS	BUILDINGS & MULTIPLE CLADDING AND ROOFLINE ABUTTING ADJACENT WALLS	AS HIGH WITH MULTIPLE PENETRATIONS, OTHER THAN DOORS & WINDOWS, THROUGH WALLS, COMPLEX JUNCTIONS	
	0	1	3	6	3
DECKS & BALCONIES	NONE, TIMBER SLAT DECK OR PORCH @ GROUND LEVEL	FULLY COVERED IN PLAN BY ROOF OR TIMBER SLAT DECK ATTACHED @ 1ST FLOOR OR 2ND FLOOR LEVELS	EXPOSED IN PLAN OR CANTILEVERED @ 1ST FLOOR LEVEL	EXPOSED IN PLAN OR CANTILEVERED @ 2ND FLOOR LEVEL OR ABOVE	
	0	2	4	6	0
KEY		0-10 MEDIUM RISK			7

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Builder GOLDSMITH DEVELOPMENTS LTD	
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BENNETT DRAUGHTING	
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COM-2009-1374

Building Consent

SECTION 51, BUILDING ACT 2004

Waitakere City Council
Te Taiao o Waitakere

THE BUILDING

Street address of building:	19 Titch Place, Glen Eden
Legal description of land where building is located:	LOT 32 DP 389289
‡Building name:	
‡Location of building within site/block number:	LOT 32 DP 389289
‡Level/unit number:	

THE OWNER

Name of owner:	NEW ZEALAND HOUSING FOUNDATION	
*Contact person:	NEW ZEALAND HOUSING FOUNDATION	
Mailing address:	PO Box 44018, Point Chevalier, AUCKLAND 1246	
Street address/registered office:		
Phone number:	Landline:	Mobile:
	Daytime:	After hours:
Facsimile number:		
Email address:		
Website:		

First point of contact for communications with the council/building consent authority: †

BUILDING WORK

The following building work is authorised by this building consent:

New 5 Bedroom Dwelling with attached (internal access) garage. Cat 2.

This building consent is issued under section 51 of the Building Act 2004. This building consent does not relieve the owner of the building (or proposed building) of any duty or responsibility under any other Act relating to or affecting the building (or proposed building).

This building consent also does not permit the construction, alteration, demolition, or removal of the building (or proposed building) if that construction, alteration, demolition, or removal would be in breach of any other Act.

‡This building consent is subject to the attached conditions: 3 pages

COMPLIANCE SCHEDULE

A compliance schedule is not required for the building.

‡ATTACHMENTS

Copies of the following documents are attached to this building consent:

Signature

Position

On behalf of: Waitakere City Council

Date: 23 October 2009

*Delete if the applicant is an individual.

†Contact details must be in New Zealand.

‡ Delete items not applicable.

§Delete if the building is intended to have a life of 50 years or more.

Notes (The following are not applicable for amendments):

1. On completion of the work covered by this building consent application must be made on the prescribed form for Code Compliance Certificate, once final inspection(s) have passed.
1. The building consent will lapse and be of no effect if the building work has not been commenced within 12 calendar months of the date of issue of the consent.
2. Work must be completed and the Code Compliance Certificate issued within 2 years of the date of approval for granting of the consent.

CONDITIONS OF BUILDING CONSENT
COM-2009-1374

The above Building Consent has been approved today subject to the following conditions:-

1. To notations on plans.

2. The applicant shall take all steps necessary to avoid damaging the street, footpath or verge area and shall reinstate any damage to those areas to the satisfaction of Council.

3. Where one is not already constructed, the owner shall construct to a standard satisfactory to Council a vehicle crossing between the carriageway and the owner's land in accordance with Council Code of Practice.

   If a non-standard crossing is required approval must be obtained from Transport Assets prior to construction of the crossing.

   When excavating for the crossing the owner shall take all steps necessary to avoid damaging Council's watermain, which is generally located in the berm area with 450mm minimum cover. Where more than 250mm is being excavated the depth and location of the watermain should be confirmed by hand digging prior to commencement of excavation. (For further information please contact Council on phone 836-8045). In the event of any damage to the watermain the cost of any repairs will be charged to the owner.

4. Officers of Council are entitled at all times during normal working hours or while work is being carried out, to inspect
   - land on which building work is being or is proposed to be carried out
   - building work that has been or is being carried out on or off the building site
   - any building

5. All handrails/barriers shall comply with N.Z.B.C. F4 & B1/AS 2. Stairs and Landings shall comply with N.Z.B.C. D1.

6. The height of the finished floor level of a concrete slab-on-ground floor above adjacent ground shall be no less than:

   a) For masonry veneer wall claddings:
      - 100 mm if ground permanently paved
      - 150 mm if unpaved

   b) For cladding other than masonry:
      - 150 mm if ground permanently paved
      - 225 mm if unpaved

7. Fixings of lintels, top plates, rafters, trusses and purlins shall comply with the New Zealand Building Code. Compliance with New Zealand Standard 3604:1999 table 8.14 and figure 8.12 will satisfy the requirements of the building code.

8. Opening windows which permit a fall of greater than 1.000m, shall have restrictors fitted in accordance with F4 of the NZ Building Code.

9. Domestic smoke alarms complying with at least one of UL 217, CAN/ULC S531, AS 3786, BS 5446:Part 1 standards shall be installed in accordance with NZBC clause F7.

10. Drainage shall be inspected and tested by Waitakere City Council Plumbing & Drainage Surveyor prior to backfilling.

11. Stormwater / sanitary drainage shall be carried out by a registered drainlayer in compliance with the NZ Building Code or an alternative solution approved by Council.

12. Prior to commencing work the owner shall ensure that the proposed building is clear of any sewers and shall ensure gravity fall of foul and stormwater drains is obtained within required gradients.

13. Sanitary plumbing to be carried out by a registered plumber in compliance with the NZ Building Code or an alternative solution approved by Council and shall be inspected by Waitakere City Council Plumbing & Drainage Surveyor prior to closing in walls, cavities and under floor.

14. A storm water cesspit is to be located in yard / driveway in accordance with NZBC E1/AS1 3.6 to obtain best storm water control. Yard / driveways to be kerbed or channelled to direct stormwater to cesspit.

15.

Figure 8: Type-one surface water sump
Paragraph 3.6.2

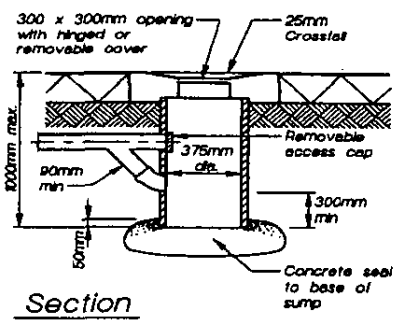
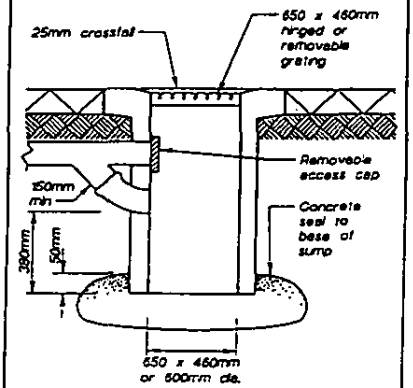


Figure 9: Type-two surface water sump
Paragraph 3.6.2



16. Provide an overflow relief gully as per AS/NZS 3500.2.2 1996.

17. As-Built Drawings:
The drainlayer must provide an 'as-built' drainage drawing to the drainage surveyor at the time of the inspection.

18. The builder/drainlayer is to check and verify all drainage depths, positions and connections before commencing any work on site.

19. Before commencement of any works and until completion of exposed earth site-works, adequate sediment and erosion control measures shall be constructed and maintained by the consent holder. The control measures must be maintained until the site has been adequately stabilised against erosion. The construction and maintenance shall be in accordance with Appendix 3, Erosion and Sediment Control Measures Appendix to the Natural Area Rules of the Waitakere City Council District Plan.

20. Subject to compliance with the conditions of Resource Consents (LUC/SUB2006-1077/1078) granted 30/10/06 pursuant to Sections 104, 104B, 104D & 108 of the Resource Management Act 1991.

21. Recommendations of soils report are to be read in conjunction with building consent and strictly adhered to.

22. Grade b masonry shall be subjected to construction observation by a design structural engineer (registered with WCC) or his nominated representative during construction.

23. Geotechnical engineer (registered with WCC) is to be retained to inspect all excavations, foundations over public & private drains and site conditions exposed during construction prior to pouring any concrete, to check that ground conditions encountered are consistent with those assumed in soils report and certify same to Council.

24. A suitably qualified engineer (registered with WCC) is required to observe the construction of the following building elements to ensure compliance with the design assumptions, requirements, and details has been achieved, and to certify the same to Council. Specifically, observation and certification is required in respect of:-

    1. **Rib-raft Foundation Slab**

25. **PUBLIC DRAINAGE INFRASTRUCTURE – ECOWATER CONDITIONS**

(DE 1) Provide certification from the engineer that the foundations have been constructed in accordance with the approved plans 'Conqra Polyraft Plan WJ15193 S1 dated 19.03.08 and methodology to protect the public drain. Provide a **post-construction CCTV** inspection of the public drains undertaken after the foundations/piles have been constructed, and prior to commencing construction of the walls. Where the post-construction CCTV reveals a defect in the public drain, the owner shall bear all costs of any remedial measures necessary to ensure proper and safe operation of the drain, before resuming building works.

(DE 2) All outstanding **fees** incurred during the construction process are required to be paid in full prior to releasing the Code Compliance Certificate.

Waitakere City Council
Te Taiao o Waitakere

Waitakere City Council
Waitakere Central
6 Henderson Valley Road
Henderson 0612

Private Bag 93109
Henderson 0650
Waitakere

Telephone
09 836 8000

24Hr Call Centre
09 839 0400

Facsimile
09 836 8001

DX CX 10250 Auckland Mail Centre
Email: info@waitakere.govt.nz

Website: www.waitakere.govt.nz

14 October 2009

NEW ZEALAND HOUSING FOUNDATION
PO Box 44018
Point Chevalier
AUCKLAND 1246

Building Consent Application: COM-2009-1374

Application Location: 19 Titch Place, Glen Eden

Description of Project: New 5 Bedroom Dwelling with attached (internal access) garage. Cat 2.

Dear Sir/Madam

Request for Further Information

A) Please note that District Plan compliance is assessed separately with the PIM application. You should refer to the PIM to identify all requirements in terms of District Plan matters. If changes are required to the Building Consent application as a result of resolving District Plan issues, a new Building Consent application may be required.

B) Council's Technical Specialists have now completed the initial processing of your consent. We request that you supply **two copies** of each of the following:

1. BUILDING SURVEYOR REQUIREMENTS

a. As specified on the drawings, substrate and floor framing requirements to wet areas are in accordance with the Superflex BRANZ appraisal No.472 - Section 8.1. Please provide manufacturer's confirmation that the proposed vinyl over the Superflex membrane are compatible, as specified on Page 8

b. Please specify on the drawings, all flashing X, Y & Z minimum dimensions in accordance with the requirements of Acceptable Solution E2/AS1..

c. Please provide Manufacturer's Specifications or Branz Appraisal for Thermakraft 215 self supporting roof underlay.

d. Please provide manufacture Specifications for Particleboard flooring

Please supply all requested information in duplicate, highlight all changes on any amended plans, complete the enclosed form, and send only to the following:

Building Consent Processing Unit
Waitakere City Council
Private Bag 93109
Henderson
Waitakere City 0650

We would appreciate the return of the **complete set** of information by 12 November 2009, so that processing can continue without delay.

Please note that submission of separate requirements will not be processed. Electronic submissions will not be accepted.

Advise us immediately in writing should you no longer wish to proceed with this application.

Should you wish to discuss any of the technical requests above, please contact the staff member as indicated by phone on 839 0400.

Yours faithfully

pp

Radmila Ristic

cc: **Owner:**
NEW ZEALAND HOUSING FOUNDATION
PO Box 44018
Point Chevalier
AUCKLAND 1246

PROJECT INFORMATION MEMORANDUM NO: COM-2009-1374

Section 31, Building Act 2004
ISSUED BY: WAITAKERE CITY COUNCIL

Waitakere City Council
Te Taiao o Waitakere

APPLICANT	PROJECT
Name: NEW ZEALAND HOUSING FOUNDATION **Mailing Address:** PO Box 44018 Point Chevalier AUCKLAND 1246	**Proposed Work** New 5 Bedroom Dwelling with attached (internal access) garage. Cat 2. **Intended Use(s) in detail:** Unknown **Intended Life:** Indefinite, but not less than 50 years **This is:**
PROJECT LOCATION	☑ **Confirmation that the proposed** building work may be undertaken, subject to the provisions of the Building Act 2004, and any requirements of the Building Consent.
Street Address: 19 Titch Place, Glen Eden	Not yet applied for ☐ No: attached ☐ Not yet issued ☐
LEGAL DESCRIPTION	
Property Number: **Valuation Roll Number:** **Legal Description:** LOT 32 DP 389289	

This project information memorandum includes:

Information identifying relevant special features of the land concerned.	Yes
Information about the land or buildings concerned notified to the Council by any statutory organisation having the power to classify land or buildings.	No
Details of relevant utility systems.	Yes
Details of authorisations which have been granted.	Yes
Notification of any other authorisations which must be obtained before the proposed building work may be undertaken.	No
Details of authorisations which have been refused.	No

Signed for and on behalf of Council:

Name:

Position: Account Manager - Building Consents Date: 14-Oct-2009

WAITAKERE CITY COUNCIL

Waitakere City Council
Te Taiao o Waitakere

PROJECT INFORMATION MEMORANDUM

PIM : **COM-2009-1374**

SITE ADDRESS: **19 Titch Place, Glen Eden**

LEGAL DESCRIPTION: **LOT 32 DP 389289**

BUILDING

Use of a Public Building

In accordance with Section 363 of the Building Act 2004, please note that it is an offence to permit the use of a public building for which no building consent or code compliance certificate has been issued.

Electricity Transmission Lines and Towers

If there are high-tension electricity transmission lines over or adjacent to the property or there are transmission towers/pylons on or adjacent to the property the applicant must ensure that the proposed building complies with the line clearances and/or the requirements for excavation in the vicinity of towers/pylons prescribed in the New Zealand Electrical Code of Practice for Electrical Safe Distances.

It is the responsibility of the applicant to ensure compliance and if necessary to contact the line owner to determine whether the proposed building will comply prior to commencing construction.

Hazard Register:

a. The Owner shall not carry out any development nor place, erect, construct or permit to remain any buildings on any part of the land unless the foundations of all buildings have been the subject of specific design by a registered engineer who is familiar with the content of the Geotechnical Completion Report prepared by Babbage Consultants Reference 42608/GE and dated October 2007 (held in Council's records under RMA20061078) (hereinafter referred to as "the said Geotechnical Completion Reports)

b. All earthworks, development and construction on any part of the land shall be carried out in accordance with:

(i) The report referred to herein where applicable; and

(ii) All specific design requirements referred to herein where applicable; and

(iii) To the entire satisfaction of the Waitakere City Council.

Wind Zone: Low

Sea Spray Zone: No

PLUMBING

Existing foul water drains:	NO	**Existing storm water drains:**	NO
Sanitary Sewer:	YES	**Stormwater Sewer:**	YES

If no state any disposal requirements: N/A

Watercare Services Limited Sewer clearance required: NO

Watercare Services Limited Bulk Watermain clearance required: NO

Miscellaneous Comments

N/A

HEALTH/DANGEROUS GOODS:

Not applicable.

DRAINAGE

Requirements for building over or adjacent to Council sewer: YES

The proposal is to construct a new 5 bedroom dwelling with an attached garage on a vacant lot referred as Lot 32 created under SUB-2006-1078. The site has provisions to connect to reticulated networks for stormwater, wastewater and water supply provided under the sub-divisional development. The proposed building footprint is in close proximity to the existing public wastewater drains at the western and northern corners. Foundation bridging detail has been provided.
The application for a water supply new connection 3WATER-2008-607 has been processed and invoiced.

MISCELLANEOUS REQUIREMENTS

PLANNING

Operative District Plan:

Natural Area:	General
Natural Landscape Elements:	NA
Human Environment:	Living
Heritage, Designation or Scheduled Site Notation:	Nil
Road Hierarchy:	West Coast Rd - District Arterial; Pyramid Place - Local
Natural Hazards:	Previous Lot 2 DP 339810 High Pressure Natural Gas Pipeline Special Feature Nos: 12071 (replanting of reserve); 12073 (natural flowpath); 12076 (overland flowpath); 12087 (flooding) Proposed Lot 32 - geotech

Impact on Waahi Tapu?: Assessed on Resource Consents (LUC 2006-1077 & SUB 2006-1078)

Archaeological Site?: In the event of archaeological evidence being uncovered (e.g. shell, middens, hangi or ovens, pit depressions, defensive ditches, artifactual material or human bones) work shall cease in the vicinity of the discovery, the area secured, and the Council (Ph 839-0400) contacted. Activity on the site will remain halted until the Manager Resource Consents gives approval for operations to recommence.

District Plan:

Site Identified to be potentially or subject to Erosion/Stability or subsidence: NO

Site Identified to be potentially or subject to Flooding : YES

Planning Special Feature:

Please note that the previous property (Lot 2, DP 339810) was previously shown under the Transitional District Plan as being located in a flood sensitive area. Proposed Lot 46 appears to be clear of this flood sensitive area.

Resource Consent Requirements:

Land Use Consent requirements: *1
***1 ALREADY GRANTED**
LUC 2006-1077
Handling Officer: Felicitas Dhliwayo
Date Granted: 30-10-2006

The following geotechnical conditions of the above resource consent must be complied with during the construction and accompanying earthworks:

Geotechnical Conditions

34. A producer statement must be provided on completion of earthworks together with an earthworks completion report stating what requirements if any are necessary for the individual lots.

35. Unless there is clear evidence in the earthworks completion report to be provided by an engineer that NZS 3604 requirements have been fully met, all foundations shall require specific design.

36. Foundations of all lots shall be verified by an experienced geotechnical engineer familiar with the geotechnical report and shall take into account the potential for shrink/swell behaviour.

Subdivision Consent Requirements:
ALREADY GRANTED
SUB 2006-1078
Handling Officer: Felicitas Dhliwayo
Date Granted: 30-10-2006
Section 224: Issued

Any Other Requirements:
YES

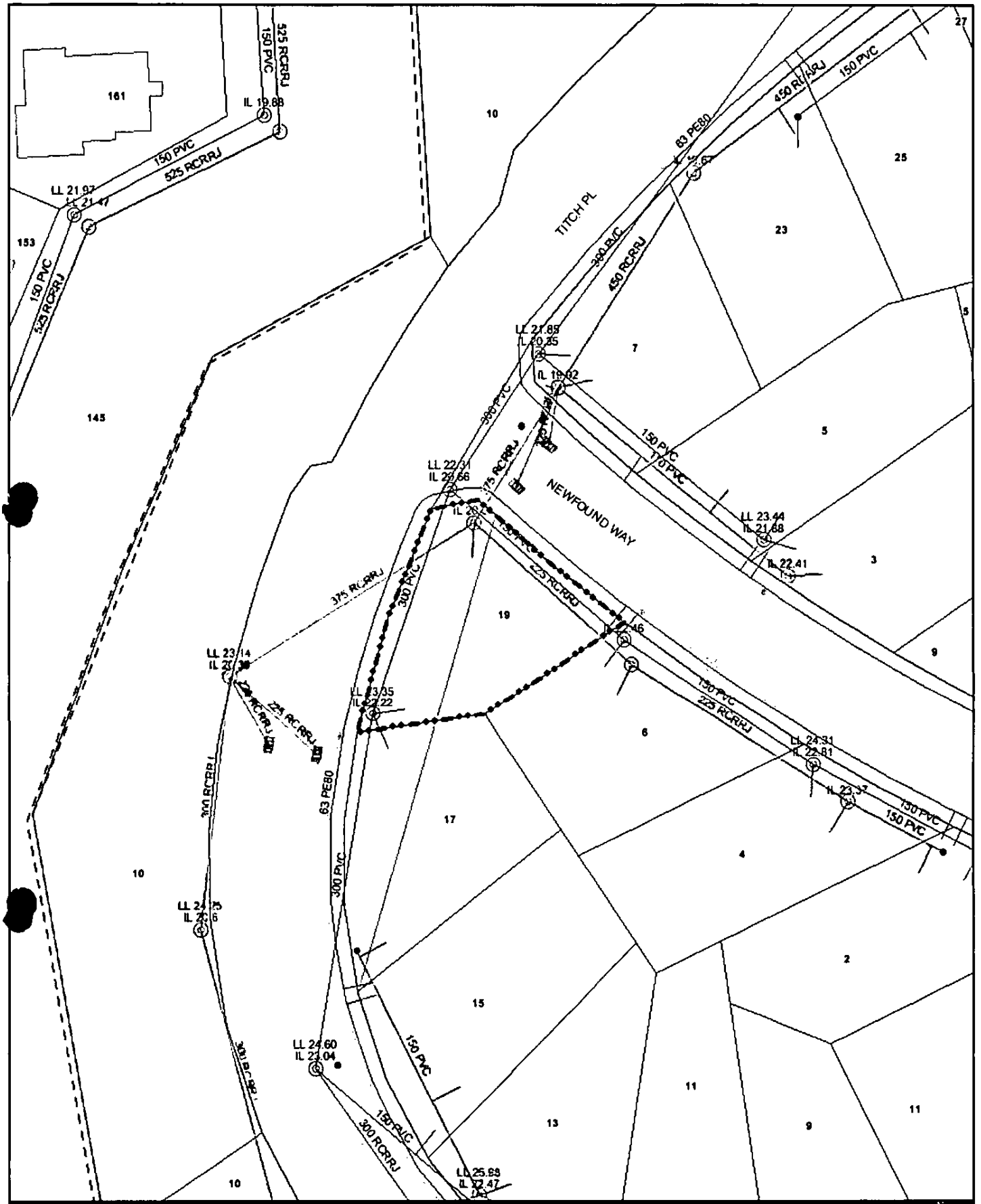
Subject to compliance with the conditions of Resource Consent (RMA LUC 2006-1077 & SUB 2006-1078) granted 30-10-2006 pursuant to Sections 93, 94, 94A - 94D, 104, 104B, 108 & 220 of the Resource
Management Act 1991.

Before commencement of any works and until completion of exposed earth site-works, adequate sediment and erosion control measures shall be constructed and maintained by the consent holder. The control measures must be maintained until the site has been adequately stabilised against erosion. The construction and maintenance shall be in accordance with **Appendix 3, Erosion and Sediment Control Measures Appendix** to the **Natural Area** Rules of the Waitakere City District Plan 2003.

A Licensed cadastral Surveyor shall certify to Council in writing prior to work progressing beyond the foundations that the building will comply with the Height in Relation to Boundary rules of the Proposed District Plan. No work shall proceed beyond this stage until a Licensed Cadastral Surveyor shall certify to Council in writing prior to work progressing beyond the framing stage that the buildings are located exactly as proposed in the application and will not exceed the degree of infringement applied for in relation to the overall height and height in relation to boundary controls of the District Plan and elsewhere complies with the height in relation to boundary and overall height rules of the District Plan. No work shall proceed beyond this stage until receipt of such certification, to the satisfaction of the Manager Resource Consents.

Vehicle Crossing/Street Damage Deposit: REQUIRED

If a vehicle crossing is required or the value of work requires a street damage deposit, pursuant to Waitakere City Council Bylaw No. 22 you are required to complete an application in the prescribed form for a vehicle crossing and street damage deposit with your application for building consent.



UNDERGROUND SERVICES

Scale = 1:500

Print Date: 12/10/2009

19 Titch Place Glen Eden

LOT 32 DP 389289

Cadastral Information from Land Information New Zealand Digital Cadastral Database DCDB Crown Copyright Reserved.

Services shown on public amenity land are not public drains unless used as through drains. While Council endeavours to provide accurate spatial data no guarantee as to the completeness and accuracy of the data shown on this plan can be given. All information, including levels and locations, are not of survey grade accuracy and should be verified on site. For enquiries about the information shown please phone the call centre (09) 839 0400.

Waitakere City Council
Te Tatau o Waitakere

UNDERGROUND SERVICES LEGEND

Water

Water Supply Facility
- Water Pump Station
- Drinking Water Sampling Manual

Water Supply Bulk Meter
- Bulk Meter
- Standard Meter Installation

Water Supply Valve
- Air Valve
- Backflow
- No Return Valve
- Peet Valve
- Zone Valve Peet
- Pressure Reducing Valve
- Sluice Valve
- Zone Valve Sluice
- Scour Valve
- Water Control Valve

Water Supply Hydrant
- Water Supply Hydrant

Water Supply Node
- Caps
- End Point
- Junction
- Reduce

Water Supply Storage Unit
- Reservoir

Water Supply Miscellaneous
- Valve Chamber

Water Supply Main Line
- WCC Assets
- Pipe Bridge
- Water Care Assets
- Abandoned Assets
- Private Assets

Water Suupply Service Line
- WCC Assets
- Abandoned Assets
- Private Assets

Stormwater

Stormwater Manhole
- Catchpit Manhole
- Drop Manhole
- *Standard Manhole*
- Inspection Chamber

Stormwater Inlet
- Catchpit - Super
- Catchpit - Double
- Catchpit - Single
- Culvert / Pipe Inlet / Outlet / Wingwall
- Open Pipe End
- Debris Control Structure

Stormwater Node
- End Point / Outlet Point / Trap

Stormwater Miscellaneous
- Overflow Path

Stormwater Storage Basin
- Stormwater Pond
- Low Impact Devices
- Filtration Devices
- Detention Device

Stormwater Main Line
- Subsoil Drain
- WCC Assets
- Abandoned Assets
- Private Assets

Stormwater Service Line
- WCC Assets
- Abandoned Assets
- Private Assets

Stormwater Channel
- Stormwater Channel

Wastewater

Wastewater Manhole
- Drop Manhole
- Manhole
- *Inspection Chamber*

Wastewater Miscellaneous
- Campervan Dumping Point
- Septic Tank Standard
- Septic Tank High Tech

Wastewater Node
- End Point

Wastewater Pumpstation
- Pumpstation

Wastewater Main Line
- Pipe Bridge
- Rising Main
- WCC Assets
- *Water Care Assets*
- Abandoned Assets
- Private Assets

Wastewater Service Line
- WCC Assets
- Abandoned Assets
- Private Assets

Information Communication Technology

- ICT Node

ICTManhole
- ICT Inspection Chamber
- ICT Manhole
- ICT Traffic Chamber

ICTDuct
- ICT Duct
- ICT Fibre Optic Duct
- ICT Traffic Cable Duct

Miscellanous
- Error in Unit Type
- Error in Unit Type

Gas Petroleum

- High Pressure Gas Pipeline

Contour

- 2 metre

Waitakere City Council
Te Taiao o Waitakere

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Website: www.waitakere.govt.nz

21 October 2009

NEW ZEALAND HOUSING FOUNDATION
PO Box 44018
Point Chevalier
AUCKLAND 1246

Dear Sir/Madam

Re : Application Number **COM-2009-1374**

Proposal **New 5 Bedroom Dwelling with attached (internal access) garage. Cat 2.**

Project Address: **19 Titch Place, Glen Eden**

Thank you for your Building Consent application lodged with Council on 28-Sep-2009. This consent is now ready to be issued.

The following fees for processing the application are outstanding.

Our counter staff will produce invoice(s) when you collect your Building Consent as per the following fee schedule:

Counter Processing Fee	126.00
Plan Processing Fee	1,735.25
Design Check Fee	300.00
Fire and Egress Processing Fee	52.00
Planning Check Fee	144.00
Drainage Engineer - Ecowater Processing Fee	152.00
Records Fee	37.00
Issuing Fee	22.75
Inspection fees	2,670.00
VXG Fees - Vehicle crossing inspection	95.00
Total to pay:	**5334.00**

If payment is made by cheque(s) to a value of more than $3,000.00, there will be a five working day clearance period before the consent is issued. If payment is made by Bank Cheque, this consent can be uplifted immediately. Council is unable to accept Credit Card payments.

Your Building Consent must be picked up within 42 days of the date of this letter, or we may refuse to issue the consent and return your application. Any outstanding processing fees will still be payable. Commencement of works relating to this application prior to issue of the consent is unlawful and subject to prosecution under the Building Act 2004.

Code Compliance Certificate Fee is payable at the time of Code Compliance Certificate application, and at the rate as shown in the Regulatory Fees and Charges schedule at that time.

Consent issued ____/____/____

Receipt No _____

Issued by _____
(GEMS CODE) «Merge_Type_Code»

District Plan compliance is assessed separately with the PIM application. You should refer to the PIM to identify all requirements in terms of District Plan matters. If amendments are made to the PIM as a result of resolving District Plan issues a new Building Consent application may be required.

Yours faithfully

Jacqueline Mutepfa
PROCESS SUPPORT
(Copy sent to owner)

Waitakere City Council
Te Taiao o Waitakere

Waitakere City Council
Waitakere Central
6 Henderson Valley Road
Henderson 0612

Private Bag 93109
Henderson 0650
Waitakere

Telephone
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Website: www.waitakere.govt.nz

20 October 2009

NEW ZEALAND HOUSING FOUNDATION
PO Box 44018
Point Chevalier
AUCKLAND 1246

letter reissued on 21-10-09

Dear Sir/Madam

Re : Application Number **COM-2009-1374**

Proposal **New 5 Bedroom Dwelling with attached (internal access) garage. Cat 2.**

Project Address: **19 Titch Place, Glen Eden**

Thank you for your Building Consent application lodged with Council on 28-Sep-2009. This consent is now ready to be issued.

The following fees for processing the application are outstanding.

Invoice 433554	604.69

Our counter staff will produce invoice(s) when you collect your Building Consent as per the following fee schedule:

Counter Processing Fee	126.00
Plan Processing Fee	1,735.25
Design Check Fee	300.00
Fire and Egress Processing Fee	52.00
Planning Check Fee	144.00
Drainage Engineer - Ecowater Processing Fee	152.00
Records Fee	37.00
Issuing Fee	22.75
Inspection fees	2,670.00
VXG Fees - Vehicle crossing inspection	95.00
Total to pay:	**5938.69**

If payment is made by cheque(s) to a value of more than $3,000.00, there will be a five working day clearance period before the consent is issued. If payment is made by Bank Cheque, this consent can be uplifted immediately. Council is unable to accept Credit Card payments.

Your Building Consent must be picked up within 42 days of the date of this letter, or we may refuse to issue the consent and return your application. Any outstanding processing fees will still be payable. Commencement of works relating to this application prior to issue of the consent is unlawful and subject to prosecution under the Building Act 2004.

Code Compliance Certificate Fee is payable at the time of Code Compliance Certificate application, and at the rate as shown in the Regulatory Fees and Charges schedule at that time.

Consent issued ____/____/____

Receipt No _____

Issued by _____
(GEMS CODE

District Plan compliance is assessed separately with the PIM application. You should refer to the PIM to identify all requirements in terms of District Plan matters. If amendments are made to the PIM as a result of resolving District Plan issues a new Building Consent application may be required.

Yours faithfully

Jacqueline Mutepfa
PROCESS SUPPORT
(Copy sent to owner)

Waitakere City Council
Te Taiao o Waitakere

Waitakere Central
6 Henderson Valley Rd
Henderson 0612
Waitakere

Waitakere City Council
Private Bag 93109
Henderson 0650
Waitakere

Telephone
09 839 0400

COPY

TAX INVOICE

GST Registration Number

52-211-247

NEW ZEALAND HOUSING FOUNDATION
PO Box 44018
Point Chevalier
AUCKLAND 1246

Date: 28 September 2009
Customer No: 302176
Invoice No: 433554

Application Location: 19 Titch Place, Glen Eden

Application: COM-2009-1374

Fee Code	Transaction Description	Amount
BLDL	Building Levy	401.09
BLDR	Building Research Levy	203.60

This account includes a total GST content of $44.56

Invoice Total 604.69
Invoice Due 12 October 2009

(Please Detach and return with payment)

Waitakere City Council
Te Taiao o Waitakere

Waitakere Central
6 Henderson Valley Rd
Henderson 0612
Waitakere

Waitakere City Council
Private Bag 93109
Henderson 0650
Waitakere

Telephone
09 839 0400

Invoice Date:	28 September 2009	Application:	DAP
Invoice Number:	433554	Debtor Number:	302176
Name:	NEW ZEALAND HOUSING FOUNDATION	Payment Reference:	370179
Application:	COM-2009-1374	Invoice Total:	604.69

Code Compliance Certificate

Section 95, Building Act 2004
(Form 7 – Building (Forms) Regulations 2004)

COPY

Waitakere City Council
Te Taiao o Waitakere

THE BUILDING

Building consent number: COM-2009-1374

Date building consent issued: 23-Oct-2009

Street address: 19 Titch Place, Glen Eden

Legal description: Lot number and Deposited plan: LOT 32 DP 389289

Valuation number: 33650-27034

Current, lawfully established, use: Dwelling

Year first constructed: 2005-2010

THE OWNER

Name of owner: New Zealand Housing Foundation

Mailing address: PO Box 44018, Point Chevalier, AUCKLAND 1246

Street address/Registered office: Bldg 55, Unitec Campus, Carrington Road, Mt Albert

Telephone no. (home): N/A

Telephone no. (work): 849 4395

Mobile number. (home): 027 5594524

Facsimile number. 849 4396

Email address: louise.d@housingfoundation.co.nz

BUILDING WORK

The following building work is authorised by this building consent:

New five bedroom dwelling with attached (internal access) garage (Cat. 2).

Intended life: Indefinite

CODE COMPLIANCE

The building consent authority named below is satisfied, on reasonable grounds, that:

☑ The building work complies with the building consent.

Signature: _____

Date: 16 April 2010

On behalf of Waitakere City Council

Print name: JOHN NICHOLLS
SENIOR PLUMBING & DRAINAGE INSPECTOR

Position:

Waitakere City Council
Private Bag 93109
6 Henderson Valley Rd
Henderson
WAITAKERE CITY
Ph: 839 0400 Fax: 836 8001

BCI-40

Checklist for the issuing of a Code Compliance Certificate

Waitakere City Council
Te Tatau o Waitakere

Note: This checklist makes up the requirement for what is to be kept on file in conjunction with checklist BCI-70.

Building Consent Number:	COM-2009-1374.

SECTION A

1.	Application for CCC received & complete; is CCC application fee paid?	☑ Y	☐ N	☐ N/A
2.	If applicable, has the Building final inspection passed?	☑ Y	☐ N	☐ N/A
3.	If applicable, has the P & D final inspection passed?	☑ Y	☐ N	☐ N/A
4.	CER inspection – have all certificates, etc been received and passed?	☑ Y	☐ N	☐ N/A
5.	Have any outstanding fees from Gems been paid (O Bal note)?	☐ Y	☐ N	☑ N/A
6.	If there are any outstanding fees and/or development contributions from Pathway, is the outstanding fee less than $200.00? Customer phoned: ☐ Y ☐ N To pay electronically ☐ / To pay on pick-up ☐	☐ Y	☑ N	☐ N/A
7.	If the consent was granted after 31 March 2005, is the CCC application within 2 years of the consent being granted?	☑ Y	☐ N	☐ N/A
8.	If the consent was granted after 31 March 2005 and has expired, has an extension of time been applied for?	☐ Y	☐ N	☑ N/A
9.	If this consent was approved after 1 July 2008, have the Inspection Fees been reconciled? Paid b/r X 15 @ $173.00	☑ Y	☐ N	☐ N/A
10.	If there are any Amendments, have they been granted?	☐ Y	☐ N	☑ N/A
11.	If a CCTV was required, has clearance been received and EW fees invoiced?	☑ Y	☐ N	☐ N/A
12.	Are all workflow tasks completed?	☑ Y	☐ N	
13.	Is the consent description correct?	☑ Y	☐ N	
•	E-mail records for file.	☑ Y		
•	Print field sheet and collate file.	☑ Y		
•	If applicable, send file for Commercial Review.	☐ Y		☑ N/A

CCC Application	Accept / Reject / Suspend		
Date	16/4/2010	Name	Nicole

Did the Technical Review for the granting of a CCC pass? ☐ Y ☑ N

14.	Check if the intended life has been specified as less than 50 years.	☐ ____ yrs	☑ Indefinite	
15.	If this is part of a current subdivision, has the address been checked?	☑ Y	☐ N	☐ N/A
16.	Is there is a related requisition? (Put a note in Pathway to email Field Services when CCC issued.)	☐ Y	☑ N	
17.	Is there a related COA? (Building Construction Review Team Leader to advise wording to be added to CCC.)	☐ Y	☑ N	
18.	Are the Owners' details correct? (Update or add if required.)	☑ Y	☐ N	
19.	Is a Compliance Schedule required?	☐ Y	☑ N	
20.	Is a Septic Tank installation included?	☐ Y	☑ N	
21.	Has a Certificate for Public Use previously been issued?	☐ Y	☑ N	
22.	Will the building be included as part of the social infrastructure?	☐ Y	☑ N	

CCC Generated	V= 33650-27034		
Date	16.4.10	Name	DC

Building Consent History
COM-2009-1374

Waitakere City Council
Te Tatau o Waitakere

Building Consent Status: Construction Review
Building Consent Issued: 23/10/2009

Property
Legal Desc LOT 32 DP 389289
Contact NEW ZEALAND HOUSING FOUNDATION
Address 19 Titch Place Glen Eden
Description New five bedroom dwelling with attached (internal access) garage (Cat. 2).
Amendments

B1 B2 B5 B7 B8 B10 B11 B12 B13 B14 B15 P1 P2 P3 P6.

COM-2009-1374
Expiry Date: 16-Oct-2011

Date	Event	Description	Officer	Status / Result / Reason
12/04/2010 00:00:00 26818/2009	CER Certificates	RECEIVED: 1. Plumbers Form - 12/11/09 2. Drainlayers Form - 12/11/09 3. Manufacturers Certificate for Timber Treatment and Grading - 10/12/09 4. Manufacturers Certificate and Layout for Roof Trusses - 10/12/09 5. Soil/Geotechnical Engineers Certificate - 25/02/10 6. Engineers Certificate for Foundations (Structural) - 25/02/10 7. Engineers Certificate for A/B Grade Masonry - 25/02/10 8. Engineers Certificate for Speciality Slab - 25/02/10 9. Surveyors Certificate for Siting - 25/02/10 10. Electrical Certificate - 25/02/10 11. I have viewed the post constructions CCTV video on ww drain. The drain is in an acceptable condition in relation to the building works. The CCTV reveals that the manhole located close to the boundary with No 17 is buried. The manhole lid level is required to be raised or the surrounding ground level lower to match. The building consent condition relating to the post construction CCTV is not been satisfied. Okay as per notes on P6 12.04.10 I have completed the QA-PSCCTV task. ECOWATER 12. As-Built - Drainage - 12.04.10 13. As-Built - Pre-floor - 12.04.10		Paid for x 15 Refund x 2.
12/04/2010 00:00:00 7728/2010	P06 Final Plumbing and Drainage	NC Certificates or Producer Statements Required:	John Nicholls	Passed 1. Confirmed with Ecowater that the manhole lid hasbeen exposed. 2. CCTV is okay as per Jason Lim.
24/03/2010 12:30:00 24829/2009	P06 Final Plumbing and Drainage	Certificates or Producer Statements Required: AS-BUILT - PRE-FLOOR AS BUILT DRAINAGE PLAN /PM Contact Person:Lance (site manger) Contact Number:021750280 Additional Information:plans on site, cert advised, cancellation fee advised.	John Nicholls	Failed CCTV to come as per condition 25 (DE1).
24/02/2010 12:00:00 24442/2009	B15 Final Building	Certificates or Producer Statements Required: /PM Contact Person:Lance (site manger) Contact Number:021750280 Additional Information:plans on site, cancellation fee advisd	Andrew Collier	Passed 1. All Ok for CCC.

COM-2009-1374

Expiry Date: 16-Oct-2011

Date	Event	Description	Officer	Status / Result / Reason
24/02/2010 00:00:00 3841/2010	B12 Pre-line Building	Certificates or Producer Statements Required:	Andrew Collier	Passed NO CHARGE 1. All itmes from 21/01/10 Ok. 2. Bottom stair riser is 2005mm from glass, so Ok.
04/02/2010 14:00:00 24441/2009	B14 Gibnail	Certificates or Producer Statements Required: AM Contact Person:Anthony Contact Number: 021975612 Additional Information:	Andrew Collier	Passed 1. All Ok.
21/01/2010 12:00:00 24438/2009	B12 Pre-line Building	Certificates or Producer Statements Required: SOIL/GEOTECHNICAL ENGINEERS CERTIFICATE ENGINEERS CERTIFICATE FOR FOUNDATIONS (STRUCTURAL) ENGINEERS CERTIFICATE FOR A/B GRADE MASONRY ENGINEERS CERTIFICATE FOR SPECIALITY SLAB SURVEYORS CERTIFICATE FOR SITING AM Contact Person: ANTHONY (BUILDER) Contact Number: 021975612 Additional Information: PLANS ONSITE	Andrew Collier	Failed 1. Safety glass upstairs bathroom with 1.5m of FFL. 2. Safety glass upper panel at bottom of stairs. 3. Check on final.
21/01/2010 00:00:00 1480/2010	B07 Framing	Certificates or Producer Statements Required:	Andrew Collier	Passed NO CHARGE 1. All items complete from 10/12/09.
19/01/2010 09:00:00 24827/2009	P02 Pre-line Plumbing	Certificates or Producer Statements Required: AM Contact Person: Peter - Plumber Contact Number: 0274969499 Additional Information: plans onsite	Phillip Tozer	Passed 1. Waste and layout as per plan. 2. Test and gauge on.
18/12/2009 08:00:00 24436/2009	B10 Cladding - Brick Veneer	Certificates or Producer Statements Required: AM Contact Person: Paul Contact Number: 0212626486 Additional Information: plans onsite	Andrew Collier	Passed 1. Ok to 1/2 high.
16/12/2009 10:00:00 24431/2009	B08 Building Wrap and Cavity	Certificates or Producer Statements Required: AM Contact Person: Anthony - Builder Contact Number: 021975612 Additional Information: Plans on site - aware of the cancellation procedures.	Andrew Collier	Passed 1. Ok to clad.

COM-2009-1374

Expiry Date: 16-Oct-2011

Date	Event	Description	Officer	Status / Result / Reason
10/12/2009 11:30:00 24430/2009	B07 Framing ✓	Certificates or Producer Statements Required: AM Contact Person:Antony Contact Number: 021 975 612 Additional Information: Plans and xconditions on site	David Ellery	Passed *1. Complete nogs for apron flashing support *2. fit U/S x 3 to garage door lintel *3. brace B25 change to braceline ok *4. received frame and truss certificate. otherwise all ok to wrap *5. Manufacturers Certificate for Timber Treatment and Grading - 10-12-09 *6. Manufacturers Certificate and Layout for Roof Trusses -10/12/09
26/11/2009 13:30:00 26618/2009 Invoiced ✓	P03 Drainage	Certificates or Producer Statements Required: PM Contact Person:Brian Contact Number:0275347500 (plumber/drainlayer) Additional Information: Cancellation details: 9/11/09 As per Inspector Murray Norris, Wrong Job. Please note this job was not booked in. Plumber did not want this inspection. No charge please. PM Contact Person: Brian Chapman (Plumber/Drainlayer) Contact Number: 0275 347 500 Additional Information:	John Nicholls	Passed 1. S/W only 2. Sewer done with Prefloor inspection 3. As built Drainage plan to come @ finalAdditional Inspection charged = # 441883
19/11/2009 15:00:00 24429/2009	B05 Specialty Slab ✓	Certificates or Producer Statements Required: PM Contact Person: Jason (flooring contractor) Contact Number:021 765 439 Additional Information:Plans onsite	Andrew Collier	Passed 1. Slab ok

COM-2009-1374

Expiry Date: 16-Oct-2011

Date	Event	Description	Officer	Status / Result / Reason
12/11/2009 09:30:00 24828/2009	P03 Drainage	Certificates or Producer Statements Required: /PM Contact Person: Brian Chapman Contact Number: 0275 347 500 Additional Information: Cancellation details: As per Inspector Murray Norris, wrong job. This was booked incorrectly. Consent # was 2009-1136 for another location. NO charge please.	John Nicholls	Passed 1. S/S only. 2. Stormwater to come.
12/11/2009 00:00:00 24826/2009	P01 Pre-Floor Plumbing	AM- first inspection in morning if possible Contact Person: Bryan- Contractor Contact Number:027 534 7500 Additional Information: Plans on site. Caller originally mentioned 2008-1464 as the consent number- however that was a cancelled consent. Booking under this consent was chosen, as this was the most recent consent number under address Certificates or Producer Statements Required:	John Nicholls	Passed Passed.
10/11/2009 11:00:00 24428/2009	B02 Reinforced Concrete and Block Work	Certificates or Producer Statements Required: AM/ Contact Person: Paul (bricklayer) Contact Number: 0212626486 Additional Information: plans on site	Andrew Collier	Passed 1. Ok to fill firewall.
04/11/2009 14:00:00 24345/2009	B01 Siting and Foundations	Certificates or Producer Statements Required: PM Contact Person: Jason - Contractors Contact Number: 021765439 Additional Information: Plans on site - aware of cancellation procedures	Andrew Collier	Passed 1. Ok to pour firewall footing and three piles to slab perimeter.
	PS4 Prod. Stat. Req'd-(Council must still inspect)	Certificates or Producer Statements Required: 1.Rib-raft Foundation Slab		

Application for code compliance certificate

WAITAKERE CITY COUNCIL
Waitakere City Council
Te Taiao o Waitakere
31 MAR 2010
MAIL CENTRE

49521
Counter Services
14 APR 2010

Section 92, Building Act 2004
(Form 6 – Building (Forms) Regulations 2004)

Building consent number: COM-2009-1374

Issued by: **Waitakere City Council**

Location of building (please tick)

☐ Auckland ☐ Manukau ☑ Waitakere ☐ North Shore ☐ Papakura ☐ Rodney ☐ Franklin

THE OWNER	**AGENT**
Name of owner: New Zealand Housing Foundation (Include preferred form of address, eg, Mr, Miss, Dr, if an individual)	(Only required if application is being made on behalf of the owner) Name of agent:
Mailing address: PO Box 44018 Point Chevalier Auckland 1246	Mailing address:
Street address: (for courier) Bldg 55, Unitec Campus Carrington Road Mt Albert	Street address: (for courier)
Telephone No: (Home):	Telephone No: (Home):
Telephone No: (Work): 8494395	Telephone No: (Work):
Mobile number: 0275594584	Mobile number:
Facsimile number: 8494396	Facsimile number:
Email address: louise.d@housingfoundation.co.nz	Email address:
Evidence of ownership:(copy of certificate of title, lease, agreement for sale & purchase or other document showing full name of legal owner(s) of the building should be attached)	Relationship to owner: (state details of the authorisation from the owner to make the application on the owner's behalf)
Signature of owner:	Signature of agent:
Print name: Louise Dunn	Print name:

FIRST POINT OF CONTACT FOR COMMUNICATION (Must be in New Zealand)

(if first point of contact for communications from the council is different to above, please provide full name, mailing address, phone numbers and email addresses)

Full name: as above

Mailing address:

Street address/Registered office:

Telephone no. (home): Telephone no. (work):

Mobile number. (home): Facsimile number.

Email address:

APPLICATION

Stage 1 of an intended 1 Stages
All building work to be carried out under the above building consent was completed on: 24/2/10

KEY CONTACTS/PERSONNEL WHO CARRIED OUT THE BUILDING WORK

Designer or Architect		**Structural Engineer**	
Business/Name:		Business/Name:	
Address:		Address:	
Daytime:	After Hours:	Daytime:	After Hours:
Mobile:	Fax:	Mobile:	Fax:
Registration/Qualifications:		Registration/Qualifications:	
Builder		**Plumber**	
Business/Name:		Business/Name:	
Address:		Address:	
Daytime:	After Hours:	Daytime:	After Hours:
Mobile:	Fax:	Mobile:	Fax:
Registration/Qualifications:		Registration/Qualifications:	
Drainlayer		**Electrician**	
Business/Name:		Business/Name:	
Address:		Address:	
Daytime:	After Hours:	Daytime:	After Hours:
Mobile:	Fax:	Mobile:	Fax:
Registration/Qualifications:		Registration/Qualifications:	
Head Contractor/Site Manager		**Other**	
Business/Name: Giddsmith Developments		Business/Name:	
Address:		Address:	
Daytime:	After Hours:	Daytime:	After Hours:
Mobile: 021 750280	Fax:	Mobile:	Fax:
Registration/Qualifications:		Registration/Qualifications:	

☐ No specified system installed

(tick)	SPECIFIED SYSTEM
☐ ☐ ☐	1.0 Automatic systems for fire suppression 1.1 Automatic sprinkler systems 1.2 Gas and foam flood or deluge system, dry and wet chemical extinguishing systems
☐ ☐ ☐	2.0 Automatic/manual emergency warning systems for fire or other dangers 2.1 Emergency warning systems including manual and automatic fire alarms, heat detectors, halon, gas, radiation systems. Are they audible or visual signals? 2.2 Automatic gas leak detection systems for the detection and measurement of combustible gases
☐ ☐ ☐ ☐	3.0 Electromagnetic or automatic doors or windows 3.1 Automatic doors (sliding/revolving/panic) 3.2 Access controlled doors (swipe card/key pad/sensor/delayed egress) 3.3 Interfaced fire or smoke doors or windows (electromagnetic door holders)
☐	4.0 Emergency lighting systems. Stand-by generator, self-contained units, other
☐	5.0 Escape route pressurisation. Location of control panel
☐	6.0 Riser mains for fire service use. Physical location of the riser, point of entry for fire service etc.
☐	7.0 Any automatic back-flow preventer connected to a potable water supply. Type of device and location (testable device)
☐ ☐ ☐ ☐	8.0 Lifts, escalators or travelators or other systems for moving people or goods within buildings: Specify number of lifts and location. 8.1 Passenger carrying lift 8.2 Goods lift 8.3 Escalators and moving walks
☐ ☐	9.0 Mechanical ventilation or air conditioning system. Owners operation manual may have maintenance provisions included. **Note**: Cooling tower installed?
☐	10.0 Building maintenance units for providing access to the exterior and interior walls of buildings.
☐	11.0 Laboratory fume cupboards. Location: _____
☐ ☐ ☐	12.0 Audio loops or other assistive listening systems 12.1 Audio loop 12.2 FM radio-frequency systems and infrared beam transmission systems.
☐ ☐ ☐ ☐	13.0 Smoke control systems: - 13.1 Mechanical smoke control 13.2 Natural smoke control 13.3 Smoke curtains
☐	14.0 Emergency power systems or signs relating to a specified system in any of the specified systems 1.0-13.0. See 15.4, Signs
☐ ☐ ☐ ☐ ☐ ☐	15.0 Means of escape: 15.1 System for communicating information for evacuation 15.2 Final exits 15.3 Fire separation 15.4 Signs. Such signs as required by • the building code (all systems above) • section 120 of the Building Act 2004 15.5 Smoke separation
☐	SS16 Cable cars
☐	The compliance schedule for this building complies with section 103(d) of the Building Act 2004

REQUEST

I request that you issue a code compliance certificate for this work under section 95 of the Building Act 2004.

The code compliance certificate should be sent to:

Name: New Zealand Housing Foundation ☑ Owner ☐ Agent

Address: PO Box 44018, Point Chevalier, Auckland 1246

Owner/agent signature: _____ **Date:** 23/8/10

Print name: Louise Dunn

If you are signing this application on behalf of a company/trust/other entity (the Applicant), you represent that you are authorised on behalf of the Applicant to make such application.

ATTACHMENTS

The following documents are attached to this application:

☐ Certificates from the personnel who carried out the work

☐ Certificates that relate to the energy work

☐ Evidence that specified systems are capable of performing to the performance standards set out in the building consent

☐ Other (specify): _____

IMPORTANT PRIVACY INFORMATION
If you would like to request access to, or correction of, your details, please advise us on the contact details below

Waitakere City Council
Private Bag 93109
6 Henderson Valley Rd
Henderson
WAITAKERE CITY
Ph: 839 0400 Fax: 836 8001

Chief Executive	
Corporate Services	
City Services Moselle	
Consultancy Services	
ECO · WATER	
Strategic Group	
Consent Services	
Field Services	
COUNTER	

ADRIENNE 6/1/2010

Nicole Daniels

From: Nicole Daniels
Sent: Friday, 16 April 2010 11:01 a.m.
To: 'louise.d@housingfoundation.co.nz'
Subject: COM-2009-1374, 19 Titch Place, Glen Eden

Attachments: img-4161045-0001.pdf

img-4161045-0001.
pdf (640 KB)

Hi Louise,

See attached, I have received your CCC application for COM-2009-1374, 19 Titch Place, Glen Eden and have started the first part of the CCC Checklist and part of our process is to do a reconciliation. Originally 15 Base Inspection were paid for however, only x 13 inspections were undertaken, which results in a refund of $356.00 (C/N # 520445). However the CCTV Ecowater Clearance has been Invoiced $266.00 (Inv # 456863), I noticed that this was only Invoiced 12/4/2010 so was showing as outstanding, now that I have done the reconciliation resulting in a refund this has come off the credit leaving a balance of $90.00 that will be refunded back to you within 14 days. Please don't pay Invoice # 456863 $266.00.

I have posted the original out to you.

Please feel free to contact me if you require any further assistance.

Regards,

Nicole Daniels
Process Support Assistant | Inspections
Consent Services |City Services

Waitakere City Council
Phone: 836-8000 ext: 8102 | Fax: 836-8001
Email: nicole.daniels@waitakere.govt.nz
Address: 6 Henderson Valley Road, HENDERSON
Postal: Private Bag 93109 HENDERSON 0650

P Please consider the environment before printing this e-mail

-----Original Message-----
From: Xerox Scanner account
Sent: Friday, 16 April 2010 10:45 a.m.
To: Nicole Daniels
Subject: Scan Data from MFDL13

Number of Images: 4
Attachment File Type: PDF

Device Name: ApeosPort-II C6500
Device Location:

BCI-70

Checklist for the granting of a Code Compliance Certificate

Waitakere City Council
Te Tatau o Waitakere

Note: This checklist makes up the requirement for what is to be kept on file in conjunction with checklist BCI-40.

Building Consent Number:	COM-2009-1774.

Check if the building work completed complies with the approved building consent and conditions on file	☑ Y ☐ N ☐ N/A
In case of a compliance schedule check to ensure that the specified systems meet the required performance standards and all IQP statements have been provided	☐ Y ☐ N ☑ N/A
Check if all producer statements received are acceptable under the producer statement register	☑ Y ☐ N ☐ N/A
Check if the energy work certificate has been provided (section 94(3))	☑ Y ☐ N ☐ N/A
Check to make sure that any amendments have been granted, & whether documentation associated with these has been properly completed	☐ Y ☐ N ☑ N/A
Check if any warnings or bans have been applied (section 94(2))	☐ Y ☐ N ☑ N/A

Check if there are any outstanding documents still to be collected:

Survey Certificates:	
☐ Height in relation to boundary	☐ Siting
☐ Maximum height of building	☐ Minimum floor level
☐ Emergency warning systems	☐ Concrete strength
☐ Mechanical ventilation	☐ Fire doors
☐ Foundation observation	☐ Spread of flame
☐ Ground conditions	☐ Backflow
☐ Masonry – A or B grade	☐ Compaction
☐ Lifts (electrical and installation)	☐ Pile driving
☐ Drain layer's and plumber's form	☐ Waterproofing
☐ Framing treatment level and location plans	☐ As built drainage plan
☐ Engineer's certificate for storm water disposal system	☐ Structural reviews
☐ On-site storm water treatment system certificate	☐ Site welding
☐ On-site waste water treatment system certificate	☐ Glazing
☐ Electrical or gas energy work certificates	☐ Drainage
☐ Installer's PS3 for on-site waste water installation	☐ Truss layout
☐ Smoke alarms and sprinklers	☐ Home heating (fires)
☑ Cadastral plan for drainage	☐ Other:

NOW IN OUTSTANDING

Please record reasons for ~~granting~~ or ~~refusing~~ the CCC:

AS PER APPROVED PLANS

All inspections have been passed and all complying producer statements and certificates have been received, OK to issue CCC				(Yes) / ~~No~~
Date	16 APR 2010	Name	PETER PROCTOR SENIOR BUILDING INSPECTOR	sign

(1) 2009-1374

BCI-115

WCC Record of inspection
Final plumbing and drainage (P6)

Waitakere City Council
Te Tatao o Waitakere

ENTERED

Surveyor's Name	John Nicholls	Time in	
Date	12-4-10	Time out	
ABA #	COM-2009-1374	Time total	
Address	19 Titch place, Glen Eden.		

Certificates & forms								
Septic tank	Y	N	N/A	Stormwater tanks	Y	N	N/A

Hot water source	Gas	Electric	**Temperature**		**HWC**	Capacity	Tempering valve	Y	N	N/A

Exterior							
Gas Bottles restrained & supported on pad	Y	N	N/A	Spouting	Y	N	N/A
Water meter / supply pipe	Y	N	N/A	Pipe penetrations / clips	Y	N	N/A
Gully location / height above finished GL	Y	N	N/A	Terminal vent	Y	N	N/A
Discharge pipes	Y	N	N/A	Manholes (Correct ground level)	Y	N	N/A
Downpipes / spreaders	Y	N	N/A	Dry chambers / Inspection chambers	Y	N	N/A
Parapet / gutters drainage	Y	N	N/A	Cess pits	Y	N	N/A
Balcony drainage	Y	N	N/A	Half-siphon bends	Y	N	N/A
				Solar Heating / Panel, etc.	Y	N	N/A

Interior							
HWC - restraint	Y	N	N/A	Bidets / Spa baths / bath	Y	N	N/A
HWC - access	Y	N	N/A	Air-admittance valve	Y	N	N/A
TPR & relief valves and drains	Y	N	N/A	Sprinklers	Y	N	N/A
Showers tested	Y	N	N/A	Fire collars	Y	N	N/A
Sanitary fittings sealed & secured	Y	N	N/A	Wetbacks – Open vent	Y	N	N/A
WC's - water seal / dual flush	Y	N	N/A	Pool – backwash – to gully traps	Y	N	N/A
Tap hardware	Y	N	N/A				

Backflow Preventer Device details

Testable device(s)	Interior	Exterior		**Devices total**			
Non-testable device(s) or Air gap(s)	Y	N		Hazard	High	Medium	Low

Description:

Location:

Stormwater Tanks / Devices

Type of Device/s:	Retention tank ☐	Detention tank ☐	Rain garden ☐	Swale/filter strip ☐
	Permeable paving ☐	Dispersal device ☐	Soakage pit / trench ☐	
	Other (specify):			

If tank, is it – Buried ☐ Above ground ☐

Operation and maintenance manual received?	Y	N	N/A	Producer Statement (PS4) received?	Y	N	N/A

☞ **IMPORTANT: Please complete back page ... ➔**

BCI-115

WCC Record of inspection
Final plumbing and drainage (P6)

Waitakere City Council
Te Taiao o Waitakere

Result of Inspection:	
Passed ☑	**Failed** ☐
Notice to Fix Resolved ☐ Additional Inspections Required: Yes ☐ No ☐ All previous inspections passed: Y / N All Certs requested have been received Y / N	Issue Notice to Fix ☐ Field Note ☐ Failed Letter ☐ Certificates Required Letter ☐ Amendments Required ☐ Additional Inspections Required: Yes ☐ No ☐

Producer statement check			Engineer's name:
Author on approved list	Y	N	

CERTIFICATES	Required	Received	CERTIFICATES	Required	Received
PLUMBING & DRAINAGE					
As-Built: Drainage ☑ Pre-floor ☑ Waste-Water ☐		✓	Backflow Preventer Test Certificate		
Plumbers Form			Installers Certificate for Backflow Preventer		
Drainlayers Form			Water Saving Inventory Device		
Engineers Cert. for Waste-Water Installation			EcoWater Conditions		
Installers Certificate for Waste-Water Installation			Licensed Cadastral Surveyors As-Built		
Waste-Water Maintenance Service Contract			**ENGINEERS (PS4)**		
Quality Assurance Certificate			Eng Cert for Stormwater Mitigation Devices		
Solar Heating Certificate			Other:		
Gas Certificate			Other:		
Other:			Other:		

CERTIFICATES (AS TICKED ABOVE) ARE REQUIRED AT THE _____ **INSPECTION.**

List of non-compliances / comments

Confirmed that the manhole lids has been exposed

CCTV is OK as per Jason Lin

Signed by: _____

ATTENTION INSPECTION SUPPORT:	Is there a Backflow Prevention Device, has EcoWater been emailed?	**YES**	**NO**

ATTENTION INSPECTION SUPPORT:	Is there a Stormwater Device, has EcoWater been emailed?	**YES**	**NO**

Instructions: If outcome is no (i.e. not approved), identify reasons in non-compliance / comment section. All sections must be completed
Key: Yes = approved: No = not approved: N/A = not applicable:

NV#451801

ENTERED

2009-1374

BCI-38

WCC Record of inspection
Final building (B15)

Waitakere City Council
Te Tatau o Waitakere

Surveyor's Name	ANDREW COLLIER	Time in	10.39
Date	24 FEB 2010	Time out	11.17
ABA #	09 - 1374.	Time total	38 MIN
Address	19 TITCH PLACE -		

Building type	(Residential)	Outbuilding	Retaining walls

Exterior							
Elevations as per plan	(Y)	N	N/A	Decks - clearance and connection details	Y	N	N/A
Materials as per plan	(Y)	N	N/A	Decks - timber treatment	Y	N	N/A
FFL vs. GL clearances	(Y)	N	N/A	Decks - timber size, span, spacing & fixings	Y	N	N/A
Grade and threshold	(Y)	N	N/A	Decks – step in floor level	Y	N	N/A
Slip resistance – main entry	(Y)	N	N/A	Decks – clearance between claddings	Y	N	N/A
Cladding to ground clearance/ weep holes	(Y)	N	N/A	Decks – barrier heights and construction	Y	N	N/A
Flashings windows & doors / sealed, clean	(Y)	N	N/A	Steps - landings	Y	N	N/A
Spouting / fascia clearances	(Y)	N	N/A	Landings / steps – slip resistance	Y	N	N/A
Paint, etc completed behind spouting	(Y)	N	N/A	Handrail to steps	Y	N	N/A
Painting & general finishing details	(Y)	N	N/A	Steps uniformity <100mm gap between risers	Y	N	N/A
Flashing to meters / alarms / fans / etc	(Y)	N	N/A	Retaining walls – part of consent	Y	N	N/A
Penetrations - wall	(Y)	N	N/A	Retaining walls - barrier	Y	N	N/A
Pergola / carport – clearance and connection details	Y	N	N/A	Roof / apron flashings	(Y)	N	N/A
Pergola / carport – timber treatment	Y	N	N/A	Penetrations - roof	Y	N	(N/A)
Pergola / carport – timber size, span, spacing & fixings	Y	N	N/A	TV / Sky dishes	Y	N	(N/A)

Subfloor							
Access	Y	N	N/A	Durability of connections	Y	N	N/A
Ventilation	Y	N	N/A	Bracing	Y	N	N/A
Crawlspace	Y	N	N/A	Insulation	Y	N	N/A
Cross-flow	Y	N	N/A	DPM – ground / structure (Bearers, joists, piles etc ...)	Y	N	N/A

Interior							
Layout as per plan	(Y)	N	N/A	Ceiling access – all levels	(Y)	N	N/A
Light and ventilation	(Y)	N	N/A	Ceiling access - size	(Y)	N	N/A
Glazing / safety glass showers and skylights	(Y)	N	N/A	Ceiling insulation fitted - type	(Y)	N	N/A
Window stays	(Y)	N	N/A	Insulation clear of downlights		N	(N/A)
Wet areas – floors Sealed at all junctions	(Y)	N	N/A	Insulation clear of combustible surfaces	Y	N	(N/A)
Wet areas – walls Sealed at all junctions	(Y)	N	N/A	Extraction fans ducted to outside air	(Y)	N	N/A
Wet areas – shower Sealed at all junctions	(Y)	N	N/A	Laundry floor coverings	(Y)	N	N/A
Kitchen Sealed at all junctions	(Y)	N	N/A	Extraction fans – bathroom	(Y)	N	N/A
Laundry Sealed at all junctions	(Y)	N	N/A	Extraction fans – ensuite	Y	N	(N/A)
Stairs – head height	(Y)	N	N/A	Extraction fans - kitchen	(Y)	N	N/A
Stairs – uniformity	(Y)	N	N/A	Extraction fans - laundry	Y	N	(N/A)
Stairs - landing	(Y)	N	N/A	Balcony – upper floors - FFL	Y	N	N/A
Stairs – barrier height	(Y)	N	N/A	Balcony - height	Y	N	N/A
Stairs - handrail	(Y)	N	N/A	Balcony – cladding clearance	Y	N	N/A
Smoke alarms – in or within 3.0m bedrooms	(Y)	N	N/A	Balcony - penetrations	Y	N	N/A
Smoke alarms all exist	(Y)	N	N/A	Balcony – slope on floor	Y	N	N/A
Smoke alarms – hush facilities	(Y)	N	N/A	Balcony – slope on all surfaces	Y	N	N/A
Stove installed	(Y)	N	N/A				

Instructions: If outcome is no (i.e. not approved), identify reasons in non-compliance / comment section. All sections must be completed
Key: Yes = approved: No = not approved: N/A = not applicable:

BCI-38

WCC Record of inspection
Final building (B15)

Waitakere City Council
Te Taiao o Waitakere

Result of Inspection:	
Passed ☑	**Failed** ☐
Notice to Fix Resolved ☐ Additional Inspections Required: Yes ☐ No ☑ All previous inspections passed: Y / N All Certs requested have been received Y / N	Issue Notice to Fix ☐ Field Note ☐ Failed Letter ☐ Certificates Required Letter ☐ Amendments Required ☐ Additional Inspections Required: Yes ☐ No ☐

Producer statement check			Engineer's name:
Author on approved list	Y	N	

CERTIFICATES	Required	Received	CERTIFICATES	Required	Received
ENGINEERS (PS4)			**CLADDING**		
Soil/Geotechnical Engineers Certificate		✓	Applicators Certificate for Plaster Cladding		
Engineers Certificate for Foundations (Structural)		✓	Manufacturers Warranty for Plaster Cladding		
Engineers Certificate for Pile Driving		✓	Applicators Certificate for Installation ff Cladding		
Engineers Certificate for A/B Grade Masonry		✓	**OTHER**		
Engineers Certificate for Speciality Slab		✓	Electrical Certificate		✓
Engineers Certificate for Hardfill Compaction			Gas Certificate		
Engineers Certificate for Structural Framing			Glazing Certificate		
Engineers Certificate for Concrete Structure			Installers Certificate for Barrier Installation		
Manufacturers/Suppliers Certificate for Spread of Flame Index			Installers Certificate for Solid Fuel/Gas Heaters		
Manufacturers/Suppliers Cert. for Smoke Development Index			**WATERPROOFING**		
SURVEYORS		✓	Applicators for Water Proofing to Wet Areas		
Surveyors Certificate for Siting			Applicators For Water Proofing To Decks		
Surveyors Certificate for Height in Relation to Boundary			Applicators for Water Proofing to Roof/Gutters		
Surveyors Certificate For Finished Floor Level (Linz Datum)			Applicators for Tanking to Retaining Wall		
TIMBER			Waterproofing Manufacturers Guarantee		
Manufacturers Certificate for Timber Treatment and Grading			Other:		
Manufacturers Certificate and Layout for Roof Trusses			Other:		

List of non-compliances / comments

All ok for CCC.

Signed by: _____

Instructions: If outcome is no (i.e. not approved), identify reasons in non-compliance / comment section. All sections must be completed
Key: Yes = approved: No = not approved: N/A = not applicable:

IPENZ ENGINEERS NEW ZEALAND | NEW ZEALAND INSTITUTE OF ARCHITECTS INCORPORATED | ACENZ

Building Code Clause(s) .....

PRODUCER STATEMENT – PS4 – CONSTRUCTION REVIEW

(Guidance notes on the use of this form are printed on the reverse side)

ENTERED

Engineers Certificate for: SOILS / GEOTECH + SPECIALTY SLAB

COM 09-1374.

Signed

25 FEB 2010

ISSUED BY: Wilton Joubert Ltd. *(Construction Review Firm)*

TO: Goldsmith Developments *(Owner/Developer)*

TO BE SUPPLIED TO: Waitakere City Council *(Building Consent Authority)*

IN RESPECT OF: Pre slab - excation; Piling; Raft Floor *(Description of Building Work)*

AT: Lot 32, 19 Titch Place, Henderson, Auckland *(Address)*

..... **LOT** 32 ..... **DP** 339810 ..... **SO** .....

Wilton Joubert Ltd. *(Construction Review Firm)* has been engaged by Goldsmith Developments

to provide ⊙ CM1 ○ CM2 ○ CM3 ○ CM4 ○ CM5 *(Engineering Categories)* or ○ OL1 ○ OL2 ○ OL3 ○ OL4 *(Architectural Categories)*

observation ○ or other ..... *(Extent of Engagement)* services

in respect of clause(s) B1 ..... of the Building Code for the building work described in documents relating to Building Consent No. COM20091374 ..... and those relating to Building Consent Amendment(s) Nos. ..... issued during the course of the works. We have sighted these Building Consents and the conditions of attached to them.

Authorised instructions / variation(s) No. ..... (copies attached) or by the attached Schedule ☐ have been issued during the course of the works.

On the basis of ⊙ this ○ these review(s) and information supplied by the contractor during the course of the works, **I believe on reasonable grounds** that ○ All ⊙ Part only of the building works have been completed in accordance with the relevant requirements of the Building Consents and Building Consent Amendments identified above, with respect to Clause(s) B1 / VM1 ..... of the Building Regulations.

I, Andrew Wilton *(Name of Construction Review Professional)* ..... am: ☑ CPEng No. 176859 .....

☐ Reg Arch No. .....

I am a Member of : ☑ IPENZ ☐ NZIA and hold the following qualifications: BE MIPENZ CPEng IntPE DipMS .....

The Construction Review Firm issuing this statement holds a current policy of Professional Indemnity Insurance no less than $200,000*.

The Construction Review Firm is a member of ACENZ : ○ YES ⊙ NO

SIGNED BY Andrew Wilton ..... ON BEHALF OF Wilton Joubert Ltd. .....

Date : 24 Feb 2010 ..... Signature : .....

Note: This statement shall only be relied upon by the Building Consent Authority named above. Liability under this statement accrues to the Construction Review Firm only. The total maximum amount of damages payable arising from this statement and all other statements provided to the Building Consent Authority in relation to this building work, whether in contract, tort or otherwise (including negligence), is limited to the sum of $200,000.*

This form to accompany **Forms 6 or 8 of the Building (Form) Regulations** 2004 for the issue of a Code Compliance Certificate.

THIS FORM AND ITS CONDITIONS ARE COPYRIGHT TO ACENZ, IPENZ AND NZIA

IPENZ ENGINEERS NEW ZEALAND | NEW ZEALAND INSTITUTE OF ARCHITECTS INCORPORATED | ACENZ

Building Code Clause(s) .....

PRODUCER STATEMENT – PS4 – CONSTRUCTION REVIEW

(Guidance notes on the use of this form are printed on the reverse side)

ISSUED BY: Mitchell Vranjes Consulting Engineers Ltd
(Construction Review Firm)

TO: Lance Goldsmith
(Owner/Developer)

TO BE SUPPLIED TO: Dartaleare City Council (grade B Masonry).
(Building Consent Authority)

IN RESPECT OF: Reinforcement to Blockwalls & Blockwall Foundations
(Description of Building Work)

AT: 19 Titch Pl.
(Address)

Glen Eden LOT 32 DP ..... SO .....

Mitchell Vranjes Consulting Eng Ltd has been engaged by Lance Goldsmith
(Construction Review Firm)

to provide ○ CM1 ○ CM2 ○ CM3 ○ CM4 ○ CM5 (Engineering Categories) or ○ OL1 ○ OL2 ○ OL3 ○ OL4 (Architectural Categories)

observation ✓ or other Reinforcement to Blockwalls & Footings only services
(Extent of Engagement)

in respect of clause(s) B1/VM1 of the Building Code for the building work described in documents relating to Building Consent No. GRADE A/B MASONRY and those relating to Building Consent Amendment(s) Nos. ..... issued during the course of the works. We have sighted these Building Consents and the conditions attached to them.

Authorised instructions / variation(s) No. ..... (copies attached) or by the attached Schedule ☐ have been issued during the course of the works.

ENTERED
Engineers Certificate for: FOUNDATIONS +
COM 09-1374.
Signed
24 FEB 2010

On the basis of ○ this ○ these review(s) and information supplied by the contractor during the course of the works, I **believe on reasonable grounds** that ○ All ✓ Part only of the building works have been completed in accordance with the relevant requirements of the Building Consents and Building Consent Amendments identified above, with respect to Clause(s) ..... of the Building Regulations.

I, Naresh Pandhi (Name of Construction Review Professional) am: ☑ CPEng No. 216136

☐ Reg Arch No. .....

am a Member of: ☑ IPENZ ☐ NZIA and hold the following qualifications: ME, MIPENT, CPEng

The Construction Review Firm issuing this statement holds a current policy of Professional Indemnity Insurance no less than $200,000*.

The Construction Review Firm is a member of ACENZ: ○ YES ✓ NO

MITCHELL, VRANJES CONSULTING ENGINEERS LTD
P.O BOX 799
PAPAKURA
PH 298 8800

SIGNED BY Naresh Pandhi ON BEHALF OF .....

Date: 28.1.2010 Signature: N.M Pandhi

Note: This statement shall only be relied upon by the Building Consent Authority named above. Liability under this statement accrues to the Construction Review Firm only. The total maximum amount of damages payable arising from this statement and all other statements provided to the Building Consent Authority in relation to this building work, whether in contract, tort or otherwise (including negligence), is limited to the sum of $200,000.*

This form to accompany **Forms 6 or 8 of the Building (Form) Regulations** 2004 for the issue of a Code Compliance Certificate.

THIS FORM AND ITS CONDITIONS ARE COPYRIGHT TO ACENZ, IPENZ AND NZIA

KARDON CONSULTANTS LIMITED

Unit E3, 17 Corinthian Drive, Albany
PO Box 32 073, Devonport 0744, Auckland
Ph +64 9 414 7105, Fax +64 9 414 7109
Mob 021 97 00 44
Email. dturner@kardon.co.nz
Website. www.kardon.co.nz

24 February 2010

ENTERED
Surveyors Certificate for: SITING
COM 09-1374.
Signed
25 FEB 2010

Waitakere City Council
Private Bag 93109
Henderson
Waitakere 0650
Auckland

Attn: Building Consents Department
Andrew Collier

Dear Sir

RE: NEW DWELLING: LOT 32 – 19 TITCH PLACE, GLEN EDEN
DP 339810 BC 2009-1374

I, Donald Alistair Turner, Registered Professional Surveyor, hereby certify that the new dwelling built on the above allotment has been:

(1) Sited correctly in relationship to the boundaries of the property.

(2) Has the correct finished floor level being in accordance with the approved plans.

We also confirm that provided that the dwelling is erected in accordance with the approved Architects drawings that it will in turn be in accordance with the approved Land Use Consent.

Yours faithfully
KARDON CONSULTANTS LTD

DA Turner
Registered Professional Surveyor

EWRB 551

Electrical Certificate of Compliance

No. 3055933

No. of attachments

for prescribed electrical work that is carried out on electrical installations and involves the placing or positioning or the replacing or repositioning of conductors (including fittings attached to those conductors).

To be completed whether or not an Inspection is required.

CUSTOMER INFORMATION - PLEASE PRINT CLEARLY

Name of customer: Goldsmith developments Phone: 0217502280

Address of installation: 4 Newfound way

Postal address of customer (if not as above):

WORK DETAILS

34 No. of lighting outlets

27 No. of socket outlets

1 No. of ranges

1 No. of water heaters

Was any installation work carried out by the homeowner? ☐ Yes ☑ No

Please tick (✓) as appropriate where work includes:

☑ Mains ☑ Main earthing system

☑ Switchboard ☑ Electric lines

Description - New installation as above
- Down lights 109 dot CA Rated

Com 09-13714 25 FEB 2010

If necessary attach any pages with sketches of work done

It is recommended that test results be recorded here:

Visual Examination ☑

Earth Continuity ☑

Bonding ☑

Polarity ☑

Insulation Resistance > 2 Mohm

Other

CERTIFICATION OF WORK

I certify that the above electrical work has been carried out in accordance with the requirements of the Electricity Act 1992 and Electricity Regulations 1997.

ELECTRICAL WORKER DETAILS

Name: Andrew Tuesley

Registration no.: E2186

Company: Tuesley Electrical & Air

Signature:

Date: 18/2/10

Contact Ph No.: 0212882577

CERTIFICATION OF ELECTRIC LINES

(to be completed where a separate electrical worker has installed the electric line portion of the mains)

Name:

Registration no.:

Company:

Signature:

Date:

Contact Ph No.:

INSPECTION DETAILS

Electrical work requiring inspection by a registered electrical inspector

✓ New mains ✓ Switchboard ✓ Earthing system — Installation work in hazardous areas

I certify that the inspection has been carried out in accordance with the requirements of regulation 41 of the Electricity Regulations 1997.

Name: Martin Gedye

Signature: M. Gedye

Registration no.: E832.

Date: 22-2-10

Daytime Contact Ph No.:

CUSTOMER COPY - THIS IS AN IMPORTANT DOCUMENT AND SHOULD BE RETAINED

This form is approved by the Electrical Workers Registration Board PO Box 10-156, Wellington. Freephone 0800 66-1000) for the purposes of the Electricity Regulations 1997.

ENTERED 2009-1374

BCI-35

WCC Record of inspection
Preline building (B12)

Waitakere City Council
Te Tatau o Waitakere

Surveyor's Name	ANDREW COLLIER	Time in	
Date	24 FEB 2010	Time out	N/A.
ABA #	09-1374	Time total	
Address	19 TITCH PLACE		

Wind zone: low / medium / high / very high / specific **Number of floors or levels inspected:** (describe) 2

Wall framing: **M.C average** _____ %

All claddings finished	Y	N	N/A	Top plate size	Y	N	N/A
Layout as per plan	Y	N	N/A	Holes & notches studs	Y	N	N/A
Windows as per plan	Y	N	N/A	Holes & notches - plates	Y	N	N/A
Joinery labels sited Wind zone / manufacturer's details, etc	Y	N	N/A	Ceiling batten size, c/s & fixing	Y	N	N/A
Joinery – seals installed	Y	N	N/A	Angle bracing – fixings / placement	Y	N	N/A
Restrictors fitted	Y	N	N/A	6Kn / 12Kn - internal walls	Y	N	N/A
Safety glass fitted	Y	N	N/A	Bottom plate fixings – internal walls	Y	N	N/A
Stairs installed	Y	N	N/A	Electrical fit-out completed	Y	N	N/A
Head-height 2.1m	Y	N	N/A	Plumbing fit-out completed	Y	N	N/A
Strapping to block walls	Y	N	N/A	Moisture content 18% maximum – record average readings	Y	N	N/A
Stairs uniform	Y	N	N/A	Wall insulation fitted correctly	Y	N	N/A
Landings provided	Y	N	N/A	Treatment - wet areas / H/3 ply S/S fixings	Y	N	N/A

Inter-tenancy

Single frame	Y	N	N/A	Floor separation	Y	N	N/A
Double frame	Y	N	N/A	Roof separation	Y	N	N/A
Insulation	Y	N	N/A	Subfloor separation	Y	N	N/A

Insulation

Subfloor	Y	N	N/A	State type	
Block walls	Y	N	N/A	State type	
Walls	Y	N	N/A	State type	
Ceiling	Y	N	N/A	State type	
Thermal envelope	Y	N	N/A	Describe envelope	

Roof framing

Spouting & downpipes installed (for weathertightness)	Y	N	N/A	Minimum roof pitch	Y	N	N/A
Truss layout provided	Y	N	N/A	No damage to trusses	Y	N	N/A
Truss layout as per plan	Y	N	N/A	Building paper if required (spreaders)	Y	N	N/A
Roof cladding completed	Y	N	N/A	Ceiling insulation installed correctly	Y	N	N/A

Result of Inspection:

Passed ☑ Subject to production as stipulated of the documents indicated overleaf (if any)

Failed ☐

Notice to Fix Resolved ☐

Additional Inspections Required: Yes ☐ No ☑

Issue Notice to Fix ☐
Field Note ☐
Failed Letter ☐
Amendments Required ☐
Additional Inspections Required: Yes ☐ No ☐

☞ **IMPORTANT: Please complete back page ...** ➔

Instructions: If outcome is no (i.e. not approved), identify reasons in non-compliance / comment section. All sections must be completed
Key: Yes = approved: No = not approved: N/A = not applicable:

DRAFT

BCI-35

WCC Record of inspection
Preline building (B12)

Waitakere City Council
Te Taiao o Waitakere

Producer statement check			Engineer's name:
Author on approved list	Y	N	

CERTIFICATES	Required	Received	CERTIFICATES	Required	Received
ENGINEERS (PS4)			**CLADDING**		
Soil/Geotechnical Engineers Certificate			Applicators Certificate for Plaster Cladding		
Engineers Certificate for Foundations (Structural)			Manufacturers Warranty for Plaster Cladding		
Engineers Certificate for Pile Driving			Applicators Certificate for Installation ff Cladding		
Engineers Certificate for A/B Grade Masonry			**OTHER**		
Engineers Certificate for Speciality Slab			Electrical Certificate		
Engineers Certificate for Hardfill Compaction			Gas Certificate		
Engineers Certificate for Structural Framing			Glazing Certificate		
Engineers Certificate for Concrete Structure			Installers Certificate for Barrier Installation		
Manufacturers/Suppliers Certificate for Spread of Flame Index			Installers Certificate for Solid Fuel/Gas Heaters		
Manufacturers/Suppliers Cert. for Smoke Development Index			**WATERPROOFING**		
SURVEYORS			Applicators for Water Proofing to Wet Areas		
Surveyors Certificate for Siting			Applicators For Water Proofing To Decks		
Surveyors Certificate for Height in Relation to Boundary			Applicators for Water Proofing to Roof/Gutters		
Surveyors Certificate For Finished Floor Level (Linz Datum)			Applicators for Tanking to Retaining Wall		
TIMBER			Waterproofing Manufacturers Guarantee		
Manufacturers Certificate for Timber Treatment and Grading			Other:		
Manufacturers Certificate and Layout for Roof Trusses			Other:		
CERTIFICATES (AS TICKED ABOVE) ARE REQUIRED AT:					

List of non-compliances / comments

ALL ITEMS FROM 21/01/10 OK.
BOTTOM STAIR RISER IS 200Smm FROM GLASS, SO OK.
NO CHARGE.

Signed by:

Instructions: If outcome is no (i.e. not approved), identify reasons in non-compliance / comment section. All sections must be completed
Key: Yes = approved: No = not approved: N/A = not applicable:

FAXTERED

Com-2009-1374

BCI-115

WCC Record of inspection
Final plumbing and drainage (P6)

Waitakere City Council
Te Tatau o Waitakere

Surveyor's Name	JOHN NICHOLLS	Time in	12.20
Date	24.2.10	Time out	12.50
ABA #	09/1374	Time total	30
Address	14 Titoki St.		

Certificates & forms

Septic tank	Y	N	N/A	Stormwater tanks	Y	N	N/A

Hot water source	Gas	Electric	**Temperature**	52.40	**HWC**	Capacity 180L	Tempering valve	Y	N	N/A

Exterior

Gas Bottles restrained & supported on pad	Y	N	N/A	Spouting	Y	N	N/A
Water meter / supply pipe	Y	N	N/A	Pipe penetrations / clips	Y	N	N/A
Gully location / height above finished GL	Y	N	N/A	Terminal vent	Y	N	N/A
Discharge pipes	Y	N	N/A	Manholes (Correct ground level)	Y	N	N/A
Downpipes / spreaders	Y	N	N/A	Dry chambers / Inspection chambers	Y	N	N/A
Parapet / gutters drainage	Y	N	N/A	Cess pits	Y	N	N/A
Balcony drainage	Y	N	N/A	Half-siphon bends	Y	N	N/A
				Solar Heating / Panel, etc.	Y	N	N/A

Interior

HWC - restraint	Y	N	N/A	Bidets / Spa baths / bath	Y	N	N/A
HWC - access	Y	N	N/A	Air-admittance valve	Y	N	N/A
TPR & relief valves and drains	Y	N	N/A	Sprinklers	Y	N	N/A
Showers tested	Y	N	N/A	Fire collars	Y	N	N/A
Sanitary fittings sealed & secured	Y	N	N/A	Wetbacks – Open vent	Y	N	N/A
WC's - water seal / dual flush	Y	N	N/A	Pool – backwash – to gully traps	Y	N	N/A
Tap hardware	Y	N	N/A				

Backflow Preventer Device details

Testable device(s)	Interior	Exterior		**Devices total**			
Non-testable device(s) or Air gap(s)	Y	N		Hazard	High	Medium	Low
Description:							
Location:							

Stormwater Tanks / Devices

Type of Device/s:	Retention tank ☐	Detention tank ☐	Rain garden ☐	Swale/filter strip ☐
	Permeable paving ☐	Dispersal device ☐	Soakage pit / trench ☐	
	Other (specify):			

If tank, is it – Buried ☐ Above ground ☐

Operation and maintenance manual received?	Y	N	N/A	Producer Statement (PS4) received?	Y	N	N/A

☞ **IMPORTANT: Please complete back page … ➔**

Instructions: If outcome is no (i.e. not approved), identify reasons in non-compliance / comment section. All sections must be completed
Key: Yes = approved: No = not approved: N/A = not applicable:

BCI-115

WCC Record of inspection
Final plumbing and drainage (P6)

Waitakere City Council
Te Taiao o Waitakere

Result of Inspection:	
Passed ☐	**Failed** ☑
Notice to Fix Resolved ☐ Additional Inspections Required: Yes ☐ No ☑ All previous inspections passed: Y / N All Certs requested have been received Y / N	Issue Notice to Fix ☐ Field Note ☐ Failed Letter ☐ Certificates Required Letter ☐ Amendments Required ☐ Additional Inspections Required: Yes ☐ No ☐

Producer statement check			Engineer's name:
Author on approved list	Y	N	

CERTIFICATES	Required	Received	CERTIFICATES	Required	Received
PLUMBING & DRAINAGE					
As-Built Drainage ☐ Pre-floor ☐			Backflow Preventer Test Certificate		
Plumbers Form			Installers Certificate for Backflow Preventer		
Drainlayers Form			Water Saving Inventory Device		
Engineers Cert. for Waste-Water Installation			EcoWater Conditions		
Installers Certificate for Waste-Water Installation			Licensed Cadastral Surveyors As-Built		
Quality Assurance Certificate			**ENGINEERS (PS4)**		
Solar Heating Certificate			Eng Cert for Stormwater Mitigation Devices		
Gas Certificate			Other:		
Other:			Other:		

CERTIFICATES (AS TICKED ABOVE) ARE REQUIRED AT THE _____ **INSPECTION.**

List of non-compliances / comments

CCTV to come as per Council 25" DEI

Signed by: _____

ATTENTION INSPECTION SUPPORT:	Is there a Backflow Prevention Device, has EcoWater been emailed?	**YES**	**NO**

ATTENTION INSPECTION SUPPORT:	Is there a Stormwater Device, has EcoWater been emailed?	**YES**	**NO**

Instructions: If outcome is no (i.e. not approved), identify reasons in non-compliance / comment section. All sections must be completed
Key: Yes = approved: No = not approved: N/A = not applicable:

2009-1374

ENTERED

BCI-37

WCC Record of inspection
Gibnail (B14)

Waitakere City Council
Te Taiao o Waitakere

Surveyor's Name	ANDREW COLLIER	Time in	7.00
Date	04 FEB 2010	Time out	7.12
ABA #	09-1374	Time total	12 MIN
Address	19 TITCH PLACE.		

Wet areas: (record linings & finish)

Wall lining: Villa board / Aqua-line / Gib-board / RPB / Elephant BD

Flooring: Concrete / H3.1 Plywood / Compressed fibre cement / Particle BD / T&G timber

Bracing							
Nailing of bracing sheets	Y	N	N/A	Nailing 1st layer of firewall	Y	N	N/A
No bracing sheets fitted behind shower or bath	Y	N	N/A	Nailing 2nd layer of firewall (sheets staggered)	Y	N	N/A
No openings in middle ⅓ of brace sheets	Y	N	N/A	Nailing 1st layer ceilings	Y	N	N/A
No power points within 90mm of edge of brace sheets	Y	N	N/A	Nailing 2nd layer ceilings (sheets staggered)	Y	N	N/A
Floor diaphragm	Y	N	N/A	Sealing of penetrations / acoustic and fire	Y	N	N/A
Ceiling diaphragm	Y	N	N/A	Power points & light fittings	Y	N	N/A
No openings in middle ⅓ of diaphragm	Y	N	N/A	Downlights to be CA rated (thermal envelope not compromised)	Y	N	N/A
				GIB sheets fixed at 100mm centres on all studs supporting tiles	Y	N	N/A

Customer advised waterproofing inspection required: Yes / No / N/A

Result of Inspection:	
Passed ☑ Subject to production as stipulated of the documents indicated overleaf (if any)	**Failed** ☐
Notice to Fix Resolved ☐ Additional Inspections Required: Yes ☑ No ☐	Issue Notice to Fix ☐ Field Note ☐ Failed Letter ☐ Amendments Required ☐ Additional Inspections Required: Yes ☐ No ☐

Producer statement check			**Engineer's name:**
Author on approved list	Y	N	

☞ **IMPORTANT: Please complete back page ... ➔**

Instructions: If outcome is no (i.e. not approved), identify reasons in non-compliance / comment section. All sections must be completed
Key: Yes = approved: No = not approved: N/A = not applicable:

BCI-37

WCC Record of inspection
Gibnail (B14)

Waitakere City Council
Te Taiao o Waitakere

CERTIFICATES	Required	Received	CERTIFICATES	Required	Received
ENGINEERS (PS4)			**CLADDING**		
Soil/Geotechnical Engineers Certificate			Applicators Certificate for Plaster Cladding		
Engineers Certificate for Foundations (Structural)			Manufacturers Warranty for Plaster Cladding		
Engineers Certificate for Pile Driving			Applicators Certificate for Installation ff Cladding		
Engineers Certificate for A/B Grade Masonry			**OTHER**		
Engineers Certificate for Speciality Slab			Electrical Certificate		
Engineers Certificate for Hardfill Compaction			Gas Certificate		
Engineers Certificate for Structural Framing			Glazing Certificate		
Engineers Certificate for Concrete Structure			Installers Certificate for Barrier Installation		
Manufacturers/Suppliers Certificate for Spread of Flame Index			Installers Certificate for Solid Fuel/Gas Heaters		
Manufacturers/Suppliers Cert. for Smoke Development Index			**WATERPROOFING**		
SURVEYORS			Applicators for Water Proofing to Wet Areas		
Surveyors Certificate for Siting			Applicators For Water Proofing To Decks		
Surveyors Certificate for Height in Relation to Boundary			Applicators for Water Proofing to Roof/Gutters		
Surveyors Certificate For Finished Floor Level (Linz Datum)			Applicators for Tanking to Retaining Wall		
TIMBER			Waterproofing Manufacturers Guarantee		
Manufacturers Certificate for Timber Treatment and Grading			Other:		
Manufacturers Certificate and Layout for Roof Trusses			Other:		
CERTIFICATES (AS TICKED ABOVE) ARE REQUIRED AT:					

List of non-compliances / comments

All OK.

Signed by: _____

Instructions: If outcome is no (i.e. not approved), identify reasons in non-compliance / comment section. All sections must be completed
Key: Yes = approved: No = not approved: N/A = not applicable:

2009-1374

ENTERED

BCI-35

WCC Record of inspection
Preline building (B12)

Waitakere City Council
Te Tatau o Waitakere

Surveyor's Name	ANDREW COLLIER	Time in	11.07
Date	21 JAN 2010	Time out	11.39
ABA #	09-1374.	Time total	32 MIN
Address	19 TITCH PLACE		

Wind zone: low / medium / (high) / very high / specific **Number of floors or levels inspected:** (describe) 2

Wall framing: **M.C average** 18 %

All claddings finished	(Y)	N	N/A	Top plate size	(Y)	N	N/A
Layout as per plan	(Y)	N	N/A	Holes & notches studs	(Y)	N	N/A
Windows as per plan	(Y)	N	N/A	Holes & notches - plates	(Y)	N	N/A
Joinery labels sited Wind zone / manufacturer's details, etc	Y	N	(N/A)	Ceiling batten size, c/s & fixing	(Y)	N	N/A
Joinery – seals installed	(Y)	N	N/A	Angle bracing – fixings / placement	(Y)	N	N/A
Restrictors fitted	(Y)	N	N/A	6Kn / 12Kn - internal walls	(Y)	N	N/A
Safety glass fitted	Y	(N)	N/A	Bottom plate fixings – internal walls	(Y)	N	N/A
Stairs installed	(Y)	N	N/A	Electrical fit-out completed	(Y)	N	N/A
Head-height 2.1m	(Y)	N	N/A	Plumbing fit-out completed	(Y)	N	N/A
Strapping to block walls	Y	N	(N/A)	Moisture content 18% maximum – record average readings	(Y)	N	N/A
Stairs uniform	(Y)	N	N/A	Wall insulation fitted correctly	(Y)	N	N/A
Landings provided	(Y)	N	N/A	Treatment - wet areas / H/3 ply S/S fixings	(Y)	N	N/A

Inter-tenancy

Single frame	Y	N	N/A	Floor separation	Y	N	N/A
Double frame	Y	N	N/A	Roof separation	Y	N	N/A
Insulation	Y	N	N/A	Subfloor separation	Y	N	N/A

Insulation

Subfloor	Y	N	(N/A)	State type	
Block walls	Y	N	(N/A)	State type	
Walls	(Y)	N	N/A	State type	
Ceiling	(Y)	N	N/A	State type	
Thermal envelope	(Y)	N	N/A	Describe envelope	

Roof framing

Spouting & downpipes installed (for weathertightness)	(Y)	N	N/A	Minimum roof pitch	(Y)	N	N/A
Truss layout provided	(Y)	N	N/A	No damage to trusses	(Y)	N	N/A
Truss layout as per plan	(Y)	N	N/A	Building paper if required (spreaders)	Y	N	(N/A)
Roof cladding completed	(Y)	N	N/A	Ceiling insulation installed correctly	(Y)	N	N/A

Result of Inspection:

Passed ☐ Subject to production as stipulated of the documents indicated overleaf (if any)	**Failed** ☑
Notice to Fix Resolved ☐ Additional Inspections Required: Yes ☐ No ☐	Issue Notice to Fix ☐ Field Note ☐ Failed Letter ☐ Amendments Required ☐ Additional Inspections Required: Yes ☑ No ☐

☞ **IMPORTANT: Please complete back page ... →**

Instructions: If outcome is no (i.e. not approved), identify reasons in non-compliance / comment section. All sections must be completed
Key: Yes = approved: No = not approved: N/A = not applicable:

BCI-35

WCC Record of inspection. Preline building (B12)

Waitakere City Council
Te Tuhao o Waitakere

Producer statement check			Engineer's name:
Author on approved list	Y	N	

CERTIFICATES	Required	Received	CERTIFICATES	Required	Received
ENGINEERS (PS4)			**CLADDING**		
Soil/Geotechnical Engineers Certificate			Applicators Certificate for Plaster Cladding		
Engineers Certificate for Foundations (Structural)			Manufacturers Warranty for Plaster Cladding		
Engineers Certificate for Pile Driving			Applicators Certificate for Installation ff Cladding		
Engineers Certificate for A/B Grade Masonry			**OTHER**		
Engineers Certificate for Speciality Slab			Electrical Certificate		
Engineers Certificate for Hardfill Compaction			Gas Certificate		
Engineers Certificate for Structural Framing			Glazing Certificate		
Engineers Certificate for Concrete Structure			Installers Certificate for Barrier Installation		
Manufacturers/Suppliers Certificate for Spread of Flame Index			Installers Certificate for Solid Fuel/Gas Heaters		
Manufacturers/Suppliers Cert. for Smoke Development Index			**WATERPROOFING**		
SURVEYORS			Applicators for Water Proofing to Wet Areas		
Surveyors Certificate for Siting			Applicators For Water Proofing To Decks		
Surveyors Certificate for Height in Relation to Boundary			Applicators for Water Proofing to Roof/Gutters		
Surveyors Certificate For Finished Floor Level (Linz Datum)			Applicators for Tanking to Retaining Wall		
TIMBER			Waterproofing Manufacturers Guarantee		
Manufacturers Certificate for Timber Treatment and Grading			Other:		
Manufacturers Certificate and Layout for Roof Trusses			Other:		
CERTIFICATES (AS TICKED ABOVE) ARE REQUIRED AT:					

List of non-compliances / comments

(1) SAFETY GLASS UPSTAIRS BATHROOM WITH 1.5m OF FFL.
(2) SAFETY GLASS UPPER PANEL AT BOTTOM OF STAIRS.
CHECK ON FINAL.

Signed by:

Instructions: If outcome is no (i.e. not approved), identify reasons in non-compliance / comment section. All sections must be completed
Key: Yes = approved: No = not approved: N/A = not applicable:

ENTERED

2009-1374

BCI-30

WCC Record of inspection Framing (B7)

Waitakere City Council
Te Taiao o Waitakere

Surveyor's Name	ANDREW COLLIER	Time in	
Date	21 JAN 2010	Time out	N/A
ABA #	09-1374	Time total	
Address	19 TITCH PLACE		

Wind zone: low / medium / high / very high / specific **Number of floors or levels inspected:** (describe) _____

General: If outcome is no (i.e. not approved), identify reasons in comment section below.

Openings as per plan	Y	N	N/A	Ceiling plane bracing	Y	N	N/A
Treatment type + grading	Y	N	N/A	Roof plane bracing	Y	N	N/A
Stud – size & c/s	Y	N	N/A	Flat strap bracing in pairs & taut	Y	N	N/A
Stud heights	Y	N	N/A	Dragon ties	Y	N	N/A
Lintel size	Y	N	N/A	Roof space braces	Y	N	N/A
Lintel point loads	Y	N	N/A	Rafter size, c/s, fixing	Y	N	N/A
Lintel fixings (wind)	Y	N	N/A	Ridge beam size & fixing	Y	N	N/A
Bottom plate fixings - in general	Y	N	N/A	Parapet framing & fixings (slopes 15°)	Y	N	N/A
Bottom plate – where face-fixed 6mm o/hang	Y	N	N/A	Flashing support (nogs)	Y	N	N/A
Bottom plate fixings for bracing elements	Y	N	N/A	Angle braces	Y	N	N/A
Bottom plate DPC	Y	N	N/A	Sheet braces	Y	N	N/A
Bottom plate to stud 6Kn &12Kn connection	Y	N	N/A	Joist – size & c/s	Y	N	N/A
Top plate – size	Y	N	N/A	C/L joist - treatment	Y	N	N/A
Uplift requirements - truss / stud / plate / lintels / beans	Y	N	N/A	C/L joist - flashings	Y	N	N/A
Truss fixings as per M/F requirements	Y	N	N/A	Deck level – step & fall across deck	Y	N	N/A
Truss to top plate connections	Y	N	N/A	External rafters and beams H3.2	Y	N	N/A
Purlin fixings / Tile battens	Y	N	N/A	Fixing of ply bracing, decking, roof (S/S)	Y	N	N/A

Inter-tenancy: If outcome is no (i.e. not approved), identify reasons in comment section below.

Single frame	Y	N	N/A	Floor / roof separation	Y	N	N/A
Double frame	Y	N	N/A	Subfloor separation	Y	N	N/A

Result of Inspection:

Passed ☑ Subject to production as stipulated of the documents indicated overleaf (if any)	**Failed** ☐
Notice to Fix Resolved ☐	Issue Notice to Fix ☐
Additional Inspections Required: Yes ☐ No ☑	Field Note ☐
	Failed Letter ☐
	Amendments Required ☐
	Additional Inspections Required: Yes ☐ No ☐

Producer statement check			**Engineer's name:**
Author on approved list	Y	N	

☞ **IMPORTANT: Please complete back page ... ➔**

Instructions: If outcome is no (i.e. not approved), identify reasons in non-compliance / comment section. All sections must be completed
Key: Yes = approved: No = not approved: N/A = not applicable:

BCI-30

WCC Record of inspection Framing (B7)

ENTERED

Waitakere City Council
Te Tatau o Waitakere

CERTIFICATES	Required	Received	CERTIFICATES	Required	Received
ENGINEERS (PS4)			**CLADDING**		
Soil/Geotechnical Engineers Certificate			Applicators Certificate for Plaster Cladding		
Engineers Certificate for Foundations (Structural)			Manufacturers Warranty for Plaster Cladding		
Engineers Certificate for Pile Driving			Applicators Certificate for Installation ff Cladding		
Engineers Certificate for A/B Grade Masonry			**OTHER**		
Engineers Certificate for Speciality Slab			Electrical Certificate		
Engineers Certificate for Hardfill Compaction			Gas Certificate		
Engineers Certificate for Structural Framing			Glazing Certificate		
Engineers Certificate for Concrete Structure			Installers Certificate for Barrier Installation		
Manufacturers/Suppliers Certificate for Spread of Flame Index			Installers Certificate for Solid Fuel/Gas Heaters		
Manufacturers/Suppliers Cert. for Smoke Development Index			**WATERPROOFING**		
SURVEYORS			Applicators for Water Proofing to Wet Areas		
Surveyors Certificate for Siting			Applicators For Water Proofing To Decks		
Surveyors Certificate for Height In Relation to Boundary			Applicators for Water Proofing to Roof/Gutters		
Surveyors Certificate For Finished Floor Level (Linz Datum)			Applicators for Tanking to Retaining Wall		
TIMBER			Waterproofing Manufacturers Guarantee		
Manufacturers Certificate for Timber Treatment and Grading			Other:		
Manufacturers Certificate and Layout for Roof Trusses			Other:		
CERTIFICATES (AS TICKED ABOVE) ARE REQUIRED AT:					

List of non-compliances / comments

ALL ITEMS COMPLETE FROM 10/12/09.
NO CHARGE.

Signed by:

Instructions: If outcome is no (i.e. not approved), identify reasons in non-compliance / comment section. All sections must be completed
Key: Yes = approved: No = not approved: N/A = not applicable:

ENTERED

com - 2009 = 1374

BCI-112

WCC Record of inspection
Preline plumbing (P2)

Waitakere City Council
Te Tatau o Waitakere

Surveyor's Name	Phil TOZER.	Time in	8.00
Date	19-01-10	Time out	8.45
ABA #	09-1374	Time total	0.75
Address	19 TITCH PLACE		

Certificates						
Registration checked	Y	N	Number			
Method of test	Y	N	N/A	G12/AS1 1500kPa	AS3500 1500kPa	NZS4763 1.5 times working pressure

Water supply pipe: (Polybutylene) / Copper / Rehau / Other _____ **System:** (G12) / AS3500

Number of floors or levels inspected: (describe) 2.

General requirements							
Layout as per plan	Y	N	N/A	Fixture vents - size & gradient	Y	N	N/A
Materials as per plan	Y	N	N/A	Pipe brackets secured to wall	Y	N	N/A
Pipes clipped in ceiling space	Y	N	N/A	Pipes in subfloor secured to framing	Y	N	N/A
Pipes checked for rattle / hammer	Y	N	N/A	Pipe penetrations	Y	N	N/A
Pipework on test	Y	N	N/A	Flashings	Y	N	N/A
Holes and notches in top plates	Y	N	N/A	All materials compatible	Y	N	N/A
Water supply pipe size and length	Y	N	N/A	Decks & balconies – outlets and overflows	Y	N	N/A
Holes and notches in joists	Y	N	N/A	Internal gutters – outlets and overflows	Y	N	N/A
Holes and notches in floor joists	Y	N	N/A	Fire collars	Y	N	N/A
Floor waste – junctions installed correctly	Y	N	N/A	Sprinklers (tested to 1500kPa)	Y	N	N/A
Floor wastes on test	Y	N	N/A	Sprinklers - pipe diameter / flow rate	Y	N	N/A
Fixture discharge pipe - size & gradient	Y	N	N/A	Recycled water	Y	N	N/A

Result of Inspection:	
Passed ☑ Subject to production as stipulated of the documents indicated overleaf (if any)	**Failed** ☐
Notice to Fix Resolved ☐ Additional Inspections Required: Yes ☐ No ☐	Issue Notice to Fix ☐ Field Note ☐ Failed Letter ☐ Amendments Required ☐ Additional Inspections Required: Yes ☐ No ☐

Producer statement check			**Engineer's name:**
Author on approved list	Y	N	

☞ **IMPORTANT: Please complete back page ... ➔**

Instructions: If outcome is no (i.e. not approved), identify reasons in non-compliance / comment section. All sections must be completed
Key: Yes = approved: No = not approved: N/A = not applicable:

BCI-112

WCC Record of inspection
Preline plumbing (P2)

Waitakere City Council
Te Tatau o Waitakere

CERTIFICATES	Required	Received	CERTIFICATES	Required	Received
PLUMBING & DRAINAGE					
As-Built Drainage ☐ Pre-floor ☐			Backflow Preventer Test Certificate		
Plumbers Form	↘		Installers Certificate for Backflow Preventer		
Drainlayers Form			Water Saving Inventory Device		
Engineers Cert. for Waste-Water Installation			EcoWater Conditions		
Installers Certificate for Waste-Water Installation			Licensed Cadastral Surveyors As-Built		
Quality Assurance Certificate			**ENGINEERS (PS4)**		
Solar Heating Certificate			Eng Cert for Stormwater Mitigation Devices		
Gas Certificate			Other:		
Other:			Other:		

CERTIFICATES (AS TICKED ABOVE) ARE REQUIRED AT THE FINAL **INSPECTION.**

List of non-compliances / comments

Waste & Layout as Per Plan.
Test & gauge on.

Signed by: _____

Instructions: If outcome is no (i.e. not approved), identify reasons in non-compliance / comment section. All sections must be completed
Key: Yes = approved: No = not approved: N/A = not applicable:

COM-2009-1374

ENTERED 9/12

BCI-33

WCC Record of inspection
Cladding brick veneer (B10)

Waitakere City Council
Te Taiao o Waitakere

Surveyor's Name	ANDREW COLLIER	Time in	9.00
Date	18 DEC 2009	Time out	9.27
ABA #	09-1374	Time total	
Address	19 TITCH PLACE.		

Brick veneer - record type: (clay) / concrete / stone / schist **Brand:** MONIER

Zone: Seaspray / (Zone 1)

Type of inspection(circle) : (Half Height) / 2nd level (slip joint) / Lintel / Shelf angle / Subfloor / Other _____

Rebate flint-coated, min 50mm rebate	(Y)	N	N/A
Building paper tight and cut short of rebate	(Y)	N	N/A
Steps in split floor levels flashed	(Y)	N	N/A
Two ties within 300mm of rebate	(Y)	N	N/A
Maximum overhang 20mm	(Y)	N	N/A
Cavity 40mm min, 75mm max	(Y)	N	N/A
No services in cavity	(Y)	N	N/A
Cavity clean, washouts provided	(Y)	N	N/A
Inside face. Mortar not built up on ties. Dags not more than 5mm.	(Y)	N	N/A
Weepholes & vents size: 75mm high or vented 10mm gap continuous along top at soffit	(Y)	N	N/A
Weephole locations: every 3rd perpend or 800 max (min 1000sq.mm per lineal metre of wall)	(Y)	N	N/A
Tie durabilty/size galv/stainless steel, min length 85mm upto 50mm cavity, 105mm min upto 70mm cavity, (for 70 series only. Refer NZS4210 for 90 series)	(Y)	N	N/A
Tie embedment: embedded at least half the width of the veneer with min 15mm cover to end	(Y)	N	N/A
Tie fixings:min 5 per sqm. 600 hori/350 vert, ties within 315 of slip joint, within 200mm of openings, 260ctrs vert over sloping shelf angles	(Y)	N	N/A
Openings and ends: must have ties within 200mm	(Y)	N	N/A
All ties screw fixed (check length if screwed into rigid backing)	(Y)	N	N/A
Mortar joints 7-13mm	(Y)	N	N/A
Mortar joints raked max 6mm and tooled	(Y)	N	N/A
Sealed at roof space	(Y)	N	N/A
230mm min. panels Ties every 2nd brick	(Y)	N	N/A
Brick panels plumb and level.	(Y)	N	N/A
Control joints (for concrete bricks) refer manufacturer requirements.	Y	N	(N/A)
Junctions with other claddings: flexible sealant over backing rod.	(Y)	N	N/A
Bond breaker (slip joint) product used: Butynol / Nuraply / Supercourse / malthoid/ other_____			

Gable –framing @ 400mm c/s	Y	N	N/A
Gable – rigid air barrier or approved wrap.	(Y)	N	N/A
Weepholes & vents 75mm high @ 800ctrs max	Y	N	N/A
Type of lintel as per NZS3604 fixed to framing or self supporting	Y	N	N/A
Lintel angle fixings into framing 75mm x 10mm galv coach screws @ 400 ctrs. Timber lintel H3.1 min.	Y	N	N/A
Lintel angle self supported: brick support 100mm upto 2m span then 200mm over 2m span.	Y	N	N/A
Lintel angle upstand flashed back to wrap (using wrap / supercourse / metal flashing etc)	Y	N	N/A
Bolted lintels stop 5mm short of jamb bricks.	Y	N	N/A
Interstorey/ above roof shelf angle: fixing, size, seating:	Y	N	N/A
Row of ties directly above and below Slip joint:	Y	N	N/A
2nd row of ties within 315mm of shelf angle/slip joint (interstorey)	Y	N	N/A
Two storey framing: min 90x45 studs @ 400ctrs max.	Y	N	N/A
Sill bricks: min 15deg slope, 30-50mm overhang	Y	N	N/A
Sill flashing drip edge 5mm into cavity, 200mm each side of opening	(Y)	N	N/A
Jamb flashing (150mm min) Supercourse to soffit	(Y)	N	N/A
Head flashing tight to bricks with stopends in cavity.	Y	N	N/A
Max Heights:			
Panel Height 4.0m	Y	N	N/A
7.0m height above ground	Y	N	N/A
5.5m gable end	Y	N	N/A
Wash outs every 10 bricks (good trade practice.Not compulsory)	Y	N	N/A
Timber subfloor:double ties within 300mm of bondbeam, ventilation, vermin proofing reqd where gaps greater than 13mm.	Y	N	N/A
Fire rating: Cavity sealed off with DPC separation.	Y	N	N/A
Steel stud framing: Thermal break, 20mm self tapping tek screws.	Y	N	N/A

☞ **IMPORTANT: Please complete back page ... ➔**

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Key: Yes = approved: No = not approved: N/A = not applicable:

BCI-33

WCC Record of inspection
Cladding brick veneer (B10)

Waitakere City Council
Te Taiao o Waitakere

Result of Inspection:	
Passed ☑ Subject to production as stipulated of the documents indicated overleaf (if any)	**Failed** ☐
Notice to Fix Resolved ☐ Additional Inspections Required: Yes ☑ No ☐	Issue Notice to Fix ☐ Field Note ☐ Failed Letter ☐ Amendments Required ☐ Additional Inspections Required: Yes ☐ No ☐

Producer statement check			Engineer's name:
Author on approved list	Y	N	

CERTIFICATES	Required	Received	CERTIFICATES	Required	Received
ENGINEERS (PS4)			**CLADDING**		
Soil/Geotechnical Engineers Certificate			Applicators Certificate for Plaster Cladding		
Engineers Certificate for Foundations (Structural)			Manufacturers Warranty for Plaster Cladding		
Engineers Certificate for Pile Driving			Applicators Certificate for Installation ff Cladding		
Engineers Certificate for A/B Grade Masonry			**OTHER**		
Engineers Certificate for Speciality Slab			Electrical Certificate		
Engineers Certificate for Hardfill Compaction			Gas Certificate		
Engineers Certificate for Structural Framing			Glazing Certificate		
Engineers Certificate for Concrete Structure			Installers Certificate for Barrier Installation		
Manufacturers/Suppliers Certificate for Spread of Flame Index			Installers Certificate for Solid Fuel/Gas Heaters		
Manufacturers/Suppliers Cert. for Smoke Development Index			**WATERPROOFING**		
SURVEYORS			Applicators for Water Proofing to Wet Areas		
Surveyors Certificate for Siting			Applicators For Water Proofing To Decks		
Surveyors Certificate for Height in Relation to Boundary			Applicators for Water Proofing to Roof/Gutters		
Surveyors Certificate For Finished Floor Level (Linz Datum)			Applicators for Tanking to Retaining Wall		
TIMBER			Waterproofing Manufacturers Guarantee		
Manufacturers Certificate for Timber Treatment and Grading			Other:		
Manufacturers Certificate and Layout for Roof Trusses			Other:		
CERTIFICATES (AS TICKED ABOVE) ARE REQUIRED AT:					

List of non-compliances / comments

OK - 10 ½ HIGH.

Signed by: _____

Instructions: If outcome is no (i.e. not approved), identify reasons in non-compliance / comment section. All sections must be completed
Key: Yes = approved: No = not approved: N/A = not applicable:

ENTERED CSM-2009-1374

BCI-31

WCC Record of inspection
Building wrap & cavity (B8)

Waitakere City Council
Te Tatau o Waitakere

Surveyor's Name	ANDREW COLLIER	Time in	9.25
Date	16 DEC 2009	Time out	9.50
ABA #	09-1374.	Time total	25mins
Address	19 TITCH PLACE.		

Building wrap – record type: TYVEK. (wall) _____ (roof)

No cladding in place	Y	N	N/A	Paper correctly restrained	Y	N	N/A
Wrap turned into openings & firmly secured	Y	N	N/A	Sealed at roof space	Y	N	N/A
Openings taped	Y	N	N/A	Wrap extends below bottom plate / joist	Y	N	N/A
Openings as per plan	Y	N	N/A	Support for downpipes, taps, etc	Y	N	N/A
Wrap fixed horizontally	Y	N	N/A	Penetrations sealed	Y	N	N/A
Lap no less than 75mm	Y	N	N/A	Roofing wrap laid to prevent ponding	Y	N	N/A
No rips or tears	Y	N	N/A		Y	N	N/A

Cavity construction – record proposed cladding: _____ (wall) _____ (roof)

Type of batten: ☐ Poly ☑ Timber ☐ CLD ☐ Cavibat ☐ PBS

Batten treatment, size, fixings, centres	Y	N	N/A	Fixings appropriate for zone	Y	N	N/A
Poly battens 20mm min	Y	N	N/A	Vermin proofing installed	Y	N	N/A
Slopes formed on all horizontal surfaces	Y	N	N/A	Steps in floor level adequately flashed	Y	N	N/A
Batten / coloursteel separation layer _____ type	Y	N	N/A	CLD Battens – all cut edges sealed	Y	N	N/A

Flashings – circle type: stainless steel / galvanised / aluminium / powder coated / plastic

Fit for purpose	Y	N	N/A	Flashings to all internal, external corners	Y	N	N/A
Head, sill & jamb	Y	N	N/A	Flashings fitted all floor junctions	Y	N	N/A
Apron & stop ends	Y	N	N/A	Adjacent materials	Y	N	N/A
Saddle flashings to parapets and balconies	Y	N	N/A	Meter boxes & other penetrations flashed	Y	N	N/A
Saddle flashings and tape to C/L joists	Y	N	N/A	Joins adequately lapped and sealed	Y	N	N/A

Result of Inspection:

Passed ☑ Subject to production as stipulated of the documents indicated overleaf (if any)	**Failed** ☐
Notice to Fix Resolved ☐	Issue Notice to Fix ☐
Additional Inspections Required: Yes ☐ No ☑	Field Note ☐
	Failed Letter ☐
	Amendments Required ☐
	Additional Inspections Required: Yes ☐ No ☐

Producer statement check			**Engineer's name:**
Author on approved list	Y	N	

☞ **IMPORTANT: Please complete back page ... ➔**

BCI-31

WCC Record of inspection
Building wrap & cavity (B8)

Waitakere City Council
Te Taiao o Waitakere

CERTIFICATES	Required	Received	CERTIFICATES	Required	Received
ENGINEERS (PS4)			**CLADDING**		
Soil/Geotechnical Engineers Certificate			Applicators Certificate for Plaster Cladding		
Engineers Certificate for Foundations (Structural)			Manufacturers Warranty for Plaster Cladding		
Engineers Certificate for Pile Driving			Applicators Certificate for Installation ff Cladding		
Engineers Certificate for A/B Grade Masonry			**OTHER**		
Engineers Certificate for Speciality Slab			Electrical Certificate		
Engineers Certificate for Hardfill Compaction			Gas Certificate		
Engineers Certificate for Structural Framing			Glazing Certificate		
Engineers Certificate for Concrete Structure			Installers Certificate for Barrier Installation		
Manufacturers/Suppliers Certificate for Spread of Flame Index			Installers Certificate for Solid Fuel/Gas Heaters		
Manufacturers/Suppliers Cert. for Smoke Development Index			**WATERPROOFING**		
SURVEYORS			Applicators for Water Proofing to Wet Areas		
Surveyors Certificate for Siting			Applicators For Water Proofing To Decks		
Surveyors Certificate for Height in Relation to Boundary			Applicators for Water Proofing to Roof/Gutters		
Surveyors Certificate For Finished Floor Level (Linz Datum)			Applicators for Tanking to Retaining Wall		
TIMBER			Waterproofing Manufacturers Guarantee		
Manufacturers Certificate for Timber Treatment and Grading			Other:		
Manufacturers Certificate and Layout for Roof Trusses			Other:		
CERTIFICATES (AS TICKED ABOVE) ARE REQUIRED AT:					

List of non-compliances / comments

OK TO CLAD.

Signed by: _____

Instructions: If outcome is no (i.e. not approved), identify reasons in non-compliance / comment section. All sections must be completed
Key: Yes = approved: No = not approved: N/A = not applicable:

ADD INS 12/11/09
441883

BCI-113

WCC Record of inspection Drainage (P3)

ENTERED

Waitakere City Council
Te Tatao o Waitakere

Surveyor's Name	Murray Adams JOHN NICHOLLS	Time in	4.00
Date	26-11-09	Time out	4.30
ABA #	09-1324	Time total	30
Address	19 Titoki Place.		

Certificates				
Registration checked	Y	N	N/A	Number:
Stormwater tanks	Y	N	N/A	

Drainage				**System:** AS3500 / NZ			
Stormwater on test	Y	N	N/A	Position of gullies	Y	N	N/A
Sewer on test	Y	N	N/A	Support & bedding of gullies	Y	N	N/A
Suitable gradient	Y	N	N/A	Gully heights and accessibility	Y	N	N/A
AS3500 minimum	Y	N	N/A	Vent within 10m	Y	N	N/A
NZ 100mm diameter	Y	N	N/A	Manholes	Y	N	N/A
Cover to drains	Y	N	N/A	Invert levels correct	Y	N	N/A
Bedding of drains	Y	N	N/A	Dry chambers	Y	N	N/A
Connection to s/w lateral	Y	N	N/A	Sloping sites - subsoil drainage	Y	N	N/A
Connection to f/w lateral	Y	N	N/A	Surface water – drives paths, etc	Y	N	N/A
Connection to septic tank	Y	N	N/A	Cess pits	Y	N	N/A
Number & location of downpipes	Y	N	N/A				
Run between downpipes 5	Y	N	N/A				

Stormwater Tanks / Devices

Type of Device/s:	Retention tank ☐	Detention tank ☐	Rain garden ☐	Swale/filter strip ☐
	Permeable paving ☐	Dispersal device ☐	Soakage pit / trench ☐	
	Other (specify):			

If tank, is it – Buried ☐ Above ground ☐

Operation and maintenance manual received?	Y	N	N/A	Producer Statement (PS4) received?	Y	N	N/A

Result of Inspection:

Passed ☑ Subject to production as stipulated of the documents indicated overleaf (if any)	**Failed** ☐
Notice to Fix Resolved ☐	Issue Notice to Fix ☐
Additional Inspections Required: Yes ☐ No ☐	Field Note ☐
	Failed Letter ☐
	Amendments Required ☐
	Additional Inspections Required: Yes ☐ No ☐

Producer statement check			**Engineer's name:**
Author on approved list	Y	N	

☞ **IMPORTANT: Please complete back page ... ➔**

BCI-113 ENTERED

WCC Record of inspection Drainage (P3)

Waitakere City Council
Te Tatao o Waitakere

CERTIFICATES	Required	Received	CERTIFICATES	Required	Received
PLUMBING & DRAINAGE					
As-Built Drainage ☑ Pre-floor ☐	✓		Backflow Preventer Test Certificate		
Plumbers Form			Installers Certificate for Backflow Preventer		
Draintayers Form			Water Saving Inventory Device		
Engineers Cert. for Waste-Water Installation			EcoWater Conditions		
Installers Certificate for Waste-Water Installation			Licensed Cadastral Surveyors As-Built		
Quality Assurance Certificate			**ENGINEERS (PS4)**		
Solar Heating Certificate			Eng Cert for Stormwater Mitigation Devices		
Gas Certificate			Other:		
Other:			Other:		

CERTIFICATES (AS TICKED ABOVE) ARE REQUIRED AT THE Final RT **INSPECTION.**

List of non-compliances / comments

S/W only

Sewer done with Preflor inspection

Signed by: _____

ATTENTION INSPECTION SUPPORT: :	Is there a Stormwater Device, has EcoWater been emailed?	**YES**	**NO**

Instructions: If outcome is no (i.e. not approved), identify reasons in non-compliance / comment section. All sections must be completed
Key: Yes = approved: No = not approved: N/A = not applicable:

Com-2009-1374

BCI-30

WCC Record of inspection Framing (B7)

ENTERED

Surveyor's Name	DAVID ELLERY	Time in	11.00
Date	10-12-2009	Time out	12.00
ABA #	2009-1374	Time total	1.0
Address	19 TITOKI PLACE GLADEDEN		

Wind zone: low / medium / high / very high / specific **Number of floors or levels inspected:** (describe) TWO

General: If outcome is no (i.e. not approved), identify reasons in comment section below.

Openings as per plan	Y	N	N/A
Treatment type + grading	Y	N	N/A
Stud – size & c/s	Y	N	N/A
Stud heights	Y	N	N/A
Lintel size	Y	N	N/A
Lintel point loads	Y	N	N/A
Lintel fixings (wind)	Y	N	N/A
Bottom plate fixings - in general	Y	N	N/A
Bottom plate – where face-fixed 6mm o/hang	Y	N	N/A
Bottom plate fixings for bracing elements	Y	N	N/A
Bottom plate DPC	Y	N	N/A
Bottom plate to stud 6Kn &12Kn connection	Y	N	N/A
Top plate – size	Y	N	N/A
Uplift requirements - truss / stud / plate / lintels / beams	Y	N	N/A
Truss fixings as per M/F requirements	Y	N	N/A
Truss to top plate connections	Y	N	N/A
Purlin fixings / Tile batterns	Y	N	N/A

Ceiling plane bracing	Y	N	N/A
Roof plane bracing	Y	N	N/A
Flat strap bracing in pairs & taut	Y	N	N/A
Dragon ties	Y	N	N/A
Roof space braces	Y	N	N/A
Rafter size, c/s, fixing	Y	N	N/A
Ridge beam size & fixing	Y	N	N/A
Parapet framing & fixings (slopes 15^0)	Y	N	N/A
Flashing support (nogs)	Y	N	N/A
Angle braces	Y	N	N/A
Sheet braces	Y	N	N/A
Joist – size & c/s	Y	N	N/A
C/L joist - treatment	Y	N	N/A
C/L joist - flashings	Y	N	N/A
Deck level – step & fall across deck	Y	N	N/A
External rafters and beams H3.2	Y	N	N/A
Fixing of ply bracing, decking, roof (S/S)	Y	N	N/A

Inter-tenancy: If outcome is no (i.e. not approved), identify reasons in comment section below.

Single frame	Y	N	N/A
Double frame	Y	N	N/A

Floor / roof separation	Y	N	N/A
Subfloor separation	Y	N	N/A

Result of Inspection:

Passed ☑ Subject to production as stipulated of the documents indicated overleaf (if any)

Failed ☐

Notice to Fix Resolved ☐

Additional Inspections Required: Yes ☑ No ☐

Issue Notice to Fix ☐
Field Note ☐
Failed Letter ☐
Amendments Required ☐
Additional Inspections Required: Yes ☐ No ☐

Producer statement check			**Engineer's name:**
Author on approved list	Y	N	

☞ **IMPORTANT: Please complete back page ... ➔**

BCI-30

WCC Record of inspection
Framing (B7)

Waitakere City Council
Te Tulao o Waitakere

CERTIFICATES	Required	Received	CERTIFICATES	Required	Received
ENGINEERS (PS4)			**CLADDING**		
Soil/Geotechnical Engineers Certificate			Applicators Certificate for Plaster Cladding		
Engineers Certificate for Foundations (Structural)			Manufacturers Warranty for Plaster Cladding		
Engineers Certificate for Pile Driving			Applicators Certificate for Installation ff Cladding		
Engineers Certificate for A/B Grade Masonry			**OTHER**		
Engineers Certificate for Speciality Slab			Electrical Certificate		
Engineers Certificate for Hardfill Compaction			Gas Certificate		
Engineers Certificate for Structural Framing			Glazing Certificate		
Engineers Certificate for Concrete Structure			Installers Certificate for Barrier Installation		
Manufacturers/Suppliers Certificate for Spread of Flame Index			Installers Certificate for Solid Fuel/Gas Heaters		
Manufacturers/Suppliers Cert. for Smoke Development Index			**WATERPROOFING**		
SURVEYORS			Applicators for Water Proofing to Wet Areas		
Surveyors Certificate for Siting			Applicators For Water Proofing To Decks		
Surveyors Certificate for Height in Relation to Boundary			Applicators for Water Proofing to Roof/Gutters		
Surveyors Certificate For Finished Floor Level (Linz Datum)			Applicators for Tanking to Retaining Wall		
TIMBER			Waterproofing Manufacturers Guarantee		
Manufacturers Certificate for Timber Treatment and Grading		✓	Other:		
Manufacturers Certificate and Layout for Roof Trusses		✓	Other:		
CERTIFICATES (AS TICKED ABOVE) ARE REQUIRED AT:					

List of non-compliances / comments

1) COMPLETE NOGS FOR APRON FLASHING SUPPORT
2) FIT U/S X3 TO GARAGE DOOR LINTEL.
3) BRACE B25 CHANGE TO BRACELINE OK.
4) RECIEVED FRAME AND TRUSS CERTIFICATES

OTHERWISE ALL OK TO WRAP

Signed by: _____

Instructions: If outcome is no (i.e. not approved), identify reasons in non-compliance / comment section. All sections must be completed
Key: Yes = approved: No = not approved: N/A = not applicable:

PlaceMakers® Know how. Can do.

COM-2009-1374

TIMBER TREATMENT + GRADE

COM 2009-1374

10-12-09 ENTERED

Auckland Frame & Truss Supplies Ltd
53 McLaughlins Road
Wiri, Manukau City
P.O. Box 97 824
South Auckland Mail Centre
Ph. 250 0300
Fax. 279 5780

November 30, 2009

Client: Goldsmith Developments Ltd.

PRODUCER STATEMENT

Ref. Type 5A
Lot:32 No.8 Newfound Way
Glen Eden

Job No. [redacted]
Quote No. C & C

This statement is to confirm the frames supplied to the above job have been supplied as follows:

Timber frames:

External Walls -	Kiln Dried and Gauged Radiata Pine, Machine Stress Graded, H1.2 Boron treated.
Ext. Bottom Plates -	Kiln Dried and Gauged Radiata Pine, Machine Stress Graded, H3 LOSP treated.
Internal Walls -	Kiln Dried and Gauged Radiata Pine, Machine Stress Graded, H1.2 Boron treated.
Int. Bottom Plates -	Kiln Dried and Gauged Radiata Pine, Machine Stress Graded, H3.1 LOSP treated.
"H" Walls -	Kiln Dried and Gauged Radiata Pine, Machine Stress Graded, H3.1 LOSP treated.
Top Trusses -	Kiln Dried and Gauged Radiata Pine, Machine Stress Graded, H1.2 Boron treated.
Lower Trusses -	Kiln Dried and Gauged Radiata Pine, Machine Stress Graded, H3.1 LOSP treated.

Note: All timber used in frames and trusses is a minimum grade MSG8 unless the architectural plan states MSG 10/12 and then the higher grade is used.

Yours faithfully

Robert Grimmer
Branch Manager

PlaceMakers® Principal Sponsors of the:
REGISTERED MASTER BUILDERS HOUSE OF THE YEAR
IN ASSOCIATION WITH PlaceMakers

[redacted]

PlaceMakers Frame & Truss

Job: 09-1462
Description:
Building Consent No.:
MiTek 20/20 Engineering 4.5.127

Client: PlaceMakers Takanini
Phone:

Site: Goldsmith Developments
Lot 32
Titch Place
Glen Eden

Phone: 021-750-280
Printed 13:36:57 07 Nov 2009

COM 2009-1574
MiTek New Zealand Ltd.
10-12-09

PRODUCER STATEMENT for MiTek 20/20™ TRUSS DESIGN

The MiTek 20/20™ truss design program has been developed by MiTek New Zealand Ltd for the design of GANG-NAIL® timber roof, floor and attic trusses in New Zealand. The truss designs computed by MiTek 20/20™ are prepared using sound and widely accepted engineering principles, and in accordance with compliance documents of the New Zealand Building Code and Verification Method B1/VM1; and internationally accepted standard ANSI/TPI 1 - 2002 as an alternative solution to satisfy the requirements of Clause B1 of the Building Code.

This producer statement covers the MiTek 20/20™ truss design and the structural performance of the GANG-NAIL plate.

ENTERED

On behalf of MiTek New Zealand Ltd, and subject to:

i) All proprietary products meeting their performance specification requirements
ii) The provision of adequate roof bracing and overall building stability
iii) Correct selection and placement of fixings
iv) Correct input of Truss Design Data below
v) The design being undertaken by suitably trained personnel
vi) The truss design being carried out in accordance with MiTek 20/20 User Terms and Conditions,

I believe on reasonable grounds that the trusses, if constructed in accordance with the MiTek 20/20™ truss design and shop drawings, will comply with the relevant provisions of the Building Code.

MiTek New Zealand Ltd holds a current policy of Professional Indemnity Insurance no less than $500,000.

On behalf of MiTek New Zealand Ltd,

In Ling Ng, BE (Hons), CPEng, IntPE, MIPENZ (ID: 146585)
TECHNICAL SERVICES MANAGER, MiTek New Zealand Ltd

MiTek 20/20™ TRUSS DESIGN DATA

The MiTek 20/20™ computer design for this job is based on the following design parameters entered into the program. The GANG-NAIL Fabricator shall ensure that these job details are current and relevant to the project for the design of the trusses.

Job Details
Roof Truss
Member Group: PMFT Truss_H1.2
Roof
Material: Galv Iron .5mm
Dead Load: 0.210 kPa
Restraints: *900 mm centres*
Live Load: Qur = 0.250 kPa
Qc = 1.100 kN

Importance Level : 2
Pitch: 28.000 deg
Ceiling
Material: Standard
Dead Load: 0.200 kPa
Restraints: *400 mm centres*
Live Load: Qc = 1.400 kN

Design Working Life : 50 years
Std Overhang: 600 mm
Wind
Area: High (44.0 m/s)
Pressure Coeff: Cpe = varies; Cpi = -0.30, 0.20

The timber for these trusses shall be standard gauged and treated to the requirements of NZS 3602:2003. Unless otherwise noted, this design assumes that the steel fixings and timber connectors proposed are located in a **"closed environment"**, as defined by NZS3604:1999 Section 4.

Truss List

Legend: * = detail only, ? = input only, ~~Txx~~ = failed design, Ø = non certified, Unmarked trusses = designed successfully, LB = lateral bracing required

Truss	Qty	Span (mm)	Pitch (deg)	Spacing (mm)	Truss	Qty	Span (mm)	Pitch (deg)	Spacing (mm)
ET2	1	5430	15.000	900	J3	1	880	15.000	900
ET3	1	2770	15.000	900	T1	3	6330	28.000	900
ET5	1D	6330	28.000	900	T2	1	6240	28.000	900
ET6	1D	6330	28.000	900	T3	4	6240	28.000	900
ET1	1	5430	15.000	900	T4	1	6240	28.000	900
ET4	1	880	15.000	900	T5	3	6330	28.000	900
J1	6	2430	15.000	900					
J2	1	2910	15.000	900					

Total quantity : 26

The computer design input has been carried out by:

Signed:

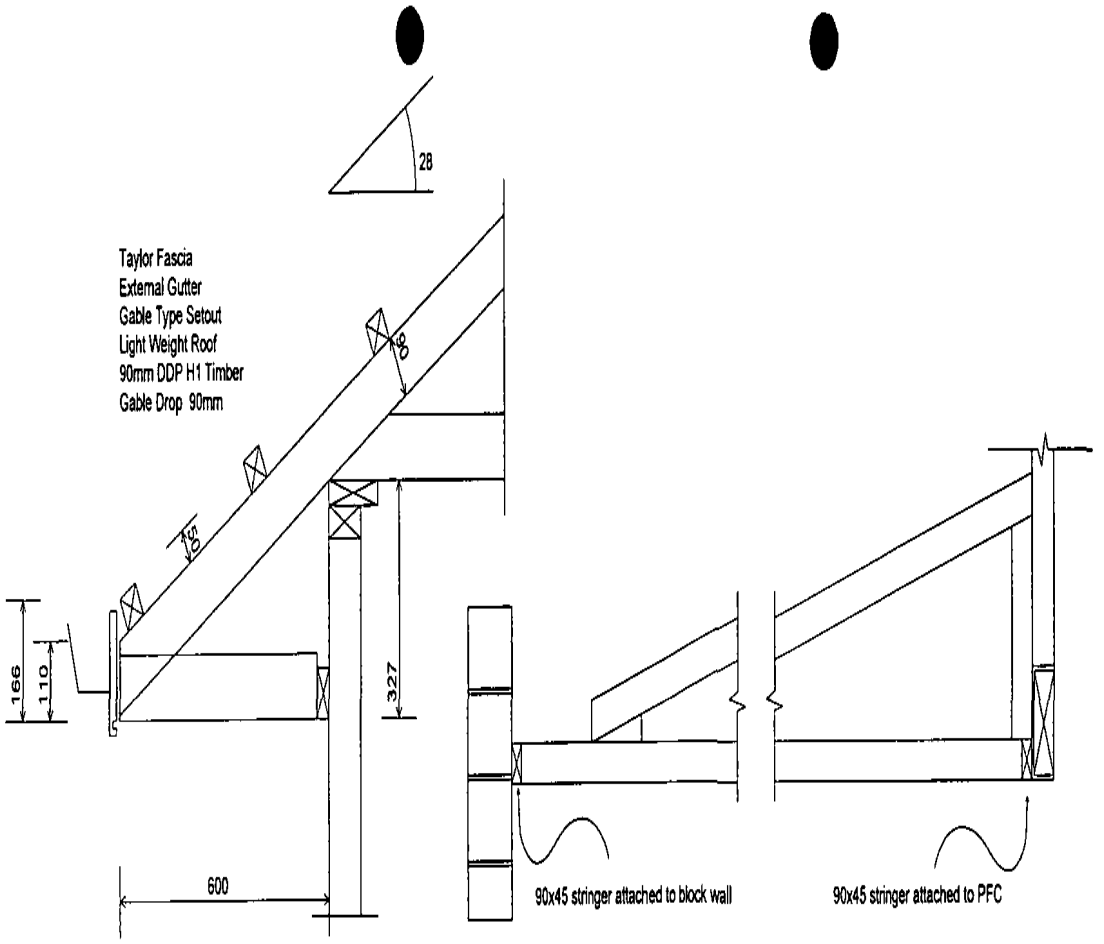
Date: Saturday, 7 November 2009

Name of Computer Operator: *Daniel Harrison*

Qualifications and Title: Detailer

Company: **PlaceMakers Frame & Truss**

PlaceMakers
Know how. Can do.



ROOF DETAILS

Pitch:	28.00
Roof Cladding:	Galv Iron .5mm
Soffit Overhang:	600
Verge Overhang:	600
Fascia Type:	External
Trusses & Rafters At:	900 crs
	Unless Stated Otherwise
Builder To Confirm All Soffit Details With	
Fascia Manufacturer:	Taylor

FIXINGS:

Quant	Fixing Report
24	X : 90x47 JH
	O : 120x47 JH
	# : 190x47 JH
	D : 165x95 JH
4	C : CT200 (pair)
	M : Multigrip (each side)
	N : Nailon Plate
	P : CPC80 Cleats 65mm screws(pair)
21	Znails LH/RH (pair)

- ALL THE ABOVE UNITS MUST BE FULLY NAILED
- COLOUR CODING OF TRUSSES IS FOR AREA LOCATION ONLY - REFER TO TRUSS NUMBERS FOR SPECIFIC LOCATION
- ALL ROOF AND CEILING BRACING TO BE FIXED TO COUNCIL REQUIREMENTS AS DETAILED ON PERMIT PLANS OTHERWISE TO NZS 3604 REQUIRMENTS

Please Note :

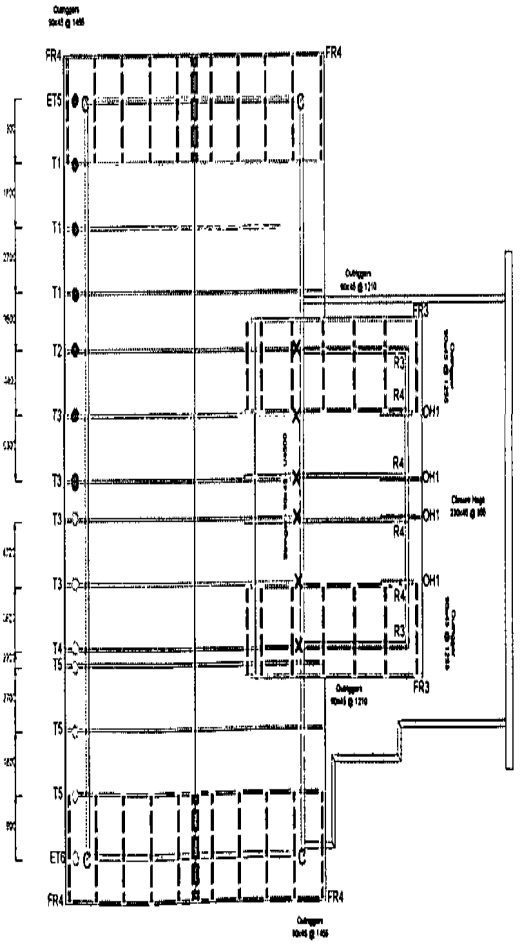
Builder Should Ensure That ALL OSH Approved Safety Practices Are Carried Out When Erecting Framing.

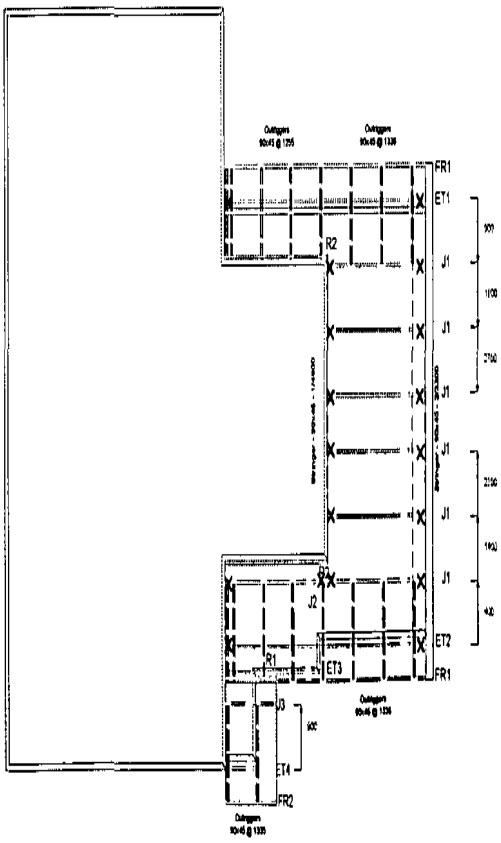
Builder To Read Pre-Cut Plans In Conjunction With Architectural Plans. Builder To Check All Opening Trim Sizes And Braces On Site Before Enclosing.

PlaceMakers Will Not Accept Any Charges For Remedial Work Unless A Written Order Is Issued Before Any Work Is Commenced. A Copy Of The Order Is To Accompany Any Invoice To PlaceMakers Frame & Truss.

If Experiencing Problems, Contact Your Rep

PlaceMakers®
Know how. Can do.





PlaceMakers Frame & Truss

53 McLaughlins Rd
Wiri
P O Box 97-624
South Auckland Mail Centre

Ph 09- 250-0300
Fax 09- 279-5780

Job Name: Goldsmith Developments

Address: Lot 32
Titch Place
Glen Eden

Job: 09-1462

Scale: n/a | Saturday, 7 November 2009 | Drawn By: Daniel H

Roof Framing
FILE

COM-2009-1374

ENTERED

BCI-24

WCC Record of inspection
Siting and foundations (B1)

Waitakere City Council
Te Taiao o Waitakere

Surveyor's Name	ANDREW COLLIER	Time in	10.12
Date	04 NOV 2009	Time out	10.49
ABA #	09-1374	Time total	37 MIN
Address	19 TITCH PLACE		

Siting				
Datum and FFL	(Y)	N		Datum taken from:
Siting as per plan	(Y)	N	N/A	(3 x pegs min)
Checked overland flow-path	Y	N	(N/A)	
Checked location / depth of drains	(Y)	N	N/A	

Corrosion zone	S/S	(1)	**Concrete strength**	17.5MPa (Zone 1) (Footings)	20MPa (Zone 1) (Exposed)	25MPa (Seaspray) Concrete docket required	Other MPa

Strip foundations – all vegetation must be removed

Footprint as per plan		(Y)	N	N/A	Height pegs (must be clear of footings)		(Y)	N	N/A
Footing depth (450 min)		(Y)	N	N/A	Chairs / support		(Y)	N	N/A
Footing width		(Y)	N	N/A	Cover	75mm bottom 50mm sides	(Y)	N	N/A
Bearing		(Y)	N	N/A	Other steel - size		(Y)	N	N/A
Starter size & c/s	< 500mm = D10 > 500mm = D12	(Y)	N	N/A	All steel - tied		(Y)	N	N/A
Starter laps		(Y)	N	N/A	All steel - grade		(Y)	N	N/A
DPM for tanking		Y	N	(N/A)					

Pile foundations

Footprint as per plan		(Y)	N	N/A	Footing depth & width		(Y)	N	N/A
Timber treatment		Y	N	(N/A)	DPM required		Y	N	(N/A)
Post size & c/s		(Y)	N	N/A	Bearing		(Y)	N	N/A

Result of Inspection:

Passed ☑ Subject to production as stipulated of the documents indicated overleaf (if any)

Failed ☐

Notice to Fix Resolved ☐

Additional Inspections Required: Yes ☐ No ☑

Issue Notice to Fix ☐
Field Note ☐
Failed Letter ☐
Amendments Required ☐
Additional Inspections Required: Yes ☐ No ☐

Producer statement check	(Y)	N	**Engineer's name:** MITCHEL VRANJES
Author on approved list	(Y)	N	WILTON JOUBERT.

☞ **IMPORTANT: Please complete back page ... ➔**

Instructions: If outcome is no (i.e. not approved), identify reasons in non-compliance / comment section. All sections must be completed
Key: Yes = approved: No = not approved: N/A = not applicable:

BCI-24

WCC Record of inspection
Siting and foundations (B1)

Waitakere City Council
Te Taiao o Waitakere

CERTIFICATES	Required	Received	CERTIFICATES	Required	Received
ENGINEERS (PS4)			**CLADDING**		
Soil/Geotechnical Engineers Certificate	✓		Applicators Certificate for Plaster Cladding		
Engineers Certificate for Foundations (Structural)	✓		Manufacturers Warranty for Plaster Cladding		
Engineers Certificate for Pile Driving			Applicators Certificate for Installation ff Cladding		
Engineers Certificate for A/B Grade Masonry	✓		**OTHER**		
Engineers Certificate for Speciality Slab	✓		Electrical Certificate		
Engineers Certificate for Hardfill Compaction			Gas Certificate		
Engineers Certificate for Structural Framing			Glazing Certificate		
Engineers Certificate for Concrete Structure			Installers Certificate for Barrier Installation		
Manufacturers/Suppliers Certificate for Spread of Flame Index			Installers Certificate for Solid Fuel/Gas Heaters		
Manufacturers/Suppliers Cert. for Smoke Development Index			**WATERPROOFING**		
SURVEYORS			Applicators for Water Proofing to Wet Areas		
Surveyors Certificate for Siting	✓		Applicators For Water Proofing To Decks		
Surveyors Certificate for Height in Relation to Boundary			Applicators for Water Proofing to Roof/Gutters		
Surveyors Certificate For Finished Floor Level (Linz Datum)			Applicators for Tanking to Retaining Wall		
TIMBER			Waterproofing Manufacturers Guarantee		
Manufacturers Certificate for Timber Treatment and Grading			Other:		
Manufacturers Certificate and Layout for Roof Trusses			Other:		
CERTIFICATES (AS TICKED ABOVE) ARE REQUIRED AT:	PRELIM.				

List of non-compliances / comments

OK TO POUR FIREWALL FOOTING & THREE PILES TO SLAB PERIMETER.

Signed by: _____

Instructions: If outcome is no (i.e. not approved), identify reasons in non-compliance / comment section. All sections must be completed
Key: Yes = approved: No = not approved: N/A = not applicable:

COM-2009-1374 cw.

ENTERED

BCI-28

WCC Record of inspection
Speciality slab (B5)

Waitakere City Council
Te Taiao o Waitakere

Surveyor's Name	ANDREW COLLIER	Time in	11.38
Date	19 NOV 2009	Time out	12.02
ABA #	09-1374.	Time total	24min
Address	19 TITCH PLACE.		

Siting

Corrosion zone	Seaspray	Zone 1	**Concrete strength**	20MPa	25MPa Concrete docket required	Note if 25MPa or > Concrete docket required

Siting as per plan	Y	N	N/A	
Overland flow-path	Y	N	N/A	
Datum vs. FFL	Y	N	N/A	Datum taken from:
Location / depth of drains	Y	N	N/A	

Slab type

Type	Conqra	Firth	Rib-raft	Other (state)

Design check

Site preparation / Metal under DPM	Y	N	N/A	Cover to mesh	Y	N	N/A
Steel – grade / size / laps	Y	N	N/A	Slab thickness	Y	N	N/A
Damp proof membrane	Y	N	N/A	Penetrations sealed	Y	N	N/A
Point load pads	Y	N	N/A	Rebate for B/V	Y	N	N/A
Slab thickenings	Y	N	N/A	Rebates for doors	Y	N	N/A
Cover to steel (side / bottom)	Y	N	N/A	Bottom plate fixings	Y	N	N/A
Slab dimensions	Y	N	N/A	Isolated footing	Y	N	N/A
F.F.L vs F.G.L	Y	N	N/A	Rib penetrations (Max. 50mm)	Y	N	N/A
Mesh size / laps	Y	N	N/A	Rib widths	Y	N	N/A
Mesh in chairs	Y	N	N/A	Poly – blocks fixed	Y	N	N/A

Result of Inspection:

Passed ☑ Subject to production as stipulated of the documents indicated overleaf (if any)

Failed ☐

Notice to Fix Resolved ☐

Additional Inspections Required: Yes ☐ No ☑

Issue Notice to Fix ☐
Field Note ☐
Failed Letter ☐
Amendments Required ☐
Additional Inspections Required: Yes ☐ No ☐

Producer statement check			**Engineer's name:** WILTON JOUBERT.
Author on approved list	Y	N	

☞ **IMPORTANT: Please complete back page...** ➔

Instructions: If outcome is no (i.e. not approved), identify reasons in non-compliance / comment section. All sections must be completed
Key: Yes = approved: No = not approved: N/A = not applicable:

BCI-28

WCC Record of inspection Speciality slab (B5)

Waitakere City Council
Te Taiao o Waitakere

CERTIFICATES	Required	Received	CERTIFICATES	Required	Received
ENGINEERS (PS4)			**CLADDING**		
Soil/Geotechnical Engineers Certificate			Applicators Certificate for Plaster Cladding		
Engineers Certificate for Foundations (Structural)			Manufacturers Warranty for Plaster Cladding		
Engineers Certificate for Pile Driving			Applicators Certificate for Installation ff Cladding		
Engineers Certificate for A/B Grade Masonry			**OTHER**		
Engineers Certificate for Speciality Slab			Electrical Certificate		
Engineers Certificate for Hardfill Compaction			Gas Certificate		
Engineers Certificate for Structural Framing			Glazing Certificate		
Engineers Certificate for Concrete Structure			Installers Certificate for Barrier Installation		
Manufacturers/Suppliers Certificate for Spread of Flame Index			Installers Certificate for Solid Fuel/Gas Heaters		
Manufacturers/Suppliers Cert. for Smoke Development Index			**WATERPROOFING**		
SURVEYORS			Applicators for Water Proofing to Wet Areas		
Surveyors Certificate for Siting			Applicators For Water Proofing To Decks		
Surveyors Certificate for Height in Relation to Boundary			Applicators for Water Proofing to Roof/Gutters		
Surveyors Certificate For Finished Floor Level (Linz Datum)			Applicators for Tanking to Retaining Wall		
TIMBER			Waterproofing Manufacturers Guarantee		
Manufacturers Certificate for Timber Treatment and Grading			Other:		
Manufacturers Certificate and Layout for Roof Trusses			Other:		
CERTIFICATES (AS TICKED ABOVE) ARE REQUIRED AT:					

List of non-compliances / comments

SLAB OK

Signed by:

Instructions: If outcome is no (i.e. not approved), identify reasons in non-compliance / comment section. All sections must be completed
Key: Yes = approved: No = not approved: N/A = not applicable:

COM-2009-1374

ENTERED

BCI-25

WCC Record of inspection
Blockwork / Reinforced concrete (B2)

Waitakere City Council
Te Tatau o Waitakere

Surveyor's Name	ANDREW COLLIER	Time in	10.43
Date	10 NOV 2009	Time out	11.06
ABA #	09-1374	Time total	23 MIN.
Address	19 TITCH PLACE		

Concrete/grout strength	17.5MPa	20MPa	25MPa	Other

(Docket required for verification)

Tilt Slab							
Dimensions (incl thickness)	Y	N	N/A	Openings: Size and reinforcing.	Y	N	N/A
Steel reinforcement size, spacing and grade	Y	N	N/A	Lifting eyes installed (as per eng design)	Y	N	N/A
All steel tied and secure	Y	N	N/A	Reinforcing concrete cover	Y	N	N/A
Ensure no release agent on reinforcing	Y	N	N/A	Steel Grade / Type			

Sub-floor Blockwork							
Vents	Y	N	N/A	Crawl space	Y	N	N/A
Access	Y	N	N/A	Polythene required	Y	N	N/A
Cross-flow	Y	N	N/A	Contractor advised sub-floor inspection required	Y	N	N/A
Bearer support	Y	N	N/A	Has provision for subsoil drainage been provided (sloping site)	Y	N	N/A

Concrete Block Masonry (NZBC:B1 & NZS 4210) Grade N/S.				If poured in series of lifts state lift number Lift # 1			
Correct block size	Y	N	N/A	Lintel steel size	Y	N	N/A
Starter size / centres	Y	N	N/A	Lintel stirrups	Y	N	N/A
Reinforcing steel cover (15mm min) / ties/ grade	Y	N	N/A	Draincoil with silt protection	Y	N	N/A
Starters lapped / tied	Y	N	N/A	Pilasters	Y	N	N/A
Bond beam steel	Y	N	N/A	Columns	Y	N	N/A
Rebate formed	Y	N	N/A	Beams	Y	N	N/A
Washouts provided at starter positions, foundation clean. (applicable where wall is greater than 1.2m high or has excessive mortar dropped on foundation)	Y	N	N/A	Retaining wall rear face pointed	Y	N	N/A
Control joints: max 6.0m ctrs, hori bar debonded eg denso taped or similar	Y	N	N/A	Cast in bolts/weld plates etc	Y	N	N/A
Mortar joints (min 7mm max 15mm)	Y	N	N/A	Openings reinforced with lintel, D16 in jamb and sill blocks.	Y	N	N/A
Builder informed of vibration requirement	Y	N	N/A	Steel Grade / Type HD 16's.			

Result of Inspection:

Passed ☑ Subject to production as stipulated of the documents indicated overleaf (if any)	**Failed** ☐
Notice to Fix Resolved ☐ Additional Inspections Required: Yes ☐ No ☑	Issue Notice to Fix ☐ Field Note ☐ Failed Letter ☐ Amendments Required ☐ Additional Inspections Required: Yes ☐ No ☐

☞ **IMPORTANT: Please complete back page ... ➔**

BCI-25

WCC Record of inspection
Blockwork / Reinforced concrete (B2)

Waitakere City Council
Te Taiao o Waitakere

Producer statement check		Engineer's name: MITCHEL VRANJES
Author on approved list	(Y) N	

CERTIFICATES	Required	Received	CERTIFICATES	Required	Received
ENGINEERS (PS4)			**CLADDING**		
Soil/Geotechnical Engineers Certificate			Applicators Certificate for Plaster Cladding		
Engineers Certificate for Foundations (Structural)			Manufacturers Warranty for Plaster Cladding		
Engineers Certificate for Pile Driving			Applicators Certificate for Installation ff Cladding		
Engineers Certificate for A/B Grade Masonry			**OTHER**		
Engineers Certificate for Speciality Slab			Electrical Certificate		
Engineers Certificate for Hardfill Compaction			Gas Certificate		
Engineers Certificate for Structural Framing			Glazing Certificate		
Engineers Certificate for Concrete Structure			Installers Certificate for Barrier Installation		
Manufacturers/Suppliers Certificate for Spread of Flame Index			Installers Certificate for Solid Fuel/Gas Heaters		
Manufacturers/Suppliers Cert. for Smoke Development Index			**WATERPROOFING**		
SURVEYORS			Applicators for Water Proofing to Wet Areas		
Surveyors Certificate for Siting			Applicators For Water Proofing To Decks		
Surveyors Certificate for Height in Relation to Boundary			Applicators for Water Proofing to Roof/Gutters		
Surveyors Certificate For Finished Floor Level (Linz Datum)			Applicators for Tanking to Retaining Wall		
TIMBER			Waterproofing Manufacturers Guarantee		
Manufacturers Certificate for Timber Treatment and Grading			Other:		
Manufacturers Certificate and Layout for Roof Trusses			Other:		
CERTIFICATES (AS TICKED ABOVE) ARE REQUIRED AT:					

List of non-compliances / comments

OK TO FILL FIRGWALL

Signed by:

Instructions: If outcome is no (i.e. not approved), identify reasons in non-compliance / comment section. All sections must be completed
Key: Yes = approved: No = not approved: N/A = not applicable:

NO COM-2009-1374.
ENTERED

BCI-113

WCC Record of inspection
Drainage (P3)

Waitakere City Council
Te Taiao o Waitakere

Surveyor's Name	Murray Norris	Time in	
Date	9-11-09	Time out	
ABA #	09-1374	Time total	
Address	19 Titoki Place.		

Certificates				
Registration checked	Y	N	N/A	Number:
Stormwater tanks	Y	N	N/A	

Drainage				**System:** AS3500 / NZ			
Stormwater on test	Y	N	N/A	Position of gullies	Y	N	N/A
Sewer on test	Y	N	N/A	Support & bedding of gullies	Y	N	N/A
Suitable gradient	Y	N	N/A	Gully heights and accessibility	Y	N	N/A
AS3500 minimum	Y	N	N/A	Vent within 10m	Y	N	N/A
NZ 100mm diameter	Y	N	N/A	Manholes	Y	N	N/A
Cover to drains	Y	N	N/A	Invert levels correct	Y	N	N/A
Bedding of drains	Y	N	N/A	Dry chambers	Y	N	N/A
Connection to s/w lateral	Y	N	N/A	Sloping sites - subsoil drainage	Y	N	N/A
Connection to f/w lateral	Y	N	N/A	Surface water – drives paths, etc	Y	N	N/A
Connection to septic tank	Y	N	N/A	Cess pits	Y	N	N/A
Number & location of downpipes	Y	N	N/A				
Run between downpipes	Y	N	N/A				

Stormwater Tanks / Devices				
Type of Device/s:	Retention tank ☐	Detention tank ☐	Rain garden ☐	Swale/filter strip ☐
	Permeable paving ☐	Dispersal device ☐	Soakage pit / trench ☐	
	Other (specify):			

If tank, is it – Buried ☐ Above ground ☐							
Operation and maintenance manual received?	Y	N	N/A	Producer Statement (PS4) received?	Y	N	N/A

Result of Inspection:	
Passed ☐ Subject to production as stipulated of the documents indicated overleaf (if any)	**Failed** ☐
Notice to Fix Resolved ☐	Issue Notice to Fix ☐
Additional Inspections Required: Yes ☐ No ☐	Field Note ☐
	Failed Letter ☐
	Amendments Required ☐
	Additional Inspections Required: Yes ☐ No ☐

Producer statement check			**Engineer's name:**
Author on approved list	Y	N	

☞ **IMPORTANT: Please complete back page ... ➔**

BCI-113

WCC Record of inspection
Drainage (P3)

Waitakere City Council
Te Tatao o Waitakere

CERTIFICATES	Required	Received	CERTIFICATES	Required	Received
PLUMBING & DRAINAGE					
As-Built Drainage ☐ Pre-floor ☐			Backflow Preventer Test Certificate		
Plumbers Form			Installers Certificate for Backflow Preventer		
Drainlayers Form			Water Saving Inventory Device		
Engineers Cert. for Waste-Water Installation			EcoWater Conditions		
Installers Certificate for Waste-Water Installation			Licensed Cadastral Surveyors As-Built		
Quality Assurance Certificate			**ENGINEERS (PS4)**		
Solar Heating Certificate			Eng Cert for Stormwater Mitigation Devices		
Gas Certificate			Other:		
Other:			Other:		
CERTIFICATES (AS TICKED ABOVE) ARE REQUIRED AT THE INSPECTION.					

List of non-compliances / comments

Please note this job was not booked in - Plumber did not want the inspection No charge Please

Signed by: MN

ATTENTION INSPECTION SUPPORT: :	Is there a Stormwater Device, has EcoWater been emailed?	**YES**	**NO**

Instructions: If outcome is no (i.e. not approved), identify reasons in non-compliance / comment section. All sections must be completed
Key: Yes = approved: No = not approved: N/A = not applicable:

NO CONT 2009-1374
ENTERED

BCI-113

WCC Record of inspection
Drainage (P3)

Waitakere City Council
Te Taiao o Waitakere

Surveyor's Name	Murray Norris	Time in	
Date	5-11-09	Time out	
ABA #	09-134	Time total	
Address	19 Tiffen Place.		

Certificates				
Registration checked	Y	N	N/A	Number:
Stormwater tanks	Y	N	N/A	

Drainage				**System:** AS3500 / NZ			
Stormwater on test	Y	N	N/A	Position of gullies	Y	N	N/A
Sewer on test	Y	N	N/A	Support & bedding of gullies	Y	N	N/A
Suitable gradient	Y	N	N/A	Gully heights and accessibility	Y	N	N/A
AS3500 minimum	Y	N	N/A	Vent within 10m	Y	N	N/A
NZ 100mm diameter	Y	N	N/A	Manholes	Y	N	N/A
Cover to drains	Y	N	N/A	Invert levels correct	Y	N	N/A
Bedding of drains	Y	N	N/A	Dry chambers	Y	N	N/A
Connection to s/w lateral	Y	N	N/A	Sloping sites - subsoil drainage	Y	N	N/A
Connection to f/w lateral	Y	N	N/A	Surface water – drives paths, etc	Y	N	N/A
Connection to septic tank	Y	N	N/A	Cess pits	Y	N	N/A
Number & location of downpipes	Y	N	N/A				
Run between downpipes	Y	N	N/A				

Stormwater Tanks / Devices				
Type of Device/s:	Retention tank ☐	Detention tank ☐	Rain garden ☐	Swale/filter strip ☐
	Permeable paving ☐	Dispersal device ☐	Soakage pit / trench ☐	
	Other (specify)			

If tank, is it – Buried ☐ Above ground ☐						
Operation and maintenance manual received?	Y	N	N/A	Producer Statement (PS4) received?	Y	N	N/A

Result of Inspection:	
Passed ☐ Subject to production as stipulated of the documents indicated overleaf (if any)	**Failed** ☐
Notice to Fix Resolved ☐	Issue Notice to Fix ☐
Additional Inspections Required: Yes ☐ No ☐	Field Note ☐
	Failed Letter ☐
	Amendments Required ☐
	Additional Inspections Required: Yes ☐ No ☐

Producer statement check			**Engineer's name:**
Author on approved list	Y	N	

☞ **IMPORTANT: Please complete back page ... ➔**

BCI-113

WCC Record of inspection
Drainage (P3)

Waitakere City Council
Te Taiao o Waitakere

CERTIFICATES	Required	Received	CERTIFICATES	Required	Received
PLUMBING & DRAINAGE					
As-Built Drainage ☐ Pre-floor ☐			Backflow Preventer Test Certificate		
Plumbers Form			Installers Certificate for Backflow Preventer		
Drainlayers Form			Water Saving Inventory Device		
Engineers Cert. for Waste-Water Installation			EcoWater Conditions		
Installers Certificate for Waste-Water Installation			Licensed Cadastral Surveyors As-Built		
Quality Assurance Certificate			**ENGINEERS (PS4)**		
Solar Heating Certificate			Eng Cert for Stormwater Mitigation Devices		
Gas Certificate			Other:		
Other:			Other:		
CERTIFICATES (AS TICKED ABOVE) ARE REQUIRED AT THE _____ **INSPECTION.**					

List of non-compliances / comments

This was book incorrectly
Consent # was 2009-1136 for
another # location
NO charge please !!

Signed by: MN

ATTENTION INSPECTION SUPPORT: :	Is there a Stormwater Device, has EcoWater been emailed?	**YES**	**NO**

Instructions: If outcome is no (i.e. not approved), identify reasons in non-compliance / comment section. All sections must be completed
Key: Yes = approved: No = not approved: N/A = not applicable:

Com-2009-1374

ENTERED

BCI-111

WCC Record of inspection
Prefloor plumbing (P1)

Waitakere City Council
Te Taiao o Waitakere

Surveyor's Name	JOHN NICHOLLS	Time in	
Date	12.11.09	Time out	
ABA #	09/1374	Time total	
Address	19 Titoki		

Drains on test	Y N	N/A		Materials	Copper / PVC / Polybutylene
Plumber registration #	Y N	N/A	14475	System	AS3500 / NZ

Pre-floor plumbing

Check floor plan vs. fixture layout	Y	N	N/A	*Floor waste gully*	Y	N	N/A
Pipes sleeved or taped	Y	N	N/A	HWC discharge pipe	Y	N	N/A
Pipe size	Y	N	N/A	Eco water requirements	Y	N	N/A
Pipe gradient	Y	N	N/A	Water saving inventory	Y	N	N/A
25mm separation pipe - foundations	Y	N	N/A	Step in floor – provision for drainage	Y	N	N/A
50mm concrete cover to pipes to u/s of slab	Y	N	N/A	Sloping site – provision for drainage	Y	N	N/A
No pipes penetrating slab thickenings or point load pads	Y	N	N/A		Y	N	N/A

Result of Inspection:

Passed ☑ Subject to production as stipulated of the documents indicated overleaf (if any)	**Failed** ☐
Notice to Fix Resolved ☐	Issue Notice to Fix ☐
Additional Inspections Required: Yes ☐ No ☐	Field Note ☐
	Failed Letter ☐
	Amendments Required ☐
	Additional Inspections Required: Yes ☐ No ☐

Producer statement check			***Engineer's name:***
Author on approved list	Y	N	

CERTIFICATES	Required	Received	CERTIFICATES	Required	Received
PLUMBING & DRAINAGE					
As-Built Drainage ☐ Pre-floor ☑	✓		Backflow Preventer Test Certificate		
Plumbers Form		✓	Installers Certificate for Backflow Preventer		
Drainlayers Form			Water Saving Inventory Device		
Engineers Cert. for Waste-Water Installation			EcoWater Conditions		
Installers Certificate for Waste-Water Installation			Licensed Cadastral Surveyors As-Built		
Quality Assurance Certificate			**ENGINEERS (PS4)**		
Solar Heating Certificate			Eng Cert for Stormwater Mitigation Devices		
Gas Certificate			Other:		
Other			Other:		

CERTIFICATES (AS TICKED ABOVE) ARE REQUIRED AT THE _____ INSPECTION.

List of non-compliances / comments

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Signed by: _____

Instructions: If outcome is no (i.e. not approved), identify reasons in non-compliance / comment section. All sections must be completed
Key: Yes = approved; No = not approved; N/A = not applicable:

ENTERED

Com-2009-1374

BCI-113

WCC Record of inspection
Drainage (P3)

Waitakere City Council
Te Taiao o Waitakere

Surveyor's Name	JOHN NICHOLLS	Time in	8.30
Date	12.11.09	Time out	9.00
ABA #	09/1374	Time total	30
Address	14 Iltch.		

Certificates				
Registration checked	(Y)	N	N/A	Number: 16475
Stormwater tanks	Y	N	(N/A)	

Drainage				**System:** AS3500 / NZ			
Stormwater on test	Y	(N)	N/A	Position of gullies	(Y)	N	N/A
Sewer on test	(Y)	N	N/A	Support & bedding of gullies	(Y)	N	N/A
Suitable gradient	(Y)	N	N/A	Gully heights and accessibility	(Y)	N	N/A
AS3500 minimum	(Y)	N	N/A	Vent within 10m	(Y)	N	N/A
NZ 100mm diameter	Y	(N)	N/A	Manholes	Y	N	(N/A)
Cover to drains	(Y)	N	N/A	Invert levels correct	Y	N	(N/A)
Bedding of drains	(Y)	N	N/A	Dry chambers	Y	N	(N/A)
Connection to s/w lateral	Y	(N)	N/A	Sloping sites - subsoil drainage	Y	(N)	(N/A)
Connection to f/w lateral	(Y)	N	N/A	Surface water – drives paths, etc	Y	(N)	N/A
Connection to septic tank	Y	N	(N/A)	Cess pits	Y	(N)	N/A
Number & location of downpipes	Y	(N)	N/A				
Run between downpipes	Y	(N)	N/A				

Stormwater Tanks / Devices

Type of Device/s:	Retention tank ☐	Detention tank ☐	Rain garden ☐	Swale/filter strip ☐
	Permeable paving ☐	Dispersal device ☐	Soakage pit / trench ☐	
	Other (specify):			

If tank, is it – Buried ☐ Above ground ☐

Operation and maintenance manual received?	Y	N	N/A	Producer Statement (PS4) received?	Y	N	N/A

Result of Inspection:

Passed ☑ Subject to production as stipulated of the documents indicated overleaf (if any)	**Failed** ☐
Notice to Fix Resolved ☐ Additional Inspections Required: Yes ☐ No ☐	Issue Notice to Fix ☐ Field Note ☐ Failed Letter ☐ Amendments Required ☐ Additional Inspections Required: Yes ☐ No ☐

Producer statement check			**Engineer's name:**
Author on approved list	Y	N	

Reflow as well

☞ **IMPORTANT: Please complete back page ...** ➔

Instructions: If outcome is no (i.e. not approved), identify reasons in non-compliance / comment section. All sections must be completed
Key: Yes = approved: No = not approved: N/A = not applicable:

BCI-113

WCC Record of inspection
Drainage (P3)

Waitakere City Council
Te Taiao o Waitakere

CERTIFICATES	Required	Received	CERTIFICATES	Required	Received
PLUMBING & DRAINAGE					
As-Built Drainage ☑ Pre-floor ☑	✓		Backflow Preventer Test Certificate		
Plumbers Form			Installers Certificate for Backflow Preventer		
Drainlayers Form		✓	Water Saving Inventory Device		
Engineers Cert. for Waste-Water Installation			EcoWater Conditions		
Installers Certificate for Waste-Water Installation			Licensed Cadastral Surveyors As-Built		
Quality Assurance Certificate			**ENGINEERS (PS4)**		
Solar Heating Certificate			Eng Cert for Stormwater Mitigation Devices		
Gas Certificate			Other:		
Other:			Other:		

CERTIFICATES (AS TICKED ABOVE) ARE REQUIRED AT THE Final AFI **INSPECTION.**

List of non-compliances / comments

Only S/S.

Stormwater to come.

Signed by: _____

ATTENTION INSPECTION SUPPORT: :	Is there a Stormwater Device, has EcoWater been emailed?	**YES**	**NO**

Instructions: If outcome is no (i.e. not approved), identify reasons in non-compliance / comment section. All sections must be completed
Key: Yes = approved: No = not approved: N/A = not applicable:

Com-2009-1374

Waitakere City Council
Te Tatao o Waitakere

Drainlayer

JOHN NICHOLLS

Building Consent No: COM-2008-1464

NOTIFICATION OF LICENSED TRADESMAN – DRAINLAYER

To be completed and returned to Council 48 hours prior to any work commencing

OWNER: NEW ZEALAND HOUSING FOUNDATION

MAILING ADDRESS:
C/- Housing Foundation
PO Box 36027
Northcote
NORTH SHORE CITY 0748

PROJECT LOCATION	**LEGAL DESCRIPTION**
ADDRESS: 19 Titch Place, Glen Eden	VALUATION ROLL NO: LOT & DP: LOT 32 DP 389289

DRAINLAYER DATE: 2-11-09

LICENSED DRAINLAYER NAME: Bryan Chapman

ADDRESS: 30 London St Te Atatu

PHONE: 0275 347 500 LICENSE NUMBER: 14475

TRADESMAN'S SIGNATURE:

Has been appointed to carry out the work described in the above referred building consent.
DESRIPTION OF WORK: drainage to new house

Copy of tradesman's current licence (tick) ☐ Attached ☑ Onfile

Inspection Required: All Drainage :Before being backfilled

The Plumbers, Gasfitters and Drainlayers Board has pointed out that there appears to be some confusion about the effect of the Building Act on who can legally do sanitary plumbing, gasfitting and drainlaying. In fact, the Building Act made only a minor amendment to the Plumbers, Gasfitters and Drainlayers Act 1976 and has not altered the situation that, under the Act, subject to certain specific expectations:
Sanitary plumbing and gasfitting must still be done by a craftsman plumber or gasfitter, as appropriate, or by a registered plumber or gasfitter under their directions; and drainlaying must still be done by a registered drainlayer.
In this respect, it should be noted that the Form 3 in the Second Schedule of the Regulations mentions registered plumbers and gasfitters. The fact that it does not mention craftsman plumbers and craftsmen gasfitters does not affect the requirements of the Plumbers, Gasfitters and Drainlayers Act 1976 as outlined above.

Com-2009-1374

Waitakere City Council
Te Taiao o Waitakere

Plumber

Building Consent No: COM-2008-1464

NOTIFICATION OF LICENSED TRADESMAN – PLUMBER

To be completed and returned to Council 48 hours prior to any work commencing

OWNER: NEW ZEALAND HOUSING FOUNDATION

MAILING ADDRESS:
C/- Housing Foundation
PO Box 36027
Northcote
NORTH SHORE CITY 0748

PROJECT LOCATION	**LEGAL DESCRIPTION**
ADDRESS:	VALUATION ROLL NO:
19 Titch Place, Glen Eden	LOT & DP: LOT 32 DP 389289

PLUMBER DATE: 2-11-09

LICENSED PLUMBER NAME: Bryan Chapman

ADDRESS: 30 London St Te Atatu

PHONE: 0275 347 500 LICENSE NUMBER: 14475

TRADESMAN'S SIGNATURE:

Has been appointed to carry out the work described in the above referred building consent.
DESRIPTION OF WORK: Plumbing to new house

Copy of tradesman's current licence (tick)	☐ Attached	☑ Onfile

Inspection Required: All Drainage :Before being backfilled

The Plumbers, Gasfitters and Drainlayers Board has pointed out that there appears to be some confusion about the effect of the Building Act on who can legally do sanitary plumbing, gasfitting and drainlaying. In fact, the Building Act made only a minor amendment to the Plumbers, Gasfitters and Drainlayers Act 1976 and has not altered the situation that, under the Act, subject to certain specific expectations:
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In this respect, it should be noted that the Form 3 in the Second Schedule of the Regulations mentions registered plumbers and gasfitters. The fact that it does not mention craftsman plumbers and craftsmen gasfitters does not affect the requirements of the Plumbers, Gasfitters and Drainlayers Act 1976 as outlined above.

Jason Lim

From: Kevin Wilkie
Sent: Thursday, 10 December 2009 9:41 a.m.
To: Ragu Ragunathan
Cc: Jason Lim; Jayesh Solanki; Quentin Dagger
Subject: RE: 69 Margan Avenue - Amendment required on sewer line

Hi Ragu

In response to your email I wish to clarify that in regard to the investigation of the manhole and the old drainage line discovered on site we advised your client in our letter of 5 November that whilst Council was prepared to investigate the situation if they wished to expedite the process that they should proceed to locate the manhole and the drain themselves.

Our investigation has identified that the drainage line is serving additional properties to the South and as such is a pubic line. We have not as yet determined the full extent of the catchment being served as the line has restrictions, outside of your client's property, that are preventing a full CCTV inspection. We are arranging for these restrictions to be cleared so we complete our investigation.

Given the situation that your client is in we are agreeable in this case to have your clients drainlayer undertake these additional works within their property under the supervision of Council's contractor. The Council contractor's input is required to ensure that servicng is maintained whilst the works are being undertaken.

The layout for the diversion that you proposed is acceptable and Jason is processing the approval for the works based on the information that you have supplied. Please note that this process is not our normal procedure and is a concession that we have made to assist your client and is not to be taken as a precedent.

As already advised by Jason the old drainage line under your proposed minor unit will need to be replaced as it is an earthenware line.

You will also need to apply for a amendment to the Building Consent for the minor unit as the foundations will need to be changed to comply with our usual building over requirements.

Kind Regards

Kevin Wilkie
Principal Subdivision & Consents Engineer
Development Services - EcoWater

Waitakere City Council
Waitakere Central - Admin Building Level 4
6 Henderson Valley Road
Phone: 836 8000 Ext 9417
Fax: 836 8001
Email: kevin.wilkie@waitakere.govt.nz

From: Emacs Group [mailto:emacs@emacsltd.co.nz] On Behalf Of Ragu Ragunathan
Sent: Tuesday, 8 December 2009 3:35 p.m.
To: Jason Lim; Kevin Wilkie
Cc: dinesh.mani@xtra.co.nz; Kent Liu

Subject: 69 Margan Avenue - Amendment required on sewer line

Dear Jason and Kevin,
This issue has not been resolved yet and construction works are on-hold due to this issue.

Background:
A manhole was suddenly discovered by the Builder when the existing building was removed. Exposed manhole was buried under the floor slab of existing building. Then Jason issued stop-work notice until this issue is resolved.
When the issue was raised by Ecowater, initially it was not known whether it is a public line or private line. The suspicion was that it could be a public line as it is connected to a manhole, which appeared to be built for this connection purpose. Hence Ecowater has agreed to do investigation and advice us of outcome.

It has been more than three weeks that Ecowater is still unable to advice of outcome. This is really disappointing progress. It is costing the owner to put hold on this project for this long. Everyday is costing him. He is very frustrated and worried about the loss incurred due to inaccuracy of Council records.

Could you lease look into this matter urgently. Attached plan shows the proposed alteration. Please review and approve.

As it has been very slow from Council side, can you please allow owner to engage a contractor to fix this issue. As engineers, we and Ecowater Engineers will supervise. Or please advice your contractor to speed up this process.

Kind Regards

Ragu Ragunathan
Principal
EMACS Group Limited
PO Box 67-026, Mt Eden, Auckland

P: 09 630 7125 Ext: 204
F: 09 631 7126
E: emacs@emacsltd.co.nz

Jason Lim

From: Emacs Group [emacs@emacsltd.co.nz] on behalf of Ragu Ragunathan [ragu@emacsltd.co.nz]

Sent: Tuesday, 8 December 2009 3:35 p.m.

To: Jason Lim; Kevin Wilkie

Cc: dinesh.mani@xtra.co.nz; Kent Liu

Subject: 69 Margan Avenue - Amendment required on sewer line

Attachments: 2009-12-08_Amended drainage plan.pdf; 2009-12-08_Eng application.pdf

Dear Jason and Kevin,
This issue has not been resolved yet and construction works are on-hold due to this issue.

Background:
A manhole was suddenly discovered by the Builder when the existing building was removed. Exposed manhole was buried under the floor slab of existing building. Then Jason issued stop-work notice until this issue is resolved.
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Could you lease look into this matter urgently. Attached plan shows the proposed alteration. Please review and approve.

As it has been very slow from Council side, can you please allow owner to engage a contractor to fix this issue. As engineers, we and Ecowater Engineers will supervise. Or please advice your contractor to speed up this process.

Kind Regards

Ragu Ragunathan
Principal
EMACS Group Limited
PO Box 67-026, Mt Eden, Auckland

P: 09 630 7125 Ext: 204
F: 09 631 7126
E: emacs@emacsltd.co.nz

Jason Lim

From: Emacs Group [mgmt@emacsltd.co.nz]
Sent: Friday, 13 November 2009 7:18 p.m.
To: Jason Lim
Cc: emenuwal; dinesh.mani@xtra.co.nz
Subject: RE: 69 Margan Ave

Hello Jason,
Your letter appear to be extreme warning letter and putting all construction works on hold. This raises high concern on delay and costs to the owner. As you are aware, any stop work on any construction generally leads to high costs. In this case, there is no doubt this delay will affect the owner financially.

1. It is obvious that this manhole was not shown on the Council record. Therefore no-one knew about this manhole.
2. This manhole lid was connected to existing concrete. When the concrete was removed the lid and frame was damaged.

Therefore it is not possible at all to blame contractor on this case.

Looking at solution.....
It is costly to make an amendment to building consent unless Council is willing to compensate. The costs for amendment involves amendment preparation, structural engineering costs, delays and Council fees.

Therefore it is advisable to find a solution without amending the building consent, which is.....
- if the in coming pipe is dead line, then manhole can be closed off. The issue is very straight forward.
- if the incoming line is live, then this line may be considered as private line. It is highly unlikely to have many houses connected to it unless Council record is entirely wrong in this area. If this is the case, then this line can be diverted around the building. The costs involved in this case would be diversion costs and closing off manhole.

Therefore we must find a solution to avoid going for an amendment.

In terms of Council investigation, I think Council assets team must give high priority and carry out investigation. This can be done within a day or two considering the urgency. If it is going to take more than two days, then Council must look at compensating the owner for the delays.

Therefore I would like to urge you to talk to Council asset team to do investigation urgently. Once this investigation is done, please let us know. I am quite happy to meet and resolve this issue urgently rather than delaying construction progress.
In the mean time, I hope Contractor can continue with construction of minor unit as it is outside of this manhole. Please advice if your view is different form this.

Kind Regards

Ragu Ragunathan
Principal

EMACS Group Ltd
Infrastructure, Building and Land development Consultants
(Professional Consulting Engineers, Planners and Surveyors)

Level 2A, 40 Mt Eden Road, Mt Eden, Auckland
PO Box 67-026, Mt Eden, Auckland
P: 09 6307125 Ext 204 | F: 09 6307126 | M: 0272 990 020
E: emacs@emacsltd.co.nz | W: www.emacsltd.co.nz

From: emenuwal [mailto:emenuwal@habitatbuilders.co.nz]

Sent: 13 November 2009 11:14 a.m.
To: dinesh.mani@xtra.co.nz; Emacs Group
Subject: FW: 69 Margan Ave

Hi dinesh, got this from the council.
I think the best way to resolve this is to shift the main dwelling to front of the property.
I have spoken to Raghu about this and he will discuss this with you.
emenuwal

From: Jason Lim [mailto:Jason.Lim@waitakere.govt.nz]
Sent: Friday, 13 November 2009 10:27 a.m.
To: emenuwal@habitatbuilders.co.nz
Subject: 69 Margan Ave

Hi,

Attached herewith the letter dated 5/11/09 as requested.

Jason Lim
Subdivisions & Consents Engineer
Development Services

Please consider the environment before printing this e-mail

Note:
This message is for the named person's use only. It may contain confidential, proprietary or legally privileged information. No confidentiality or privilege is waived or lost by any mistransmission. If you receive this message in error, please immediately delete it and all copies of it from your system, destroy any hard copies of it and notify the sender. You must not, directly or indirectly, use, disclose, distribute, print, or copy any part of this message if you are not the intended recipient.
Any views expressed in this message are those of the individual sender, except where the message states otherwise and the sender is authorised to state them to be the views of any such entity.

Thank You.
http://www.waitakere.govt.nz

No virus found in this incoming message.
Checked by AVG - www.avg.com
Version: 9.0.707 / Virus Database: 270.14.61/2497 - Release Date: 11/13/09 03:33:00

Jason Lim

From: Ragu Ragunathan [ragu@emacsltd.co.nz]
Sent: Friday, 11 December 2009 8:56 a.m.
To: Quentin Dagger
Cc: Kevin Wilkie; Jason Lim; Jayesh Solanki; Kent Liu
Subject: RE: 69 Margan Avenue - Amendment required on sewer line

Hello Quentin,
I hope you can understand the situation here.
Short brief:
A public unrecorded sewer line was discovered during removal of existing building. Then it was found that this line is running through the area of proposed minor household unit. All site works are on-hold due to this issue.
We need to apply for foundation amendment to bridge this line. We will apply for amendment shortly.
We would appreciate if you could please assist on this to fast track this approval (amendment).

Thank you
Ragu

-----Original Message-----
From: Kevin Wilkie [mailto:Kevin.Wilkie@waitakere.govt.nz]
Sent: Thu 12/10/2009 3:50 PM
To: Ragu Ragunathan
Cc: Jason Lim; Jayesh Solanki; Quentin Dagger
Subject: RE: 69 Margan Avenue - Amendment required on sewer line

Noted but please be aware you have no approval to commence wthe works
until we have issued the approval for this.

Kind Regards

Kevin Wilkie
Principal Subdivision & Consents Engineer
Development Services - EcoWater

Waitakere City Council
Waitakere Central - Admin Building Level 4
6 Henderson Valley Road
Phone: 836 8000 Ext 9417
Fax: 836 8001
Email: kevin.wilkie@waitakere.govt.nz

From: Ragu Ragunathan [mailto:ragu@emacsltd.co.nz]
Sent: Thursday, 10 December 2009 1:23 p.m.
To: Kevin Wilkie
Cc: Jason Lim; Jayesh Solanki; Quentin Dagger
Subject: RE: 69 Margan Avenue - Amendment required on sewer line

Thanks Kevin.
I will advice our client (property owner). As I mentioned he is very upset on two counts. 1. Delay caused by this issue. 2. Additional cost.
I will leave it to him to attend his concerns in an appropriate ways.

In terms of progressing with the work involved, we will action upon direction from our client. We will talk a Drainlayer and organise this.

Kind Regards
Ragu

-----Original Message-----
From: Kevin Wilkie [mailto:Kevin.Wilkie@waitakere.govt.nz]
Sent: Thu 12/10/2009 9:40 AM
To: Ragu Ragunathan
Cc: Jason Lim; Jayesh Solanki; Quentin Dagger
Subject: RE: 69 Margan Avenue - Amendment required on sewer line

Hi Ragu

In response to your email I wish to clarify that in regard to the investigation of the manhole and the old drainage line discovered on site we advised your client in our letter of 5 November that whilst Council was prepared to investigate the situation if they wished to expedite the process that they should proceed to locate the manhole and the drain themselves.

Our investigation has identified that the drainage line is serving additional properties to the South and as such is a pubic line. We have not as yet determined the full extent of the catchment being served as the line has restrictions, outside of your client's property, that are preventing a full CCTV inspection. We are arranging for these restrictions to be cleared so we complete our investigation.

Given the situation that your client is in we are agreeable in this case to have your clients drainlayer undertake these additional works within their property under the supervision of Council's contractor. The Council contractor's input is required to ensure that servicng is maintained whilst the works are being undertaken.

The layout for the diversion that you proposed is acceptable and Jason is processing the approval for the works based on the information that you have supplied. Please note that this process is not our normal procedure and is a concession that we have made to assist your client and is not to be taken as a precedent.

As already advised by Jason the old drainage line under your proposed minor unit will need to be replaced as it is an earthenware line.

You will also need to apply for a amendment to the Building Consent for the minor unit as the foundations will need to be changed to comply with our usual building over requirements.

Kind Regards

Kevin Wilkie
Principal Subdivision & Consents Engineer
Development Services - EcoWater

Waitakere City Council
Waitakere Central - Admin Building Level 4
6 Henderson Valley Road
Phone: 836 8000 Ext 9417
Fax: 836 8001
Email: kevin.wilkie@waitakere.govt.nz

From: Emacs Group [mailto:emacs@emacsltd.co.nz] On Behalf Of Ragu Ragunathan

Sent: Tuesday, 8 December 2009 3:35 p.m.
To: Jason Lim; Kevin Wilkie
Cc: dinesh.mani@xtra.co.nz; Kent Liu
Subject: 69 Margan Avenue - Amendment required on sewer line

Dear Jason and Kevin,
This issue has not been resolved yet and construction works are on-hold due to this issue.

Background:
A manhole was suddenly discovered by the Builder when the existing building was removed. Exposed manhole was buried under the floor slab of existing building. Then Jason issued stop-work notice until this issue is resolved.
When the issue was raised by Ecowater, initially it was not known whether it is a public line or private line. The suspicion was that it could be a public line as it is connected to a manhole, which appeared to be built for this connection purpose.
Hence Ecowater has agreed to do investigation and advice us of outcome.

It has been more than three weeks that Ecowater is still unable to advice of outcome. This is really disappointing progress. It is costing the owner to put hold on this project for this long. Everyday is costing him. He is very frustrated and worried about the loss incurred due to inaccuracy of Council records.

Could you lease look into this matter urgently. Attached plan shows the proposed alteration. Please review and approve.

As it has been very slow from Council side, can you please allow owner to engage a contractor to fix this issue. As engineers, we and Ecowater Engineers will supervise.
Or please advice your contractor to speed up this process.

Kind Regards

Ragu Ragunathan
Principal
EMACS Group Limited
PO Box 67-026, Mt Eden, Auckland

P: 09 630 7125 Ext: 204
F: 09 631 7126
E: emacs@emacsltd.co.nz

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Thank You.
http://www.waitakere.govt.nz

Jason Lim

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Attachments: Maize Bkgrd.jpg

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Kevin Wilkie
Principal Subdivision & Consents Engineer
Development Services - EcoWater

Waitakere City Council
Waitakere Central - Admin Building Level 4
6 Henderson Valley Road
Phone: 836 8000 Ext 9417
Fax: 836 8001
Email: kevin.wilkie@waitakere.govt.nz

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Kind Regards

Ragu Ragunathan
Principal
EMACS Group Limited
PO Box 67-026, Mt Eden, Auckland

P: 09 630 7125 Ext: 204

F: 09 631 7126
E: emacs@emacsltd.co.nz

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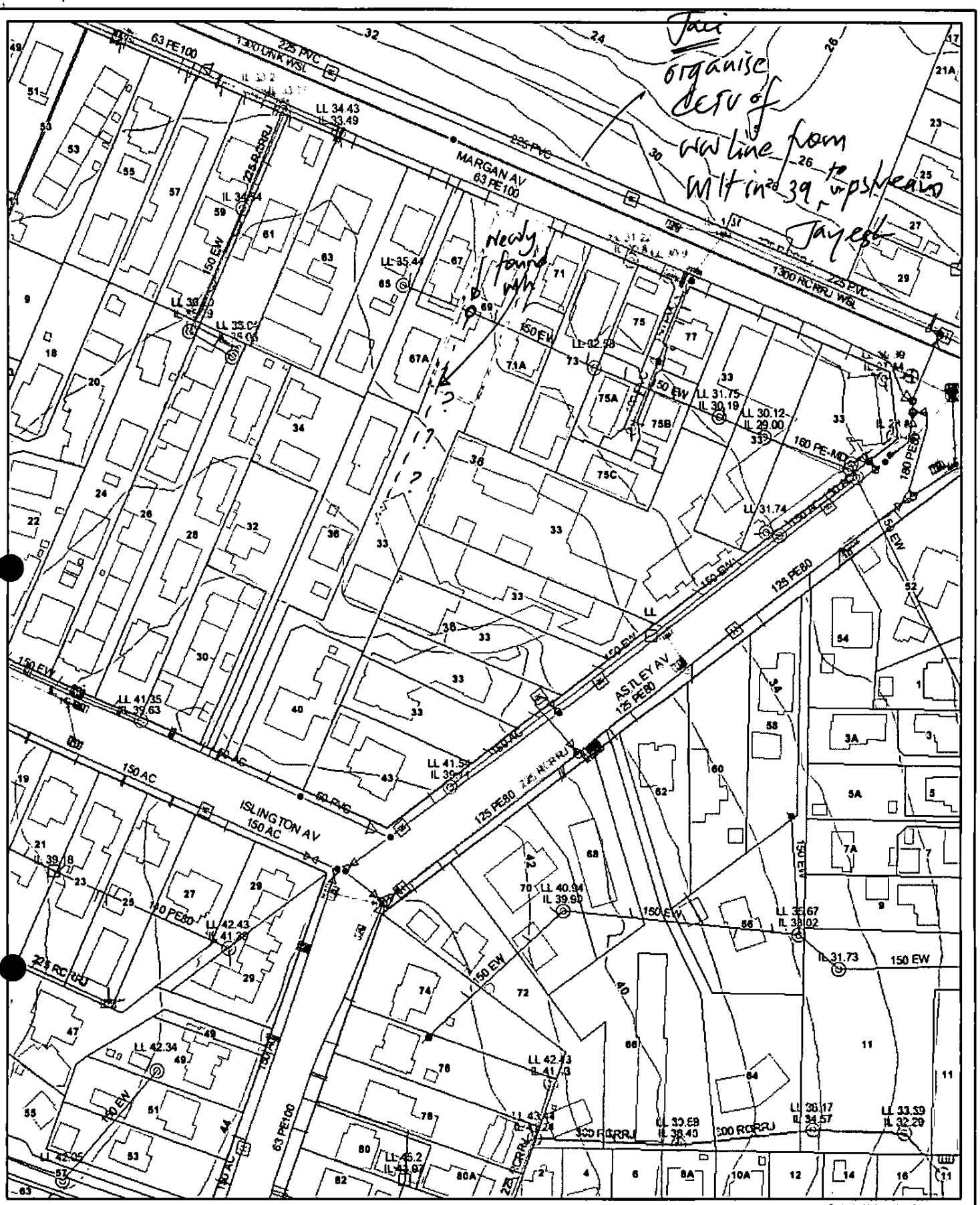
Thank You.
http://www.waitakere.govt.nz



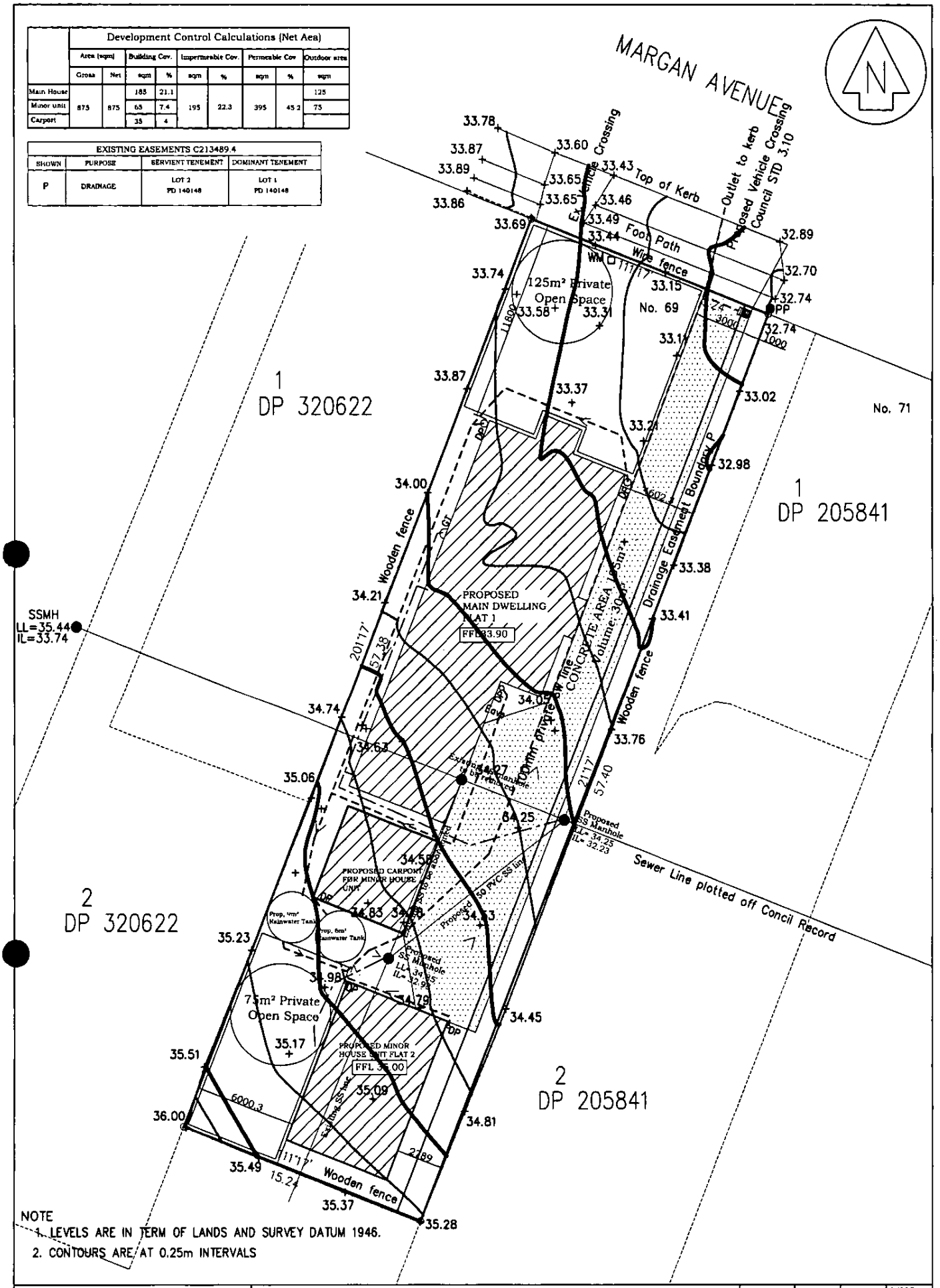
5/11/2009

Cadastral information from
Land Information New Zealand
Digital Cadastral Database DCDB
Crown Copyright Reserved.

Scale = 1:1,492 @ A4

Services shown on public amenity land are not public drains unless used as through drains. While Council endeavours to provide accurate spatial data no guarantee as to the completeness and accuracy of the data shown on this plan can be given. All information, including levels and locations, are not of survey grade accuracy and should be verified on site. For enquiries about the information shown please phone the call centre (09) 839 0400.

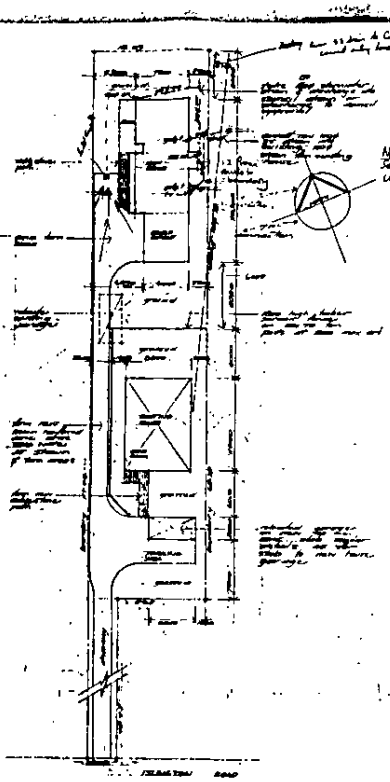
Waitakere City Council
Te Taiao o Waitakere



Engineering Management And Consultancy Services Ltd
P O Box 67-026
Mt Eden, Auckland
Phone : 09-6307125
Fax : 09-6307126
Email : emacs@emacsltd.co.nz

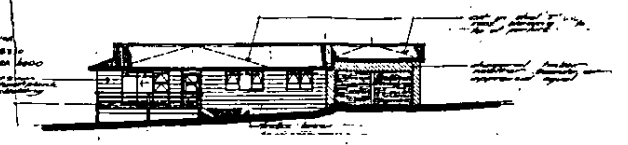
PROPOSED SITE PLAN OF LOT 2 DP 140148 AT 69 MARGAN AVENUE, NEW LYNN

DRAWN BY	SCALE	REV	SHEET No
PV	1:200@A3		543/01
CHECKED BY	DATE		
KL	08.04.09		
DP 140148	LOT 2	PROJECT No EMCS09543	

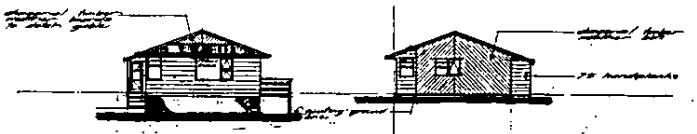


Site & Drainage Plan 1:200

Legal Description

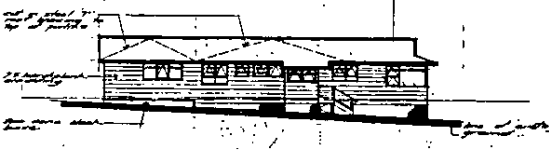


north west elevation



north east elevation

south west elevation



south east elevation

Site & Drainage Plan Elevations

New House

3

3/3

A1 - 21X

Waitakere City Council
Te Tatao o Waitakere

Asset Management

Service Request Detail

Report Date 04/12/2009 08:43 AM **Submitted By** Video - 988472

Service # 983614
Problem CCTVE CCTV - EMERGENCY

Address 69 MARGAN AVE
NEW LYNN 0600

Call Date 16/11/2009 09:20 **Priority** E 1 **Duration of Call** 00:00
Taken By EJB BURWELL, JACI **Responsibility** WKS TECHSCAPE **# of Calls** 1
Source **Project**
☐ **Customer Contact Requested** **Budget #**

Service Request Progress

Schedule	(resolved)
Inspect	Inspected from 16/11/2009 10:00 AM to 16/11/2009 10:00 AM by BBS BBS.
Resolve	Resolved at 16/11/2009 12:00 PM with code WRES RESOLVED BY TECHSCAPE. Additional work orders have been completed.

Location 69 MARGAN AVENUE, NEW LYNN

Area **Sub-Area**
District **Map #**
Parcel
Template Type **A/P #**
Asset

Primary Caller

Name WAITAKERE CITY COUNCIL
First,MI , **Title**
Address

City HENDERSON
State/Province **ZIP/PC** 0650
Country ☐ **Foreign** **Reference #**
E-Mail
Day Phone 8368000 **Evening Phone**
Call Date 16/11/2009 09:20 **Taken By** EJB
Comments
Problem Address: 69 MARGAN AVENUE NEW LYNN 0600. 16-NOV-2009 09:22:18: AS PER JASON/JAYESH PLEASE CCTVR MANHOLE FOUND IN #69 AND TRACK UPSTREAM TO SEE HOW FAR IT GOES. PLEASE CONTACT JASON WHEN THIS IS COMPLETED - JACI 161109

Call List

There are no additional callers for this service number

Comments
Problem Address: 69 MARGAN AVENUE NEW LYNN 0600. 16-NOV-2009 09:22:18: AS PER JASON/JAYESH PLEASE CCTVR MANHOLE FOUND IN #69 AND TRACK UPSTREAM TO SEE HOW FAR IT GOES. PLEASE CONTACT JASON WHEN THIS IS COMPLETED - JACI 161109
BBS: Nov 18 2009 1:43PM ----------
C.C.T.VED FROM UNMARKED MANHOLE IN 69 MARGAN AVE UP TOWARDS 33 ISLINGTON ST,LINE IS PARTIALLY BLOCKED BY ROOTS IN 33 ISLINGTON ST,LINE IS MARKED ON BOUNDRY (tandrews 18/11 01:43)
BBS: Nov 23 2009 10:56AM ----------
C.C.T.VED FROM UNMARKED MANHOLE IN 69 MARGAN AVE UP TOWARDS 33 ISLINGTON ST,LINE IS PARTIALLY BLOCKED BY ROOTS IN 33 ISLINGTON ST,LINE IS MARKED ON BOUNDRY (tandrews 18/11 01:43) (kfraser 23/11 10:56)

Comments	

Inspected						Resolution					
By		Date		Time		Code		Date		Time	

Waitakere City Council
Te Taiao o Waitakere

Waitakere City Council
Waitakere Central
6 Henderson Valley Road
Henderson

Telephone
09 839 0400
(Customer Services)

RATES ASSESSMENT / INVOICE

RATE ACCOUNT No. 6003139

For Period	01 Jul 2009 To 30 Jun 2010
Instalment No.	3
Invoice Date	**01 Feb 2010**
Due Date (last date for payment)	**22 Feb 2010**

Tax Invoice G.S.T. Reg. No. 52-211-247

SHO

NEW ZEALAND HOUSING FOUNDATION
PO Box 44018
Point Chevalier
AUCKLAND 1246

19 FEB 2010
Selling 24/2/10

Instal.	Amount	Penalty Date
1	397.30	20 Aug 2009
2	397.30	20 Nov 2009
3	397.30	22 Feb 2010
4	397.36	20 May 2010

Valuation No. 33650-27034
Description of Property
LOT 32 DP 389289

Residential And Other Uses

Property Location
19 Titch Place, Glen Eden

Property Area	0.035 Ha
Land Value	155000
Capital Value	155000
Special Land Value	
Postponement Value	

Note : Payments received after 15 Feb 2010 are not included in this notice.
An Additional 10%($39.73) will be added to the current instalment if not paid on or before 22 Feb 2010

Statement of Account Tax Invoice This Instalment

Unpaid Rates From Previous Year 01 Jul 2009	0.00
Previous Instalments	794.60
Penalties Added	0.00
Penalties *Remitted*	0.00
Adjustments	0.00
Payments Made To 15 Feb 2010	794.60 cr
This Instalment (Incl. G.S.T.)	397.30
AMOUNT NOW DUE $	**397.30**
No Later Than	**22 Feb 2010**

Total Payment To Clear Account $794.66
To June 2010
If Paid by 22 Feb 2010

SCRIPTION OF RATES	Factor / Units	Value of Factor	Rate / Charge	Total Rates
tewater Uniform Charge	Per sep used/inhabited pt of rating unit	1	419	$419.00
eral Rate - Step 1 *	Land Value	155000	0.002876	$445.76
orm Annual General Charge	Per sep used/inhabited pt of rating unit	1	720	$720.00
by World Cup Levy	Per sep used/inhabited pt of rating unit	1	4.5	$4.50

e General Rate includes contributions to: * Auckland Regional Amenities Funding Levy of $9.45
e Auckland War Memorial Museum Levy of $26.50
ITAT Levy of $10.69

TOTAL FOR YEAR $ (Incl. G.S.T.) $1,589.26

G.S.T. Content of Annual Rate $176.56

Water Rates will be separately invoiced twice yearly based on the consumption recorded by meter @81 cents per 1000 litres.

For further Payment Options see reverse

ates Remittance Advice

ase use this form when making payment at the ANZ, Council Offices or by mail. If paying by mail receipts will only be issued if requested.

st Date for Payment 22 Feb 2010

yable through any branch of the ANZ
through any office, or by mail to the Waitakere City Council.
ake cheques payable to Waitakere City Council.
ease write your address and phone number on back of cheque.

fer: NEW ZEALAND HOUSING FOUNDATION

ticulars of Cheques Bank Branch

Rate Account No 6003139

Amount Due $397.30

Amount Paid

Cheque:

Total $

REDIT WAITAKERE CITY COUNCIL – RATES ACCOUNT

Staples. Do Not Fold.

⑈1006003139⑈ ⑆010102⑆ 045144000⑈05 ⑈ 64

787168/1 WCCLRD_555555_01_PORBOXC4.PRS 0000040000047 (170210)

Inspection Fee Reconciliation

Application Number: **COM-2009-1374**

Address: **19 Titch Place, GLEN EDEN**

Inspection Reconciliation		
Number of inspections invoiced at granting	15	
Extra inspections invoiced during construction	1	
Inspections invoiced on Amendments		
Inspections fees credited		
Total Inspections Invoiced	16	
Less number of chargable inspections carried out	14	
Number of non-chargable inspections	3	
Difference	-2	
Rate per inspection (update rate if required)	$ 178.00	
Inspection Reconciliation Total		-356.00
Other Fees		
Code Compliance Certificate fee		
Other fees yet to be invoiced (EcoWater)		266
Inspections over 1 hour		
Invoice / Credit Note Total		-90.00
Other unpaid invoices		
Total		**-90.00**

Name: Nicole Daniels Date: 16/4/2010

Waitakere City Council
Te Taiao o Waitakere

Waitakere Central
6 Henderson Valley Rd
Henderson 0612
Waitakere

Waitakere City Council
Private Bag 93109
Henderson 0650
Waitakere

Telephone
09 839 0400

TAX INVOICE

GST Registration Number

52-211-247

NEW ZEALAND HOUSING FOUNDATION
PO Box 44018
Point Chevalier
AUCKLAND 1246

Date: 12 April 2010
Customer No: 302176
Invoice No: 456863

Application Location: 19 Titch Place, Glen Eden

Application: COM-2009-1374

Fee Code	Transaction Description	Amount
ECWPRO	Drainage Engineer - Ecowater Processing Fee	266.00

COPY

This account includes a total GST content of $29.55

Invoice Total 266.00
Invoice Due 26 April 2010

Remittance Advice :
(Please Detach and return with payment)

Waitakere City Council
Te Taiao o Waitakere

Waitakere Central
6 Henderson Valley Rd
Henderson 0612
Waitakere

Waitakere City Council
Private Bag 93109
Henderson 0650
Waitakere

Telephone
09 839 0400

Invoice Date:	12 April 2010	Application:	DAP
Invoice Number:	456863	Debtor Number:	302176
Name:	NEW ZEALAND HOUSING FOUNDATION	Payment Reference:	370179
Application:	COM-2009-1374	Invoice Total:	266.00

Waitakere City Council
Te Taiao o Waitakere

Waitakere Central
6 Henderson Valley Rd
Henderson 0612
Waitakere

Waitakere City Council
Private Bag 93109
Henderson 0650
Waitakere

Telephone
09 839 0400

CREDIT NOTE

GST Registration Number

52-211-247

NEW ZEALAND HOUSING FOUNDATION
PO Box 44018
Point Chevalier
AUCKLAND 1246

Date: 16-Apr-2010
Customer No: 302176
Credit Note No: 520445

Application Location: 19 Titch Place, Glen Eden

Application: COM-2009-1374

Fee Code	Transaction Description	Amount
INSBSE	Base Inspection Fees	-356.00

This account includes a total GST content of -39.55

Credit Note Total -356.00

Remittance Advice :
(Please Detach and return with payment)

Waitakere City Council
Te Taiao o Waitakere

Waitakere Central
6 Henderson Valley Rd
Henderson 0612
Waitakere

Waitakere City Council
Private Bag 93109
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Babbage® CONSULTANTS

WEST COAST ROAD WAITAKERE CITY HOUSING DEVELOPMENT

for

NZ HOUSING FOUNDATION

SUPPLEMENTARY GEOTECHNICAL ASSESSMENT REPORT

Ref: 42608
November 2006

Architects · Consulting Engineers · Surveyors · Project Managers

Client: **NZ Housing Foundation**

Project: **West Coast Road Housing Development**

Job Number: **42608**

Report Title: **Supplementary Geotechnical Assessment**

Document Reference: **BDOC03004368**

Report Date: **November 2006**

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-	27/11/06	First Issue	R J Allison	M J D Stapleton

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1.0 INTRODUCTION

Babbage Consultants Ltd (Babbage) were appointed by NZ Housing Foundation to carry out a geotechnical investigation to support subdivision and earthworks consent applications for the proposed residential development at 423 to 429 West Coast Road, Glen Eden in Waitakere City.

The results of the geotechnical investigation and recommendations for the development of the site were presented in a report by Babbage dated June 2006 (Ref: BDOC02880325). The recommendations included that an additional geotechnical investigation should be carried out to support detailed design of the earthworks in the vicinity of the proposed fill batter adjacent to the 100 year flood level. In particular, to determine the consolidation characteristics of the soils beneath the proposed fill batter within the Stage 2 development.

This report presents the results of the supplementary geotechnical investigation and provides recommendations for detailed design of the earthworks.

2.0 SITE DESCRIPTION

2.1 LOCATION AND TOPOGRAPHY

The site is located at 423-429 West Coast Road, Glen Eden in Waitakere City, as shown on the Site Location Plan in Appendix A.

The site covers an area of approximately 5.7 hectares and is bound to the south by West Coast Road and to the east by Woodbank Drive and associated residential development. Most of the western boundary is generally marked by Parrs Stream that flows northwards into the Waikumete Stream that flows approximately parallel to the northern boundary. However, in the south west the boundary extends westward of Parrs Stream to the existing residential development off Albionvale Road.

The site generally comprises rough grassland with areas of scrubby bush and exotic trees in the vicinity of the stream with small localised areas of thicker

bush in the southern and northern parts of the site. A line of mature pine trees trend east west across the southern part of the site. A stormwater pond is located in the south western part of the site to the west of Parrs Stream.

The land generally slopes gently downwards towards Parrs Stream. The existing ground levels in the southern part of the site reduce from approximately RL32m in the south east to approximately RL24m in the vicinity of the stream. Over the southern and central part of the site the existing slope gradients are typically between 1(v) in 3.5(h) to 1(v) in 6(h).

In the northern part of the site the ground level generally reduces from approximately RL29m close to Titch Place on the eastern boundary to approximately RL18m adjacent to the northern boundary.

From the walkover survey there are no apparent signs of significant previous slope instability, although much of the site is heavily vegetated with grass and bush and therefore this may mask such features as shallow scarps.

2.2 AERIAL PHOTOGRAPHS

To assess possible previous areas of fill placement on the site, aerial photographs from 1940, 1959 and 2001 were viewed. The photographs indicate the site has remained largely unchanged, with the exception of some minor residential development in the south eastern part of the site and the construction of the stormwater pond in approximately 2001. The residential development appears to have comprised a single dwelling in 1940 with additional outbuildings being evident in 1959. These buildings are not evident in 2001.

Minor areas of fill appear to have been placed in the vicinity of the eastern boundaries in the central and northern part of the site, associated with the construction of the residential dwellings along Woodbank Drive. Fill also appears to have been placed to form the eastern side of the existing stormwater pond.

No significant signs of instability were identified in the air photos reviewed for this report.

3.0 PROPOSED DEVELOPMENT

The proposed development is for a residential subdivision of approximately 60 lots, to be constructed in three stages. Stage 1 includes the northern part of the site, Stage 2 the south eastern and Stage 3 the south western. In addition it is proposed to replace the existing stormwater pond in the south western part of the site with swales and construct a new stormwater pond in the north western corner of the site.

A footbridge is also to proposed to link the Stage 1 area to the land to the west of Parr's Stream.

A preliminary development layout is shown on the Borehole Location Plans (Sheets 1 and 2) in Appendix A.

The majority of the proposed residential dwellings are understood to comprise two storey structures, although Stage 3 is understood to comprise two and three storey structures with basement level parking although the parking space may not be enclosed.

Significant earthworks are to be carried out to develop the site to form a series of building platforms rising from the 100 year flood level adjacent to the stream. In Stage 1, preliminary earthworks design indicate cut depths of approximately 4.5m over the central part of the site and the placement of up to 1.5m of fill adjacent to the 100 year flood level along the margins of the stream.

In Stage 2, it is proposed to construct a significant fill platform above the 100 year flood level between a new access road and the stream. The proposed fill heights range from approximately 1.5m in the southern end to 3.5m in the northern end of the fill. Some cut of the land adjacent to the eastern boundary is proposed, with the depth of cut ranging from approximately 2.75m in the south east corner to 1m in the north west corner.

In Stage 3, maximum cut depths are anticipated to be approximately 3.0m with maximum fill heights of approximately 2.0m.

It is understood that no retaining structures are permitted to be constructed immediately adjacent to the flood plain and therefore fill batters are proposed along the 100 year flood level. Remote from the flood plain, retaining structures are proposed to support areas of cut and fill where significant changes in ground level occur between the various building platforms and access roads.

The preliminary earthworks plan is shown on Drawing No's 42608/G04 and G05 in Appendix A.

4.0 SITE INVESTIGATION

The initial fieldwork was carried out between the 22nd and 25th May 2006 and comprised 23 No hand auger boreholes to depths of between 0.8m and 3.15m below ground level (bgl), designated HA1 to HA23.

The additional fieldwork was carried out between the 18th and 25th July 2006 and comprised 4 No machine boreholes to depths of between 9m and 14m bgl , designated BH1 to BH4. The approximate location of the boreholes is shown on the Borehole Location Plan (Drawing No's 42608/G02 and G03) included in Appendix A.

The machine boreholes were sunk using rotary open barrel techniques with water flush. Undisturbed tube samples were taken at selected depths within the machine boreholes. The soil and core recovered from the boreholes was logged by a Babbage Engineering Geologist. The core and bagged disturbed samples recovered from the machine boreholes were returned to the Babbage Geotechnical Laboratory for inspection and testing.

In situ testing in the boreholes consisted of standard penetration tests (SPT) at selected intervals. In addition, the in situ shear strength of the materials encountered in the boreholes was measured at selected depths using a hand-held Pilcon Shear Vane. The stratigraphy encountered in the boreholes and the

results of the in situ tests are presented in the Borehole Summaries in Appendix B.

5.0 LABORATORY TESTING

The following tests were carried out on samples recovered from the boreholes:

- Moisture Content 22 No
- Plasticity Index 3 No
- Quick Undrained Triaxial Compression 2 No
- One Dimensional Consolidation 3 No

The results of the above tests are presented in the Babbage Geotechnical Laboratory Report in Appendix C. In addition, the results of the moisture content and plasticity indices are included on the Summaries of Soil Profile and Testing in Appendix B.

6.0 GEOLOGY AND STRATIGRAPHY

6.1 GEOLOGY

The IGNS's Geological Map of the Auckland Urban Area, 1:50,000, Sheet R11, 1992 indicates the geology at the site to generally comprise deposits of the Puketoka Formation comprising pumiceous muds, sands and gravels with muddy peat and lignite.

6.2 STRATIGRAPHY

The ground conditions, as indicated in the machine boreholes, generally confirm the anticipated geology, and generally comprise a sequence of clays with organic horizons, interbedded with silt and sand horizons.

In BH1 and BH4 the clay is generally firm / firm to stiff between approximately 2m to 3m and 5m to 6m below ground level (bgl). These clays are generally

highly plastic and range in colour from light brownish grey and orange to blue grey. In BH2 and BH3 the results of the vane shear tests do not indicate a similar reduction in peak undrained shear strength, the clays generally being stiff / stiff to very stiff in consistency.

A 0.6m to 0.9m thick layer of fine to medium grained sand was encountered in boreholes BH2, BH3 and BH4 at depths of between 3.2m and 8.0m bgl. The results of Standard Penetration Tests (SPT's) carried out within the sands indicates them to be loose to medium dense.

7.0 GROUNDWATER CONDITIONS

Groundwater strikes were not recorded in the boreholes since water flush was used in the drilling process which masked any seepages. However, groundwater seepages were recorded in the previous adjacent hand auger boreholes at depths of between 0.1m and 1.6m bgl during the fieldwork.

No long term monitoring of the local groundwater regime was carried out.

8.0 DISCUSSION

8.1 GENERAL

Previous discussion and recommendations is included in our Geotechnical Assessment Report dated June 2006 referenced in Section 1 and should be read in conjunction with this report.

8.2 STABILITY

From a previous review of aerial photographs and observations made during the walkover survey, there do not appear to be any signs of significant instability on the site.

The proposed fill embankments along the 100 year flood level are indicated to be at gradients of 1(v) to 2(h) and range in height from approximately 1.5m to

3.0m. The findings of the machine boreholes indicate the soft to firm material previously encountered in boreholes HA7, HA11 and HA12 between approximately 1m and 2m bgl appears to be localised. In BH1 the clays were generally firm to stiff / stiff to 2.5m depth and firm from 2.5m to 5.5m bgl, with no soft material being encountered. However, the result of a single triaxial compression test carried out on a sample of clay from BH1 at 1.5m bgl indicates the undrained shear strength to be 27kPa. This is approximately half the value measured with the hand shear vane at the same depth and may be partly attributed to sample disturbance. However, the result does correlate with the values obtained at similar depths from the hand shear vanes carried out within boreholes HA11 and HA12.

In boreholes BH2 and BH3 the clays were generally stiff / stiff to very stiff in consistency.

Preliminary stability assessments using G Slope software have been carried out to assess / infer a factor of safety of the existing slope (Section AA on Drawing G03) and of the proposed embankment (Section BB on Drawing G03). Section AA was selected since it represents a steeper part of the site with an underlying layer of soft to firm clay, as indicated from the hand auger boreholes. Section BB was selected to represent a typical section through a higher part of the proposed embankment. Whilst the soft to firm layer of clay was not encountered in borehole BH2, it has been included to represent a "worst case" scenario.

The Bishop simplified method of analysis for circular failure has been used in the analysis. The soil parameters used in the analysis were based on our previous experience in similar soils and considered to be moderately conservative. They are summarised in the following table:

Soil Type	Unit Weight (kN/m^3)	Effective Cohesion c' (kPa)	Effective Friction Angle Ø' (degrees)
FILL	17	5	30
CLAY Soft to Firm	18	2	27
CLAY Stiff	18	5	30
CLAY Very Stiff	20	7	32

The results of the stability analyses indicate that the factor of safety against failure for the existing slope (Section AA') is greater than 1.5 for a partially saturated slope, which is considered to represent moderately conservative conditions. For a fully saturated slope the factor of safety is indicated to reduce to approximately 1.1. This is considered satisfactory since a fully saturated slope, in our opinion, represents worst credible conditions.

In the case of Section BB', the results of the stability analysis indicate the factor of safety against failure of the proposed embankment batter, assuming unsaturated conditions, is approximately 1.8. However, for a groundwater surface at the base of the fill, approximately coincident with the existing ground surface, the factor of safety reduces to approximately 1.4. Since the findings of the boreholes indicate the layer of soft to firm clay modelled in the analysis is not continuous beneath the proposed embankment, we consider that this represents worst credible conditions. It is therefore our opinion that the indicated factor of safety against failure is satisfactory.

A summary of the graphical output from the G Slope analysis is included in Appendix D.

In order to minimise surface erosion of the embankment batter from surface runoff and consequential frittering and localised surface creep and shallow slumping, we consider that a vegetative cover should be developed over the slope of the embankment. To protect the embankment surface until vegetative cover is established and aid the development of the vegetative cover we consider a biodegradable mat should be installed on the slope rather than a thick layer of mulch and / or topsoil. Both mulch and topsoil can, prior to the

establishment of a well rooted vegetative cover, cause surface saturation and near surface movement. We consider the use of matting to reduce infiltration should assist in short term protection of the slope.

In addition, overland flow over the slope will need to be controlled. Rather than permit sheet flow over the slope it is recommended that the flow is directed into drains at selected intervals along the slope. The base of the drains should be formed from low permeable material to prevent erosion of the underlying soil and their discharge should be directed away from the base of the slope.

8.3 EARTHWORKS

As discussed in Section 3, significant earthworks are proposed on site to achieve the required platform levels for the proposed structures and access roads. The maximum depth of cut is approximately 4.5m in the central part of the Stage 1 area whilst the maximum thickness of fill is approximately 3.5m along the 100 year flood level in the Stage 2 area.

In the case of the proposed fill batters to be constructed along the 100 year flood level, the placement of between 2m and 3.5m of fill will result in consolidation settlement of the underlying soils. The magnitude of this consolidation settlement and the rate at which it occurs will be largely controlled by the compressibility and permeability of the underlying soils. The findings of the hand auger boreholes indicate that in the Stage 1 area, the soils are likely to comprise stiff to very stiff sandy clays of moderate plasticity. However, in the Stage 2 area, the clays are indicated to be soft to firm, organic and of high plasticity. The results of laboratory consolidation tests carried out on samples recovered from the machine boreholes indicate the clays to be medium to high compressibility.

Based on the above, it is our opinion that whilst consolidation settlement beneath the proposed fill batters in the Stage 1 may generally be less than 25mm, assuming medium compressibility clays are present, in the Stage 2 area, preliminary calculations indicate consolidation settlement of approximately 50mm to 100mm may result beneath parts of the fill batters. The time period for 50% and 90% of this consolidation settlement to occur, is indicated from the

laboratory tests to be approximately 6 months and 30 months respectively. Therefore, it is anticipated that additional drainage will be required to reduce the drainage path and thereby reduce the period over which 90% consolidation occurs. Preliminary analysis indicates that for a drainage path of approximately 3m the period for 90% consolidation to occur may be reduced to approximately 12 months. Pre-loading the area would increase the rate of settlement and reduce the period over which 90% consolidation occurs.

In order to minimise the effect of consolidation settlement on the proposed structures, we consider that the fill in the Stage 2 area should be placed during the initial stages of development and subsequent construction delayed for a minimum period of 6 months. The settlement of the fill should be monitored during this period to confirm the rate and amount of settlement taking place, thereby providing confidence in the assessment of likely settlement after development to ensure that it is within acceptable limits.

The placement of up to 3.5m of fill and any additional preload, on the soft to firm clays will require to be carried out under strict control in order to avoid potential bearing capacity failure of the underlying clays. The clay is indicated to have an undrained shear strength of 18kPa at 1m bgl in HA11 0.2m below the underside of topsoil in that location. We note this strength will not support conventional construction plant and the topsoil would also require removal using a hydraulic excavator rather than a motorscraper. This soft to firm soil is susceptible to bearing capacity failure for applied bearing pressures in excess of approximately 35kPa. If the full height of fill is placed over a short period of time and no drainage is installed within the underlying clays, it is our opinion that localised bearing capacity failure of the soft to firm clays may occur.

In order to minimise the risk of bearing capacity failure beneath the fill batter it is recommended that additional vertical drainage is installed beneath the area of fill and the rate of filling is strictly controlled to permit the dissipation of excess pore pressures within the underlying clays. This may be achieved by installing vertical "wick" drains and a drainage blanket prior to filling. Alternatively, consideration may be given to installing counterfort drains or stone columns instead of "wick" drains. These would have the advantage of providing additional vertical support to the fill batter. In the case of counterfort drains, the

presence of shallow groundwater and low strength clays may make excavation of trenches to depths of between 3m and 4m problematic.

Preliminary analysis indicate counterfort drains should be installed at a maximum lateral spacing of 6m and be a minimum depth of 3m. They should be excavated parallel to the slope and extend 1m to 2m beyond the toe and crest of the slope batter. The drainage aggregate will require to be sufficiently graded to prevent clogging and maintain adequate flow and therefore a 20/7 aggregate is likely to be suitable. The arisings from the excavation are anticipated to largely comprise saturated highly plastic clays with organics and therefore be largely unsuitable for re-use. As such, the majority of this material may require to be disposed of off site.

Prior to the placement of fill it is expected that some form of subsoil drainage will be installed to ensure that groundwater seepage is not impeded by the placement of the fill.

Testing and certification of all fill will be required where the thickness exceeds 0.6m or where structures or roads are to be located on the fill.

8.4 FOUNDATIONS

8.4.1 Shallow Foundations

Based on the findings of the investigation it is considered that the foundations for the majority of the proposed structures may be designed in accordance with NZS 3604:1999 "Timber Framed Buildings". This recommendation applies only to foundations within in situ soil or certified fill and no foundations should be founded in topsoil or uncertified fill.

In the case of structures located on the fill adjacent to the 100 year flood level, shallow foundations at a minimum depth of 600mm are considered suitable for structures located no closer than 1.2m from the crest of the 1(v) to 2(h) batter slope. This is to ensure that the foundation is located no closer than a line at a gradient of 1(v) to 3(h) from the toe of the batter and therefore minimise the risk of loss of support should localised frittering / minor creep and movement of the batter slope occur.

In order to minimise differential and total settlements as a result of the variation in thickness of the fill material, it is recommended that strict control is placed on the quality and compaction of the fill beneath the proposed structures. In addition, it is recommended that a serviceability limit state bearing strength of 100kPa is not exceeded for strip or pad foundations constructed within the fill material and that pad sizes should not exceed 1.0m x 1.0m in plan and strip foundations not exceed 1m width. The timing of final development over the fill in the Stage 2 area will however be dependant on consolidation of the materials beneath the fill rather than the strength of the fill itself. Monitoring of the fill should confirm when development is appropriate.

In the case of the proposed structures to be located on Lot 61 to the west of the stream, we understand they are to be two and three storey structures with additional basement car parking. The building platforms for the structures are indicated to be in areas of cut ranging in depth from 0.5m to 3.0m, as shown on Drawing G05 in Appendix A.

The findings of boreholes HA3, HA4 and BH4 indicate the ground conditions in the vicinity of the proposed structures to comprise a 0.3m to 0.9m thick layer of topsoil and / or fill overlying a sequence of stiff and very stiff moderately plastic clays. The results of the hand shear vanes carried out within the uppermost 3m indicate the average undrained shear strength to be approximately 90kPa. However, at approximately 3m to 3.5m bgl the clays are indicated to become locally firm and highly plastic.

Based on the above, it is considered the stiff to very stiff clays are a suitable founding stratum for shallow foundations. However, in areas of proposed deep cut, the firm highly plastic clays may be encountered, and it is our opinion that shallow foundations constructed within these soils may be subject to unacceptable vertical movement post construction. As such measures are likely to be required to mitigate this potentially adverse movement. These measures may include limiting the width of the foundations and applied foundation loads and/or removing the firm clay and replacing with hardfill. Alternatively, the use of pile foundations may be considered.

In the case of shallow foundations founded within the stiff to very stiff clays, it is recommended that a serviceability limit state bearing strength of 100kPa is not exceeded for strip or pad foundations and that pad sizes should not exceed 0.8m x 0.8m in plan and strip foundations not exceed 0.6m width. To minimise the effect of shrinkage and swelling, it is recommended that shallow foundations are founded at least 450mm below finished ground level. Where highly plastic clays occur, the founding depth should be increased to 600mm. However, it is recommended that once formation levels are reached the surface is inspected by a Geotechnical Engineer familiar with this report to confirm the founding depths.

8.4.2 Pile Foundations

Where structures are located closer than 1.2m to the crest of the 1(v) to 2(h) batter along the 100 year flood level, the use of piled foundations is recommended in order to minimise the risk of loss of support should localised frittering and slumping of the batter slope occur. From the preliminary layouts included on Drawings G04 and G05 it is anticipated that Lots 23, 46, 47, 52 to 55, 57 and 60 will require piled foundations. The design of the piles should consider loss of lateral support from the batter slope below / downslope of the piles, as well as lateral loads that may be imposed from the fill and structure. As such, it is recommended that the total length of pile is at least equivalent to twice the combined unsupported length of pile and depth of fill and that the head of the pile is suitably restrained.

The findings of the boreholes indicate the soils at approximately 3m below the base of the proposed fill embankment generally comprise stiff or very stiff clays and silts / medium dense sands. However, in the case of Lots 46 and 47, the findings of BH1 indicate the presence of firm clay from approximately 2m to 6m bgl.

Based on the above, preliminary calculations to determine the ultimate vertical strength of a single timber pile installed within the firm clay and stiff clay have been carried out and are summarised in the table below:

Founding Stratum	Pile Diameter (mm)	Embedment Depth (m)	Ultimate Vertical Strength (kN)
Firm Clay	300	3.0	120
Firm Clay	300	6.0	215
Stiff Clay	300	3.0	190

The embedment depth above is the length of pile within the natural soils beneath the base of the proposed embankment. It is assumed that no skin friction is mobilised along the shaft of the pile within the fill.

The method of installation of the piles should consider the presence of shallow groundwater and low strength clays and silts, as well as the drainage blanket and vertical / counterfort drains. Collapse of bored piles within the natural soils is considered likely and as such, it is anticipated that pre-boring through the fill embankment and then driving into the underlying natural soils may prove suitable.

If driven piles are adopted then it is recommended the pile capacity is assessed in the field by using Hiley's pile driving formula. For bored piles, a static load test could be carried out.

9.0 CONCLUSIONS

Based on the fieldwork covered by this investigation it is considered that the site is suitable for residential subdivision in accordance with the proposed earthworks and subject to the recommendations contained within this report.

10.0 RECOMMENDATIONS

10.1 It is recommended that all fill be certified beneath areas where development takes place (e.g. beneath buildings, roads etc). In the case of the fill along the 100 year flood level in Stage 2, it is recommended that development planning allows for a delay between completion of earthworks and building development of at least 6 months in order to permit resulting consolidation settlement of the underlying clays. In order to increase the rate of consolidation settlement and minimise the risk of bearing capacity failure beneath the fill batter it is recommended that additional vertical drainage is installed beneath the area of fill and the rate of filling is strictly controlled to permit the dissipation of excess pore pressures within the underlying clays. The vertical drainage may include "wick" drains, counterfort drains or stone columns. The method of installation should consider the presence of low strength clays and high groundwater level..

10.2 It is recommended that subsoil drainage is installed beneath areas of fill and in particular to the rear of retaining structures. In addition, the results of the groundwater monitoring indicate that groundwater may be encountered at shallow depth within cut areas and therefore adequate provision for drainage will require to be made in these areas.

10.3 It is recommended that a biodegradable mat is installed on the slope batter in order to minimise surface erosion of the embankment batter and to promote a vegetative cover. In addition, overland flow over the slope should be controlled by the installation of drains at selected intervals along the slope. The base of the drains should be formed from low permeable material to prevent erosion of the underlying soil and their discharge should be directed away from the base of the slope.

10.4 It is recommended that the foundations for residential dwellings are designed in accordance with NZS 3604:1999, with the exception of those for Lots 23, 46, 47, 52 to 55, 57 and 60 and the two to three storey structures in Stage 3, where specific design will be required. It is recommended that a serviceability limit state bearing strength of 100kPa is not exceeded for strip or pad foundations constructed within the fill material and that pad sizes should not exceed 1.0m x 1.0m in plan and strip foundations not exceed 1m width. It is recommended

that the foundations are founded at least 450mm below finished ground level to take into account possible shrinkage swell affects. Where highly plastic clay forms the founding material then this depth should be increased to 600mm. It is recommended that once formation levels are reached the surface is inspected by a Geotechnical Engineer familiar with this report to confirm the founding depths.

10.5 Where structures are located closer than 1.2m to the crest of the 1(v) to 2(h) batter along the 100 year flood level, the use of piled foundations is recommended. The design of the piles should consider loss of lateral support from the batter slope, as well as lateral loads that may be imposed from the fill and structure. As such, it is recommended that the total length of pile is at least equivalent to twice the sum of the unsupported length of pile and depth of fill and that the head of the pile is suitably restrained.

10.6 It is recommended that shallow foundations for the proposed two and three storey structures on Lot 61 are founded within the stiff to very stiff clays and designed using a serviceability limit state bearing strength not exceeding 100kPa and that pad sizes should not exceed 0.8m x 0.8m in plan and strip foundations not exceed 0.6m width. We recommend however that once formation levels are reached the surface is inspected by a Geotechnical Engineer familiar with this report to confirm the founding depths.

11.0 LIMITATIONS

11.1 RESTRICTION OF INTENDED PURPOSE

This report has been prepared solely for the benefit of our client NZ Housing Foundation with respect to the proposed redevelopment of the site, as described in Section 3. The reliance by other parties on the information or opinions contained in the report shall, without our prior review and agreement in writing, be at such party's sole risk.

11.2 LEGAL INTERPRETATION

Opinions and judgements expressed herein are based on our understanding and interpretation of current regulatory standards, and should not be construed as legal opinions. Where opinions or judgements are to be relied on they should be independently verified with appropriate legal advice.

11.3 RELIABILITY OF INFORMATION

Recommendations and opinions in this report are based on data from the boreholes described in Section 6 of this report. The nature and continuity of subsoil conditions away from the boreholes are inferred and it must be appreciated that actual conditions could vary considerably from the assumed model.

During excavation and construction the site should be examined by a Geotechnical Engineer competent to judge whether the exposed subsoils are compatible with the inferred conditions on which the report has been based. It is possible that the nature of the exposed subsoils may require further investigation and the modification of the design based upon this report.

Babbage would be pleased to provide this service and believe that the project would benefit from such continuity. In any event, it is essential Babbage be advised if there is any variation in subsoil conditions from those described in the report as it may affect the design parameters recommended in the report.

This report has been prepared by Russell Allison and reviewed by Malcolm Stapleton.

Respectfully submitted
Babbage Consultants Limited

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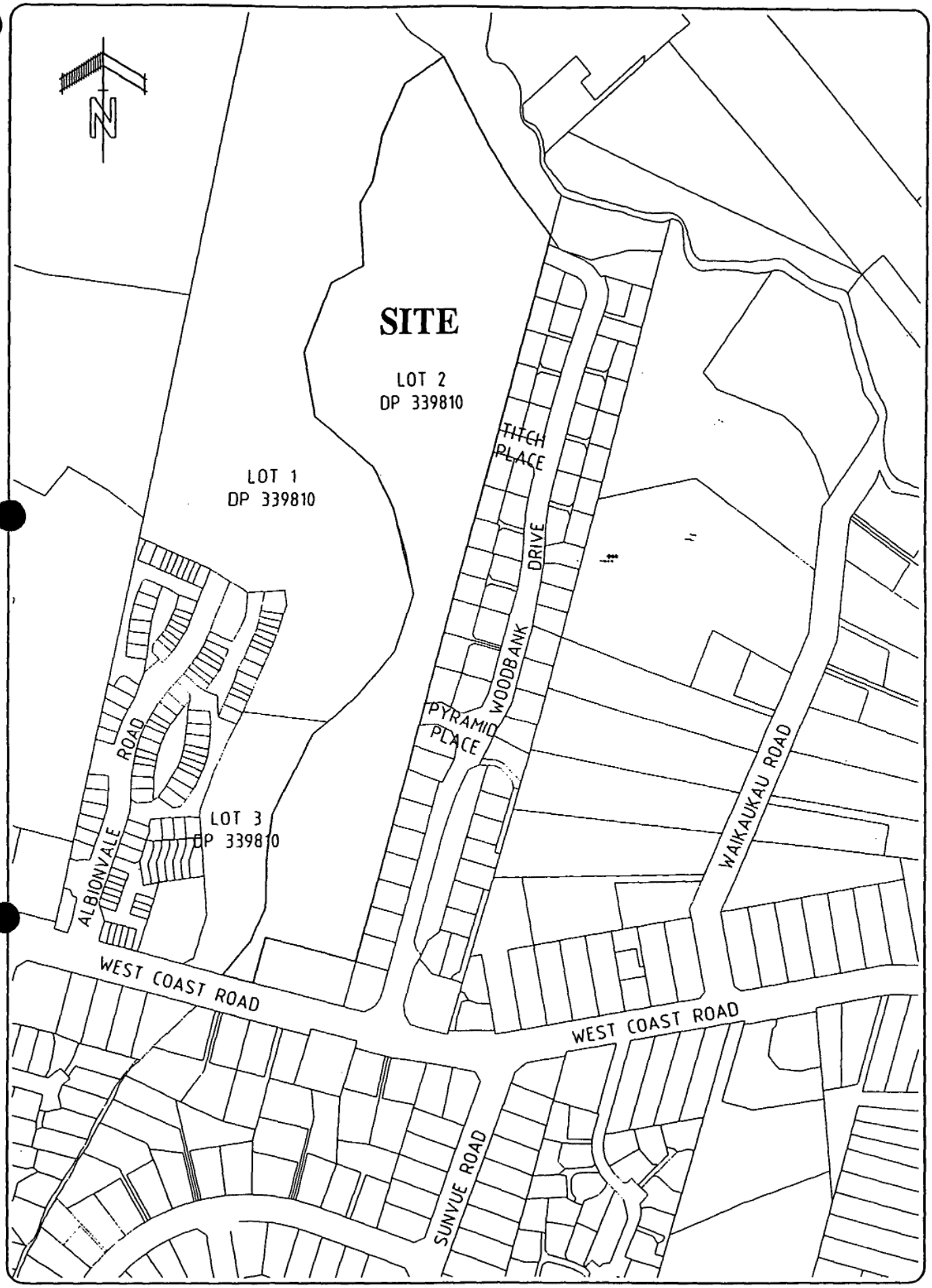
Appendix A

Drawings



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WEST COAST ROAD HOUSING DEVELOPMENT FOR NZ HOUSING FOUNDATION

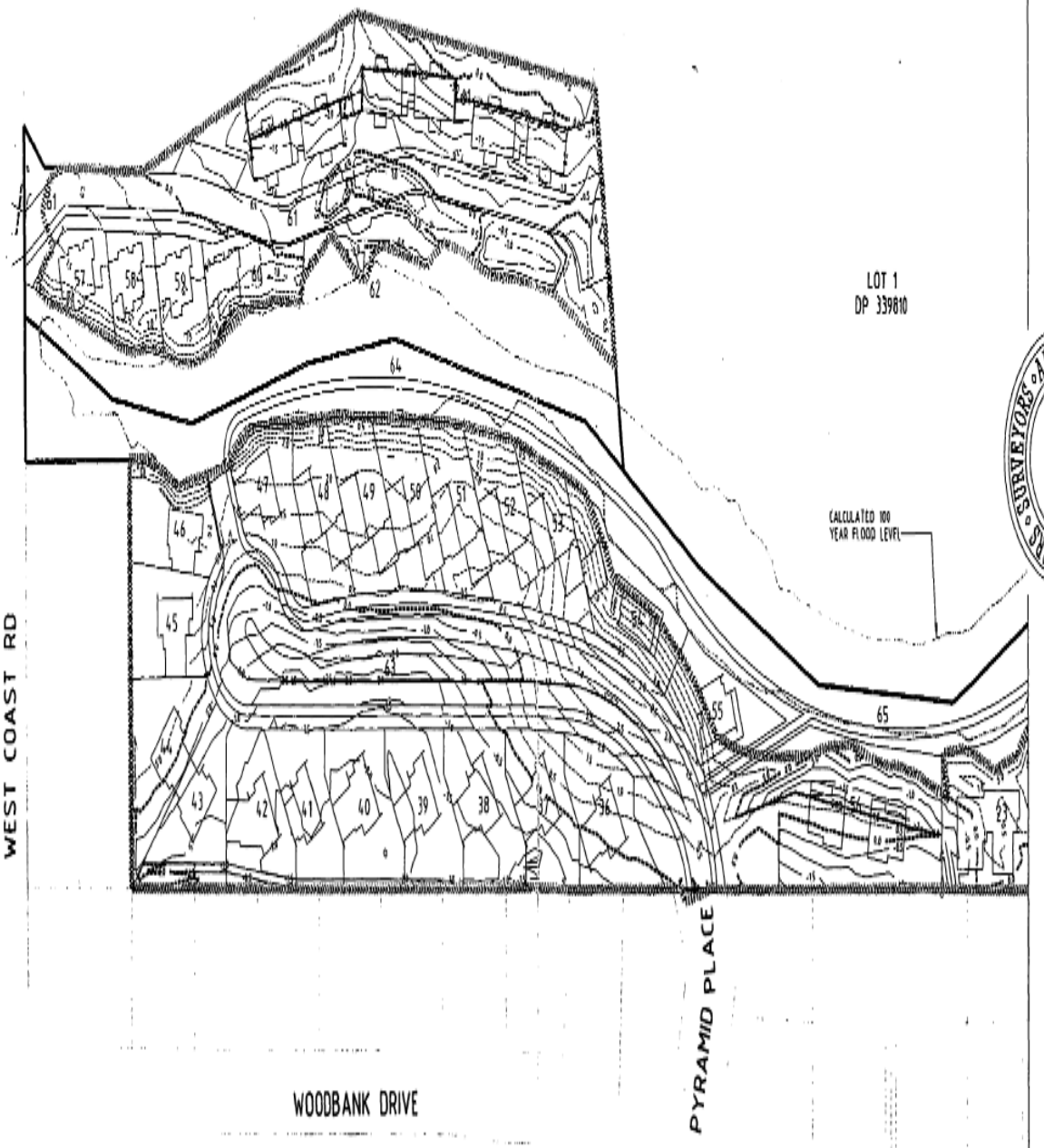
JOB NO:	42608
TITLE:	SITE LOCALITY PLAN
SCALE:	NOT TO SCALE
DRAWING:	G01

KEY

- BOUNDARY
- CUT CONTOURS
- FILL CONTOURS
- ZERO CUT/FILL
- EXTENT OF EARTHWORKS
- CALCULATED 100 YEAR FLOOD LEVEL
- EXISTING EASEMENT

NOTES

1. ALL LEVELS SHOWN ARE TO AUCKLAND VERTICAL DATUM 1949.
2. CONTOURS SHOWN ARE AT 0.25m INTERVALS
3. CONTOURS SHOWN ARE TO FINAL DESIGN LEVELS AND NOT TO SUBGRADE LEVELS



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REV	DATE	DESCRIPTION	DRAWN	CHECK
A	07.08.08	LEVELS AMENDED	PK	DAR

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CLIENT / PROJECT

WEST COAST ROAD HOUSING DEVELOPMENT

FOR

NZ HOUSING FOUNDATION

DRAWING TITLE

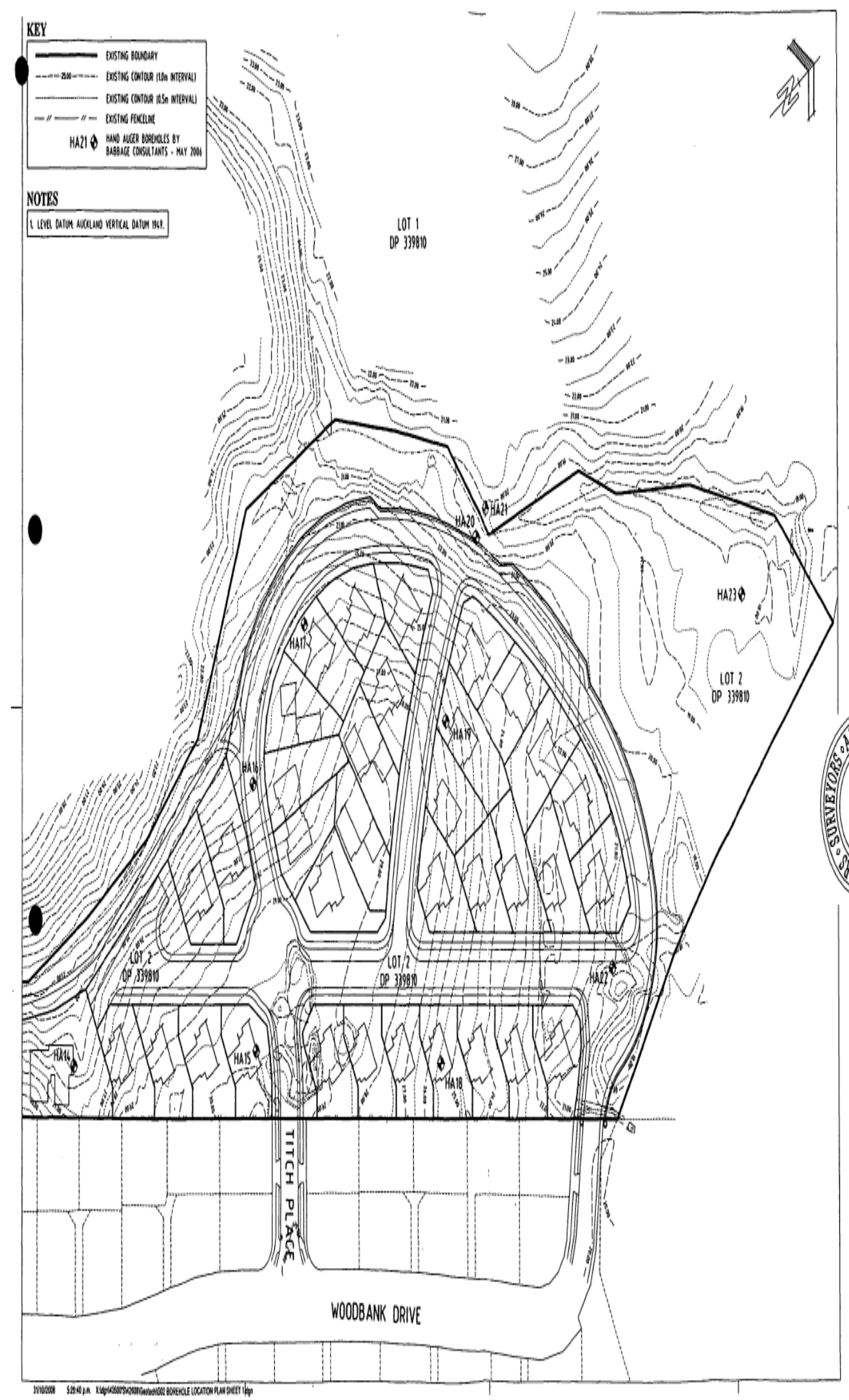
CUT AND FILL ISOPAC PLAN (SHEET 2)

	DATE	INITIAL
DESIGNED		
DRAWN	JUNE 2008	GW
CHECKED		
APPROVED		

SCALE (A1)

1:500

JOB NUMBER	DRAWING NUMBER	REVISION
42608	G05	A



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REV	DATE	DESCRIPTION	DRAWN	CHECK
A	30.10.06	HAND AUGER DESCRIPTIONS AMENDED	MJD	RA

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CLIENT / PROJECT

WEST COAST ROAD HOUSING DEVELOPMENT

FOR

NZ HOUSING FOUNDATION

DRAWING TITLE

BOREHOLE LOCATION PLAN (SHEET 1)

	DATE	INITIAL
DESIGNED		
DRAWN	JUNE 2006	GMB
CHECKED		
APPROVED		

SCALE (A1)

1:500

JOB NUMBER	DRAWING NUMBER	REVISION
42603	G02	A

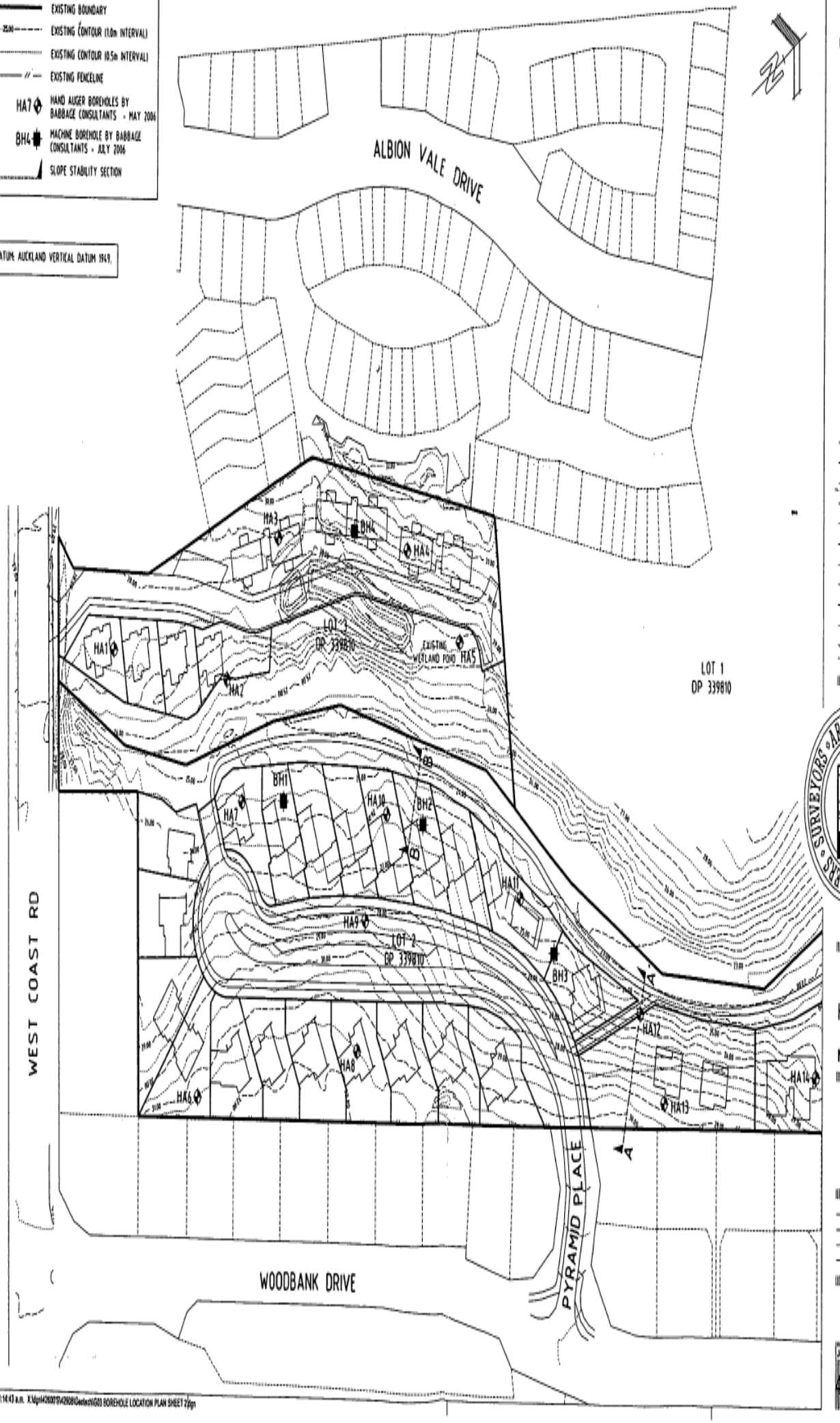
31/10/2006 5:29:40 p.m. X:\dgn\42603\SHEETS\42603Section\G002 BOREHOLE LOCATION PLAN SHEET 1.dgn

KEY

- EXISTING BOUNDARY
- 25.00 EXISTING CONTOUR (1.0m INTERVAL)
- EXISTING CONTOUR (0.5m INTERVAL)
- EXISTING FENCELINE
- HA7 HAND AUGER BOREHOLES BY BABBAGE CONSULTANTS - MAY 2006
- BH4 MACHINE BOREHOLE BY BABBAGE CONSULTANTS - JULY 2006
- SLOPE STABILITY SECTION

NOTES

1. LEVEL DATUM: AUCKLAND VERTICAL DATUM 1949.



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DRAWING NOTES

REV	DATE	DESCRIPTION	DRAWN	CHECK
A	30.10.06	MACHINE BOREHOLES AND SLOPE SECTIONS ADDED	MJD	RA

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CLIENT / PROJECT

WEST COAST ROAD HOUSING DEVELOPMENT

FOR

NZ HOUSING FOUNDATION

DRAWING TITLE

BOREHOLE LOCATION PLAN (SHEET 2)

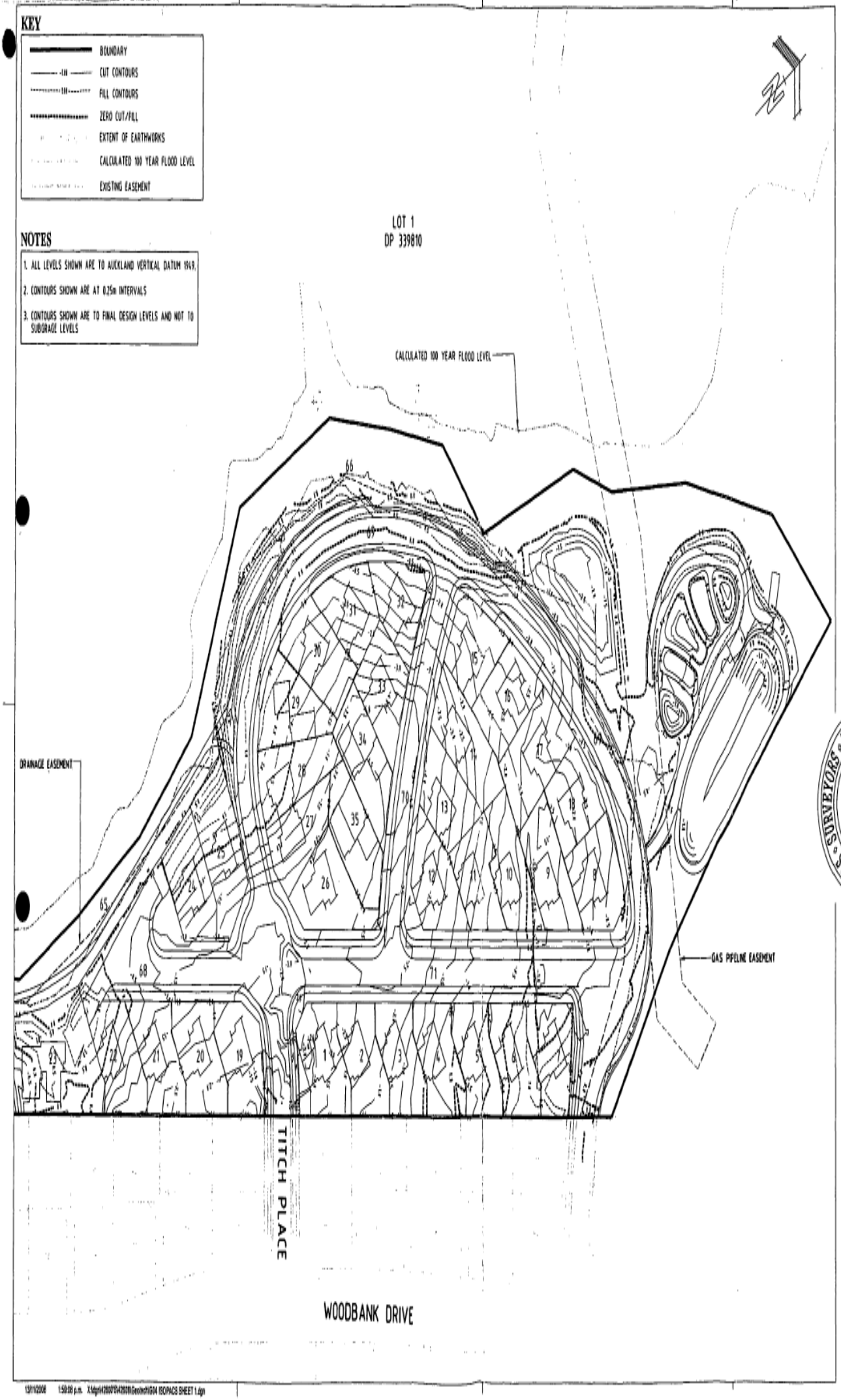
	DATE	INITIAL
DESIGNED		
DRAWN	JUNE 2006	GNB
CHECKED		
APPROVED		

SCALE (A1)

1:500

JOB NUMBER	DRAWING NUMBER	REVISION
42608	G03	A

10/11/2006 11:14:43 a.m. X:\dgn\42600\SI\42608\Geotech\G03 BOREHOLE LOCATION PLAN SHEET 2.dgn



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A	07.09.06	LEVELS AMENDED	FK	DMR

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CLIENT / PROJECT

WEST COAST ROAD
HOUSING DEVELOPMENT
FOR
NZ HOUSING FOUNDATION

DRAWING TITLE

CUT AND FILL
ISOPAC PLAN
(SHEET 1)

	DATE	INITIAL
DESIGNED		
DRAWN	JUNE 2006	GW
CHECKED		
APPROVED		

SCALE (A1)
1:500

JOB NUMBER	DRAWING NUMBER	REVISION
42608	G04	A

13/11/2006 1:59:28 p.m. X:\dgn\42600\042608\Geotech\G04 ISOPACS SHEET 1.dgn

Appendix B

Geotechnical Investigations

Babbage CONSULTANTS

SUMMARY OF SOIL PROFILE & TESTING

JOB No.	42608/GE
HOLE No.	BH4

PROJECT: WEST COAST ROAD, HENDERSON

DATE STARTED: 25/07/2006	METHOD: OB/SPT/TU/WD	RIG: Kubota STV40 Tractor Rig	SHEET 1 of 3
DATE FINISHED: 25/07/2006	DRILLED BY: Prodrill (Auck) Ltd.	FLUID: water	LOGGED BY: J. Franklin

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

DEPTH (m)	SOIL SYMBOL	GEOLOGIC UNIT	GROUND WATER
0.00			
	FILL: silt, clayey, very stiff, slightly to moderately plastic, dark brown with patches of orange clay, slightly moist.	FILL	NR
	Core slipped out of core barrel when being retrieved, so 0.5 - 1.0m run was taken to 1.5m. Core slipped again, so run was taken to 2.0m.		
0.90			
1.00	CLAY, silty, minor fine sand, very stiff, moderately plastic, mottled orange and bright orange, slightly moist, worm burrows infilled with fill material, roots.	PUKETOKA FORMATION (TAURANGA FORMATION)	
1.60	CLAY, fine to medium sandy, minor silt, pumiceous, stiff, moderately plastic, mottled orange, bright orange, light grey, grey and white, moist.		
2.00	Very sandy.		
3.00	Mottled bright orange and grey.		
3.20	CLAY, minor fine sand, minor silt, firm, highly plastic, brownish grey, very moist.		
3.60	CLAY, trace fine sand, trace silt, stiff to very stiff, highly plastic, light grey with faint black mottles, slightly moist.		
4.00	With black mottles, occasional organics, very moist.		
	4.45m: 2cm dark brown organic band.		
	Mottled grey and dark brownish grey.		
	4.7m: 2cm horizon of pumiceous sandy CLAY.		

SAMPLES RECOVERED & TEST RESULTS

CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE
		OB	80	
		OB	85	
	S1	SPT	100	5
		OB	55	
	S2	SPT	100	6
		OB	90	

MOISTURE CONTENTS = ●
LIMITS: PLASTIC = X LIQUID = +
20 40 60
IN SITU VANE (kPa) = ✳
50 100 150

OTHER TESTS
Corrected Shear Vane Result **
U = peak / R = remoulded
SPT / Scala Penetrometer

unable to penetrate

81kPa (U)
32kPa (R)
1/2/3
N = 5

36kPa (U)
27kPa (R)
2/3/3
N = 6

72kPa (U)
27kPa (R)

Remarks: The boundary between the Puketoka Formation and underlying Waitemata Group is very indistinct and is only approximate. IWGR = inferred Waitemata Group Rock.

** IN HOUSE METHOD BASED ON BS1377

Babbage CONSULTANTS	SUMMARY OF SOIL PROFILE & TESTING	JOB No.	42608/GE
	PROJECT: WEST COAST ROAD, HENDERSON	HOLE No.	BH4
DATE STARTED: 25/07/2006	METHOD: OB/SPT/TU/WD	RIG: Kubota STV40 Tractor Rig	SHEET 2 of 3
DATE FINISHED: 25/07/2006	DRILLED BY: Prodrill (Auck) Ltd.	FLUID: water	LOGGED BY: J. Franklin

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

DEPTH (m)	SOIL SYMBOL	SOIL/ROCK DESCRIPTION	GEOLOGIC UNIT	GROUND WATER
5.75		CLAY, with minor medium to coarse sand-sized lumps of cemented silt, very stiff, moderately plastic, dark grey with occasional white flecks, moist.	PUKETOKA FORMATION (TAURANGA FORMATION)	
6.00		Assumed core loss.		
6.90		CLAY, trace fine sand, trace silt, stiff, highly plastic, light grey with occasional black mottles, moist, occasional organics.		
7.50		ORGANIC CLAY, minor fine sand, minor silt, firm, highly plastic, dark brown with black mottles, moist, organic fragments.		
7.70		CLAY, as at 6.9m		
8.05		SAND, fine to medium, some silt, minor clay, non-plastic, light grey, slightly moist.		
8.40		Very silty.		
8.75		ORGANIC CLAY, minor fine sand, minor silt, firm, highly plastic, dark brown with black mottles, moist, organic fragments.		
9.25		CLAY, trace fine sand, trace silt, very stiff, moderately plastic, light grey, slightly moist.		
10.00				

SAMPLES RECOVERED & TEST RESULTS

DEPTH (m)	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	MOISTURE CONTENTS = ● LIMITS: PLASTIC = × LIQUID = + (20 40 60) IN SITU VANE (kPa) = ✳ (50 100 150)	OTHER TESTS: Corrected Shear Vane Result ** U = peak / R = remoulded SPT / Scala Penetrometer
		S3	SPT	100	4		1/2/2 N = 4
		O	WD	0			
5.75		T1	TU	100			
6.00							
			OB	55			
6.90							66kPa (U) 18kPa (R)
7.50							105kPa (U) 27kPa (R) 2/2/3 N = 5
7.70		S4	SPT	100	5	94.1 ●	
8.05							
8.40			OB	100			
8.75							
9.25		T2	TU	100			
10.00							170kPa (U) 32kPa (R)

Remarks: The boundary between the Puketoka Formation and underlying Waitemata Group is very indistinct and is only approximate. IWGR = inferred Waitemata Group Rock.

** IN HOUSE METHOD BASED ON BS1377

Babbage CONSULTANTS	SUMMARY OF SOIL PROFILE & TESTING	JOB No.	42608/GE
	PROJECT: WEST COAST ROAD, HENDERSON	HOLE No.	BH4
DATE STARTED: 25/07/2006	METHOD: OB/SPT/TU/WD	RIG: Kubota STV40 Tractor Rig	SHEET 3 of 3
DATE FINISHED: 25/07/2006	DRILLED BY: Prodrill (Auck) Ltd.	FLUID: water	LOGGED BY: J. Franklin

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

DEPTH (m)	SOIL SYMBOL	SOIL/ROCK DESCRIPTION	GEOLOGIC UNIT	GROUND WATER	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	MOISTURE CONTENTS = ● LIMITS: PLASTIC = X LIQUID = + (20 40 60) IN SITU VANE (kPa) = ✳ (50 100 150)	OTHER TESTS: Corrected Shear Vane Result ** U = peak / R = remoulded; SPT / Scala Penetrometer
		Increasing fine sand.					OB	100			
		Minor fine sand.									126kPa (U) 42kPa (R) 5/6/7 N = 13
		Trace fine sand.	PUKETOKA FORMATION (TAURANGA FORMATION)			S5	SPT	100	13		
		Grey with thin bands of fine sandy CLAY.					OB	67			91kPa (U) 44kPa (R)
12.00		Grades to CLAY, trace fine sand, trace silt, very stiff, moderately plastic, dark grey, slightly moist, with regular bands of fine sandy CLAY.				S6	SPT	100	12		116kPa (U) 31kPa (R) 4/5/7 N = 12
12.50			WAITEMATA GROUP SOIL								
12.60							OB	100			unable to penetrate
13.20											
13.30											unable to penetrate
13.50		Solid nose SPT at 13.5m				S7	SPT	0			12 / 20 / 30 blows for 90mm penetration
13.89			IWGR								
		End of Borehole at 13.89 m									

Remarks: The boundary between the Puketoka Formation and underlying Waitemata Group is very indistinct and is only approximate. IWGR = inferred Waitemata Group Rock.

** IN HOUSE METHOD BASED ON BS1377

Babbage CONSULTANTS

SUMMARY OF SOIL PROFILE & TESTING

JOB No.	42608/GE
PROJECT: WEST COAST ROAD, HENDERSON	
HOLE No.	BH3

DATE STARTED: 19/07/2006	METHOD: OB/SPT/TT	RIG: track mounted excavator rig	SHEET 1 of 2
DATE FINISHED: 19/07/2006	DRILLED BY: Prodrill (Auck) Ltd.	FLUID: water	LOGGED BY: J. Franklin / H. Singh

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

SAMPLES RECOVERED & TEST RESULTS

MOISTURE CONTENTS = ●
LIMITS: PLASTIC = X LIQUID = +
20 40 60
IN SITU VANE (kPa) = ✳
50 100 150

OTHER TESTS
Corrected Shear Vane Result **
U = peak / R = remoulded
SPT / Scala Penetrometer

DEPTH (m)	SOIL SYMBOL	DESCRIPTION	GEOLOGIC UNIT	GROUND WATER	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	OTHER TESTS
		SILT, clayey, minor fine sand, stiff, moderately plastic, dark grey, very moist.	PUKETOKA FORMATION (TAURANGA FORMATION)	NR			OB	90		
0.35		SILT, clayey, some fine sand, very stiff, moderately plastic, mottled orange and light grey, moist.								69kPa (U) 24kPa (R)
0.70		Grades to CLAY, minor silt, minor fine sand, very stiff, moderately plastic, mottled orange and light grey, moist.					OB	60		
1.00		Brownish grey with faint orange mottles.								112kPa (U) 70kPa (R)
		Moderately to highly plastic, moist.					OB	50		84kPa (U) 48kPa (R)
1.60		Stiff. Becomes silty.				S1	SPT	100	3	1/1/2 N = 3
1.80		CLAY, minor silt, minor fine sand, firm to stiff, highly plastic, light greyish brown, very moist.								
2.00							OB	100		
2.15		CLAY, minor silt, very stiff, moderately plastic, mottled grey, orange and bright orange, slightly moist.								
2.45		CLAY, very stiff to hard, some silt, trace fine sand, slightly plastic, uniform grey, slightly moist.					OB	100		110kPa (U) 32kPa (R)
3.00						S2	SPT	100	10	unable to penetrate 5/3/7 N = 10
3.25		SAND, fine to medium, some silt, non-plastic, grey, very moist to wet.								
3.55		SAND, fine to medium, some silt, non-plastic, light grey, wet.								
3.85		ORGANIC CLAY, minor silt, very stiff, moderately to highly plastic, dark greyish brown with black mottles, slightly moist, wood fragments.					OB	100		
4.00		CLAY, minor silt, trace fine sand, very stiff, moderately plastic, light grey, slightly moist.								149kPa (U) 29kPa (R)
						S3	SPT	100	7	2/3/4 N = 7
5.00										

Remarks:

** IN HOUSE METHOD BASED ON BS1377

Babbage CONSULTANTS

SUMMARY OF SOIL PROFILE & TESTING

JOB No. 42608/GE

PROJECT: WEST COAST ROAD, HENDERSON

HOLE No. BH3

DATE STARTED: 19/07/2006	METHOD: OB/SPT/TT	RIG: track mounted excavator rig	SHEET 2 of 2
DATE FINISHED: 19/07/2006	DRILLED BY: Prodrill (Auck) Ltd.	FLUID: water	LOGGED BY: J. Franklin / H. Singh

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

DEPTH (m)	Description	GEOLOGIC UNIT	GROUND WATER
	Minor fine sand.		
	Some fine sand.		
6.00	Some fine to medium sand.		
	Grades to CLAY, fine to medium sandy, minor silt, very stiff, moderately plastic, light grey with white flecks, slightly moist.	WAITEMATA GROUP SOIL	
6.70			
6.85	SILT, clayey, hard, slightly plastic, light grey, slightly moist, weakly cemented.		
7.00	SILTSTONE, very weak, completely weathered, grey to dark grey.	WAITEMATA GROUP ROCK	
7.10			
7.30	SANDSTONE, fine, very weak, well cemented, completely weathered.		
7.50	SILTSTONE, very weak, completely weathered, grey to dark grey, some sub-vertical fractures.		
	Solid nose SPT at 7.5m - material recovered in core barrel appeared to be siltstone.		
8.00			
8.20	SANDSTONE, fine, very weak to weak, very well cemented, highly weathered, grey, some sub-vertical white veins.		
9.00			
9.08	Solid nose SPT at 9.0m		
	End of Borehole at 9.075 m		

SAMPLES RECOVERED & TEST RESULTS

CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	OTHER TESTS
		OB	95		149kPa (U) 40kPa (R)
					110kPa (U) 36kPa (R)
	S4	SPT	100	9	2/4/5 N = 9
		OB	100		
	S5	SPT	0	23	10/11/12 N = 23
		TT	75		
	S6	SPT	0		50 blows for 75mm penetration

MOISTURE CONTENTS = ●
LIMITS: PLASTIC = X LIQUID = +
20 40 60
IN SITU VANE (kPa) = ✳
50 100 150

OTHER TESTS: Corrected Shear Vane Result ** U = peak / R = remoulded; SPT / Scala Penetrometer

Remarks:

** IN HOUSE METHOD BASED ON BS1377

Babbage CONSULTANTS

SUMMARY OF SOIL PROFILE & TESTING

JOB No. 42608/GE

PROJECT: WEST COAST ROAD, HENDERSON

HOLE No. BH2

DATE STARTED: 18/07/2006	METHOD: OB/SPT/TU/WD	RIG: track mounted excavator rig	SHEET 1 of 2
DATE FINISHED: 18/07/2006	DRILLED BY: Prodrill (Auck) Ltd.	FLUID: water	LOGGED BY: J. Franklin / H. Singh

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

SAMPLES RECOVERED & TEST RESULTS

MOISTURE CONTENTS = ●
LIMITS: PLASTIC = X LIQUID = +
IN SITU VANE (kPa) = ✳

OTHER TESTS
Corrected Shear Vane Result **
U = peak / R = remoulded
SPT / Scala Penetrometer

DEPTH (m)	SOIL SYMBOL	SOIL/ROCK DESCRIPTION	GEOLOGIC UNIT	GROUND WATER	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	OTHER TESTS
0.00		SILT, fine sandy, some clay, stiff to very stiff, moderately plastic, dark brownish grey, moist.	PUKETOKA FORMATION (TAURANGA FORMATION)	NR						
0.20		SILT, fine sandy, clayey, stiff to very stiff, slightly to moderately plastic, banded orange and light grey, moist.					OB	90		102kPa (U) 15kPa (R)
0.60		CLAY, fine sandy, some silt, stiff, moderately plastic, mottled grey, light grey and orange, moist.					OB	100		
0.90		CLAY, some fine sand, minor silt, stiff to very stiff, moderately plastic, mottled orange and light grey, slightly moist.								116kPa (U) 42kPa (R)
1.00		Mottled light greyish brown and orange, moist.					OB	100		
		Moderately to highly plastic.								102kPa (U) 59kPa (R)
		Highly plastic.					OB	80		
		Minor fine sand, mottled orange and light grey.								91kPa (U) 52kPa (R)
2.00		Trace fine sand.					OB	80		
2.90		CLAY, some silt, minor fine sand, stiff, highly plastic, mid-grey with black flecks, very moist, trace organics.								60kPa (U) 22kPa (R)
3.00		CLAY, minor fine sand, minor silt, stiff, moderately plastic, light grey, moist.				T1	TU	100		
3.25		CLAY, minor fine sand, minor silt, stiff, highly plastic, light brown with black mottles, moist, organics.								
3.55		CLAY, minor fine sand, minor silt, stiff, moderately plastic, light grey, moist.								
3.70		SAND, fine to medium, clayey, slightly plastic, light grey, moist.					OB	100		
3.95		SAND, fine to medium, some silt, non-plastic, light grey, moist.								
4.00		Dark grey, very moist. Wet.				S1	SPT	100	7	5/5/2 N = 7
4.25		ORGANIC CLAY, minor fine sand, minor silt,					WD	0		
4.90										
5.00										

Remarks:

** IN HOUSE METHOD BASED ON BS1377

Babbage CONSULTANTS

SUMMARY OF SOIL PROFILE & TESTING

JOB No.	42608/GE
PROJECT: WEST COAST ROAD, HENDERSON	
HOLE No.	BH2

DATE STARTED: 18/07/2006	METHOD: OB/SPT/TU/WD	RIG: track mounted excavator rig	SHEET 2 of 2
DATE FINISHED: 18/07/2006	DRILLED BY: Prodrill (Auck) Ltd.	FLUID: water	LOGGED BY: J. Franklin / H. Singh

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

SAMPLES RECOVERED & TEST RESULTS

MOISTURE CONTENTS = ●
LIMITS: PLASTIC = × LIQUID = +
20 40 60
IN SITU VANE (kPa) = ✳
50 100 150

OTHER TESTS
Corrected Shear Vane Result **
U = peak / R = remoulded
SPT / Scala Penetrometer

DEPTH (m)	SOIL SYMBOL		GEOLOGIC UNIT	GROUND WATER	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	OTHER TESTS
		abundant organics, highly plastic, dark brownish grey, moist.								
5.25		CLAY, minor silt, trace fine sand, stiff to very stiff, moderately plastic, light grey with occasional black mottles, moist.	PUKETOKA FORMATION (TAURANGA FORMATION)			T2	TU	100		
6.00		Moderately to highly plastic.					OB	100		162kPa (U) 48kPa (R)
		Highly plastic, very moist.				T3	TU	100		78kPa (U) 24kPa (R)
7.00		Moist.					OB	70		103kPa (U) 31kPa (R)
		Minor fine sand, moderately plastic. Pocket of fine sandy clay.								81kPa (U) 24kPa (R)
8.00		CLAY, fine sandy, minor silt, very stiff, moderately plastic, light grey with occasional green mottles, slightly moist.	WAITEMATA GROUP SOIL			S2	SPT	100	10	4/5/5 N = 10
		Mid-grey with white speckles.					OB	81		167kPa (U) 42kPa (R)
9.00		Fine to medium sandy, grades to dark grey. 10cm fine gravelly horizon (siltstone gravel) and carbonaceous material.				S3	SPT	100	18	unable to penetrate 7/8/10 N = 18
9.95		End of Borehole at 9.95 m								

Remarks:

** IN HOUSE METHOD BASED ON BS1377

Babbage CONSULTANTS

SUMMARY OF SOIL PROFILE & TESTING

JOB No. 42608/GE

PROJECT: WEST COAST ROAD, HENDERSON

HOLE No. BH1

DATE STARTED: 18/07/2006	METHOD: OB/SPT/TU	RIG: track mounted excavator rig	SHEET 1 of 3
DATE FINISHED: 18/07/2006	DRILLED BY: Prodrill (Auck) Ltd.	FLUID: water	LOGGED BY: J. Franklin / H. Singh

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

DEPTH (m)	Description	GEOLOGIC UNIT	GROUND WATER	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	OTHER TESTS
0.15	TOPSOIL.	TS	NR						
	SILT, clayey, minor fine sand, stiff, moderately plastic, dark grey, moist.					OB	80		66kPa (U) 18kPa (R)
						OB	90		
0.85	CLAY, minor silt, minor fine sand, firm to stiff, moderately plastic, mottled orange and light grey, moist.								
1.00						OB	100		91kPa (U) 52kPa (R)
	Highly plastic, brown with orange mottles, very moist, fine to medium sand-sized organics.				T1	TU	100		52kPa (U) 26kPa (R)
2.00									
2.05	Roots and organics.	PUKETOKA FORMATION (TAURANGA FORMATION)							
	CLAY, minor fine sand, stiff, highly plastic, light bluish grey, moist. Occasional bright orange mottles and white specks, occasional siltstone gravel. Root.					OB	100		48kPa (U) 7kPa (R)
	Becomes firm.				T2	TU	100		48kPa (U) 17kPa (R)
3.00									
	Trace fine sand.					OB	100		60kPa (U) 27kPa (R)
4.00	Occasional faint black mottles.				S1	SPT	100	5	45kPa (U) 18kPa (R) 1/2/3 N = 5
5.00									

MOISTURE CONTENTS = ●
LIMITS: PLASTIC = X LIQUID = +
20 40 60
IN SITU VANE (kPa) = ✳
50 100 150

OTHER TESTS
Corrected Shear Vane Result **
U = peak / R = remoulded
SPT / Scala Penetrometer

Remarks:

** IN HOUSE METHOD BASED ON BS1377

Babbage CONSULTANTS

SUMMARY OF SOIL PROFILE & TESTING

JOB No.	42608/GE
PROJECT: WEST COAST ROAD, HENDERSON	
HOLE No.	BH1

DATE STARTED: 18/07/2006	METHOD: OB/SPT/TU	RIG: track mounted excavator rig	SHEET 2 of 3
DATE FINISHED: 18/07/2006	DRILLED BY: Prodrill (Auck) Ltd.	FLUID: water	LOGGED BY: J. Franklin / H. Singh

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

SAMPLES RECOVERED & TEST RESULTS

MOISTURE CONTENTS = ●
LIMITS: PLASTIC = X LIQUID = +
20 40 60
IN SITU VANE (kPa) = ✳
50 100 150

OTHER TESTS
Corrected Shear Vane Result **
U = peak / R = remoulded
SPT / Scala Penetrometer

DEPTH (m)	SOIL SYMBOL	GEOLOGIC UNIT	GROUND WATER	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	OTHER TESTS
						OB	100		42kPa (U) 11kPa (R)
6.00									70kPa (U) 18kPa (R)
6.25					T3	TU	100		
						OB	100		70kPa (U) 24kPa (R)
7.00									134kPa (U) 31kPa (R)
					S2	SPT	100	13	5/6/7 N = 13
8.00									
8.05									
8.15						OB	90		
					S3	SPT	100	16	unable to penetrate 6/7/9 N = 16
9.00									
9.60						OB	100		
10.00									

Grades to mid-grey with black specks, some fine sand.

CLAY, some fine sand, minor silt, stiff becoming very stiff, moderately to highly plastic, light grey to mid-grey, moist.

Silty patches, mid-grey.

Band of fine sandy CLAY with some fine siltstone gravel.

CLAY, some fine sand, minor silt, very stiff, moderately to highly plastic, light grey to mid-grey, moist.

Very stiff to hard, with white flecks.

CLAY, fine sandy, some silt, trace siltstone gravel, hard, moderately plastic, dark grey, slightly moist, with pockets of fine sand.

WAITEMATA GROUP SOIL

Remarks:

** IN HOUSE METHOD BASED ON BS1377

Babbage CONSULTANTS

SUMMARY OF SOIL PROFILE & TESTING

JOB No.	42608/GE
HOLE No.	BH1

PROJECT: WEST COAST ROAD, HENDERSON

DATE STARTED: 18/07/2006	METHOD: OB/SPT/TU	RIG: track mounted excavator rig	SHEET 3 of 3
DATE FINISHED: 18/07/2006	DRILLED BY: Prodrill (Auck) Ltd.	FLUID: water	LOGGED BY: J. Franklin / H. Singh

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

SAMPLES RECOVERED & TEST RESULTS

MOISTURE CONTENTS = ●
LIMITS: PLASTIC = × LIQUID = +
20 40 60
IN SITU VANE (kPa) = ✳
50 100 150

OTHER TESTS
Corrected Shear Vane Result **
U = peak / R = remoulded
SPT / Scala Penetrometer

DEPTH (m)	SOIL SYMBOL	GEOLOGIC UNIT	GROUND WATER	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	OTHER TESTS
		WAITEMATA GROUP SOIL							7/10/15 N = 25
					S4	SPT	100	25	
Dark brown horizon, common sand patches, slightly plastic.									
10.95–11.00									
End of Borehole at 10.95 m									

Remarks:

** IN HOUSE METHOD BASED ON BS1377

EXPLANATION OF TERMS AND SYMBOLS

These pages present an explanation of the terms and symbols used on the log sheets entitled "Summary of Soil Profile and Testing". The materials, boundaries and conditions have been interpreted at the test hole locations only and could differ elsewhere on the site.

1. DEPTH / ELEVATION

This column refers to the depth below the ground surface existing at the time of drilling. The corresponding elevations are shown with respect to the datum noted where survey information is available.

2. SOIL AND ROCK SYMBOL

This column contains the standard soil and rock symbols used by Babbage for the materials encountered in the boreholes as shown below:

Fill	Clay	Boulders
Asphalt	Silt	Sandstone
Concrete	Sand	Siltstone
Topsoil	Gravel	Volcanic Rock
Peat or Organic Soil	Cobbles	Uncertain Material

3. SOIL AND ROCK DESCRIPTION

The terms used to describe the soils and rocks are generally in accordance with the NZ Geomechanics Society's "***Guidelines for the Field Description of Soils and Rocks in Engineering Use***", Nov. 1988 and the NZ Geotechnical Society's "***Guidelines for the Classification and Field Description of Soils and Rocks for Engineering Purposes***" Feb 2003 (draft for comment).

The **soils** are generally described in the following order:

Major soil type, minor soil type/s, consistency (for cohesive soils) or density (for cohesionless soils), plasticity, structure and/or particle shapes, colour, moisture condition, minor inclusions, other significant aspects (e.g. geological description).

Where rock is encountered, the **rock material** and the **rock mass** are described in the following order:

Major rock type, texture and fabric, strength, weathering, colour, discontinuity type, discontinuity spacing, discontinuity orientation, discontinuity opening, discontinuity roughness, geological description (if this can be determined).

Where no field or laboratory tests are carried out, the soils and rock descriptions are based on handling and visual assessment of the recovered samples. **Any design based on such descriptions should allow for the generic nature of the descriptions.**

4. GEOLOGIC UNIT

This column divides the soil and/or rock encountered in the borehole into units that have been formally described and published by geologists (determined from geological maps), or informal units describing what general categories the materials belong to eg. fill, weathered rock, alluvium, etc.

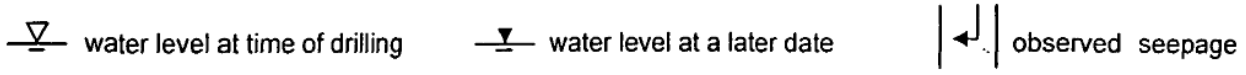
EXPLANATION OF TERMS AND SYMBOLS

5. PIEZOMETER

This column graphically displays what happens to the hole on completion of drilling – ie. whether the hole is backfilled, left open with a plug, or if a piezometer/standpipe is installed. Details of the installation are given in the "Remarks" section at the bottom of the log.

6. GROUNDWATER

The groundwater level, or the depth at which free water was observed in the borehole, or any seepage observed in the borehole, are denoted by the symbols given below.



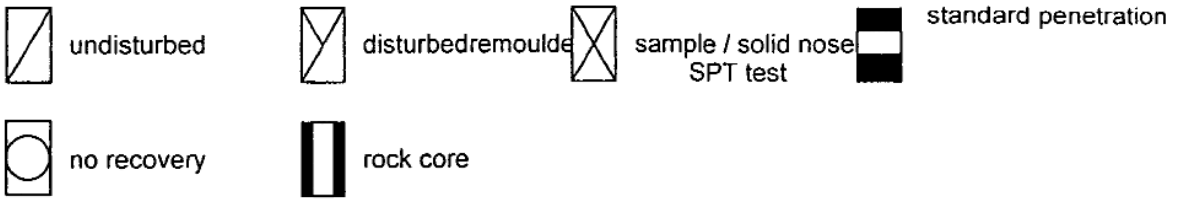
The level is the water level in an open hole unless otherwise indicated.

N in the column indicates the water level could not be recorded due to drilling water/mud, rain or hole caving.
NR in this column indicates that no record of the groundwater level was taken.
D in this column indicates that the hole was dry.
F in this column indicates when free water in the hole was first noticed.

7. SOIL SAMPLES

Condition

This column indicates the depth, length and condition of each sample taken. The following symbols are used to represent the condition of the samples.



Type (and sample number)

The type of sample and its sequential number is indicated in this column as follows:

A	auger sample	**P**	piston tube sample
B	block or bulk sample	**S**	standard penetration test (SPT) sample
D	disturbed sample (eg. open barrel core)	**T**	thin-walled tube sample
J	jar sample	**W**	wash or air return sample
GW	ground water sample	**O**	other (see text)

Disturbed soils samples are transported and stored in plastic bags. Machine borehole disturbed samples are transported and stored in core boxes. Tube samples are sealed with plastic bags in the field and with wax on return to the laboratory.

Method

This refers to the particular drilling/sampling technique:

HA	hand auger	**TU**	push-tube
HD	hand dug	**SSA**	solid stem machine auger
HSA	hollow stem machine auger	**SPT**	standard penetration test
EX	hydraulic excavator	**SP**	scala penetrometer
OB	open barrel	**TT**	triple tube
PP	pneumatic percussion	**WD**	wash drill

EXPLANATION OF TERMS AND SYMBOLS

Recovery

This column gives the sample recovery as a percentage of the sampled length for open barrel and triple tube core runs, and also split spoon SPT tests. If nothing is shown, the sample recovery was not measured.

8. TEST RESULTS

Penetration Resistance

The Penetration Resistance is the number of blows required to drive either a 50mm (outside diameter) open end "spilt spoon" or "Raymond" sampler the final 300mm of a 450mm penetration using a 64kg weight falling 760mm. The number of blows required to drive the sampler the final 300mm is referred to as the **"N" value**. The test is referred to as the **Standard Penetration Test or SPT**. The number of blows for each 150mm penetration of the test, or part-penetration when driving is terminated due to hard ground, are given in the "Other Tests" column, e.g. 15, 36, 46 for 55mm would indicate 15 blows for the first 150mm, 36 blows for the second 150mm and 46 blows for a further 55mm penetration and a N value of greater than 50 would be reported.

In some cases a solid steel 60° cone is used for this test (a **solid nose Standard Penetration Test**). For these cases the penetration resistance is reported as an **"S" value** is reported in this column.

Water Content and Atterberg Limits

The moisture or water content, plastic limit and liquid limit of the recovered soil sample, as determined in the laboratory in accordance with the test procedures set out in NZS4402, is plotted against depth. The abbreviations and graphic symbols are defined as follows:

•	w	natural moisture content
×	w_P	plastic limit
+	w_L	liquid limit

Other Tests

The following abbreviations are used to indicate the type of test undertaken:

COM	Compaction Test	pp	Pocket penetrometer strength
*CON	Consolidation test	*Q	Consolidated undrained triaxial test
G	Specific gravity or solid density of particles	qu	Unconfined compressive strength
k	Permeability coefficient	*SB	Shear box test
LS	Linear shrinkage	SP	Scala penetrometer
OC	Organic content	*ST	Swelling test
*PSD	Particle size distribution	SV	Vane shear strength: (U) – undisturbed (R) – remoulded

*These tests are usually summarised separately.

9. REMARKS

Any additional observations or relevant information such as weather conditions, piezometer design, daily drilling progress, survey co-ordinates of the borehole, problems encountered during drilling, etc.

Appendix C

Laboratory Testing

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Please reply to: W.E. Campton

Babbage Consultants Limited
P O Box 2027
Auckland 1140, New Zealand

Job Number: 42608/GE/L
File:
Checked by: J.F.
JF
28th July 2006

Attention: **RUSSELL ALLISON**

Dear Sir,

Re: ***West Coast Road, Henderson***
SPT Moisture Content Testing
Report No. 42608/GE/L/SPT Moistures

The following table presents the results of moisture content testing on drill rig Standard Penetration Test (SPT) soil samples collected by this laboratory on the 18th, 19th and 25th of July 2006. Test Standards used are as follows:

Moisture Content NZS4402:1986:Test 2.1

Hole No	Sample No	Depth (m)	Moisture Content (%)
BH1	S1	4.50 – 4.95	61.8
	S2	7.50 – 7.95	37.4
	S3	9.00 – 9.45	34.6
	S4	10.50 – 10.95	33.4
BH2	S1	4.50 – 4.95	44.0
	S2	8.00 – 8.45	45.9
	S3	9.50 – 9.95	33.3
BH3	S1	1.50 – 1.95	72.8
	S2	3.00 – 3.45	76.4
	S3	4.50 – 4.95	42.6
	S4	6.00 – 6.45	38.1
BH4	S1	2.00 – 2.45	37.2
	S2	3.50 – 3.95	61.8
	S3	5.00 – 5.45	67.5
	S4	7.50 – 7.95	94.1
	S5	10.50 – 10.95	46.1
	S6	12.00 – 12.45	38.8

Thank you for the opportunity to carry out this testing. If you have any queries regarding the content of this report please contact the undersigned at your convenience.

Yours faithfully,

Wayne Campton
Signatory (Laboratory Manager)
Babbage Geotechnical Laboratory

new zealand accredited laboratory

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation. This report may not be reproduced except in full.

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Auckland 1140, New Zealand

Attention: **RUSSELL ALLISON**

Job Number: 42608/GE/L
File:
Checked by:
JF
7th August 2006

Dear Sir,

Re: ***West Coast Road***
Plasticity Testing
Report No. 42608/GE/L/AL

The following table presents the results of Atterberg Limits testing on soil push-tube samples collected by this laboratory on the 18th of July 2006. Our instructions were to determine the natural moisture content and plasticity index of these samples. Page two of this report shows where these samples plot on the Casagrande Chart.

Test standards used were:

Moisture Content:	NZS4402:1986:Test 2.1	Plastic Limit:	NZS4402:1986:Test 2.3
Liquid Limit:	NZS4402:1986:Test 2.2	Plasticity Index:	NZS4402:1986:Test 2.4

Sample Number	Depth (m)	Moisture Content (%)	Liquid Limit	Plastic Limit	Plasticity Index
BH1 T1	1.50 – 1.95	39.0	78	25	**53**
BH1 T2	3.00 – 3.45	60.4	110	30	**80**
BH2 T2	5.00 – 5.45	42.4	68	22	**46**

Note: The whole soil was used for these tests and was wet up & dried where required.
The test results relate only to the samples under test due to the sampling procedure.

Thank you for the opportunity to carry out this testing. If you have any queries regarding the content of this report please contact the undersigned at your convenience.

Yours faithfully,

Wayne Campton
Signatory (Laboratory Manager)
Babbage Geotechnical Laboratory

new zealand accredited laboratory

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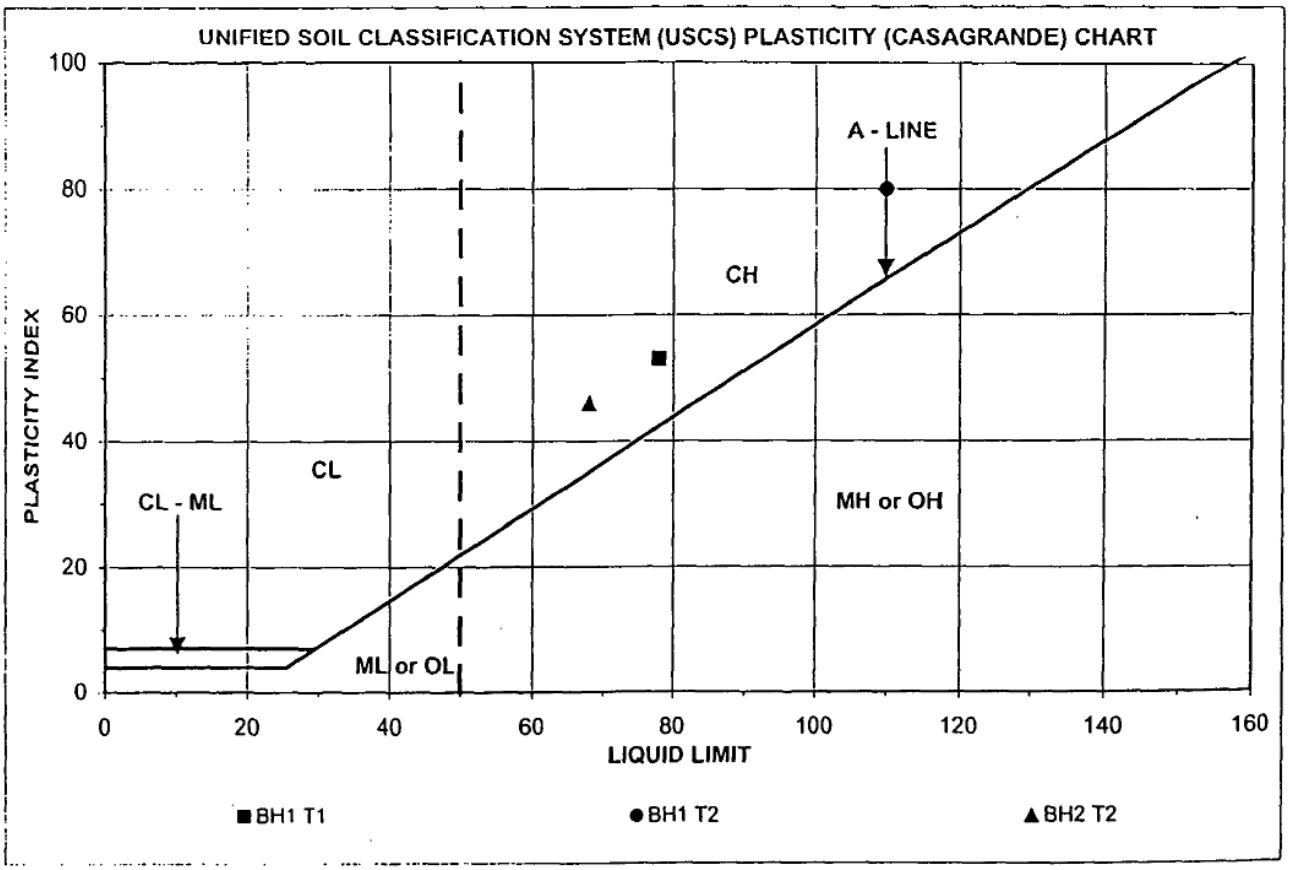
BGL BABBAGE GEOTECHNICAL LABORATORY	Job No: 42608/GE/L Reg. No: 1503	Report No: 42608/GE/L/AL	Page 2 of 2 Issue Date: Feb-06 Rev: 0

PROJECT: WEST COAST ROAD, HENDERSON

		Initials	Date
Determination of the Liquid Limit, Plastic Limit, and the Plasticity Index	Tested By:	JF	4/08/06
	Compiled By:	JF	7/08/06
Test Method: NZS4402: 1986: Test 2.2, Test 2.3 and Test 2.4	Checked By:	JF	7/08/06

SUMMARY OF TESTING

SAMPLE NUMBER	Liquid Limit	Plastic Limit	Plasticity Index	Soil Classification
BH1 T1 / 1.50 - 1.95m	78	25	53	CH
BH1 T2 / 3.00 - 3.45m	110	30	80	CH
BH2 T2 / 5.00 - 5.45m	68	22	46	CH



LEGEND

CL	Clay - low plasticity	**CH**	Clay - high plasticity
ML	Silt - low liquid limit	**MH**	Silt - high liquid limit
OL	Organic Soil - low liquid limit	**OH**	Organic Soil - high liquid limit

NOTE: soil type descriptions are based on recommendations in the NZGS "Field Description of Soils & Rocks" (Draft for comment Feb 2003).

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Auckland 1140, New Zealand

Job Number: 42608/GE/L

Checked by: JF

23rd August 2006

Attention: **RUSSELL ALLISON**

Dear Sir,

Re: ***West Coast Road***
One Dimensional Consolidation Testing
Report Number: 42608/GE/L/ODC

The following ten pages presents a summary of the results of one dimensional consolidation testing on 75mm and 60mm diameter push-tube samples collected by this laboratory on the 18th of July 2006. These push-tube samples were tested in accordance with the following standards:

Moisture Content:	NZS4402:1986:Test 2.1
One Dimensional Consolidation:	NZS4402:1986:Test 7.1

Samples were extruded from the tube and then trimmed close to final ring diameter using a scalpel blade. The consolidation ring was then pushed over the trimmed soil until the sample protruded from both ends of the ring. A wire was then used to cut the sample from the remaining tube and a flat edge used to trim the soil in the ring.

These test results relate to the samples tested only. The values of Mv shown on the tables have been calculated for each pressure increment, using void ratio difference for that increment.

Sample Descriptions ;

BH1 T1 / 1.50 – 1.95m
CLAY, trace fine sand, trace silt, firm to stiff, highly plastic, light grey with orange & black mottles, very moist, rootlets.

BH1 T2 / 3.00 – 3.45m
CLAY, trace fine sand, trace silt, firm, highly plastic, light grey, very moist.

BH2 T2 / 5.00 – 5.45m
CLAY, minor fine sand, minor silt, very stiff, highly plastic, light grey, slightly moist.

Thank you for the opportunity to carry out this testing. If you have any queries regarding the content of this report please contact the undersigned at your convenience.

Yours faithfully,

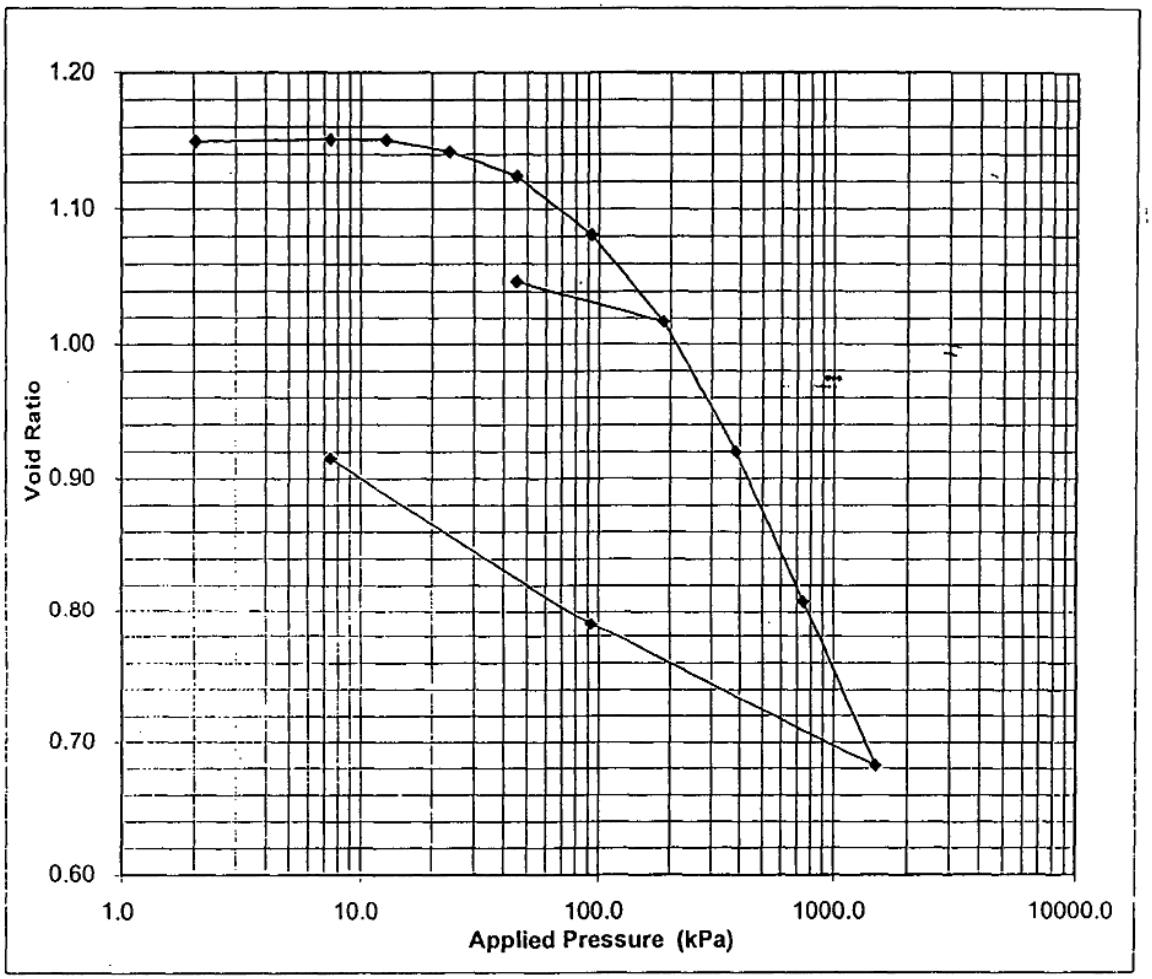
Wayne Campton
Signatory (Laboratory Manager)
Babbage Geotechnical Laboratory

new zealand accredited laboratory

All tests reported herein have been performed in accordance with the laboratory's *scope of accreditation*. This report may not be reproduced except in full.

	Job No:	Reg. No:	Sheet	of	Issue Date:	Aug-99
BGL BABBAGE GEOTECHNICAL LABORATORY	42608/GE/L	1503	2	10	Rev. No:	4
	PROJECT				Auth. By:	WEC
	WEST COAST ROAD					
					Initials	Date
ONE DIMENSIONAL CONSOLIDATION				Tested By:	JF	Jul-06
Test Method: NZS4402:1986:Test 7.1				Compiled By:	JF	Jul-06
				Checked By:	WEC	23/08/06

Bore No: BH1 **Sample Number:** T1 **Depth:** 1.5 - 2.0m



Applied Pressure kPa	Void Ratio e	Mv m²/MN	Consolidation Coefficient Cv (log t) m²/year	Cv (sqrt t) m²/year
2.0	1.149			
7.5	1.151	-0.127		
12.9	1.151	0.024		
23.7	1.142	0.369	1.9	9.9
45.4	1.124	0.391	1.3	2.7
93.1	1.081	0.421	1.4	3.6
186.3	1.017	0.329	1.1	2.1
45.4	1.047	0.104		
186.3	1.018	0.102		
383.6	0.920	0.245	1.0	1.3
747.7	0.808	0.160	0.9	1.0
1493.5	0.682	0.093	0.8	1.1
93.1	0.790	0.046		
7.5	0.915	0.818		

BGL Babbage Geotechnical Laboratory	Job No: 42608/GE/L	Reg. No: 1503	Sheet 3 of 10	Issue Date:	Aug-99
				Rev. No:	4
	PROJECT: WEST COAST ROAD			Auth. By:	WEC
				Initials	Date
ONE DIMENSIONAL CONSOLIDATION Test Method: NZS4402:1986:Test 7.1			Tested By:	JF	Jul-06
			Compiled By:	JF	Jul-06
			Checked By:	WEC	23/08/06

RESULT SUMMARY:

Bore Number: BH1 **Sample Number:** T1 **Depth:** 1.5 - 2.0m

Sample History: Undisturbed ~~/ remoulded / compacted / other~~
Specimen from 75mm diameter tube
~~Compacted with ..... compactive effort / other~~

Sample preparation: Extruded from 75mm diameter tube in increments and trimmed around ring. 60mm diameter ring then pushed over sample.

Test details: Consolidation machine number : 2 Ring number : Brass
Area of ring : 2827mm^2
Solid density of soil particles, Ps = 2.65t/m^3 : ~~measured~~/assumed

		INITIAL		FINAL	
Mass of dry specimen	Ms (g)		72.50		72.50
Thickness of specimen	H (mm)	Hi	20.800	Hf	16.278
Water content	w (%)	w_i	42.8	w_f	36.5
Dry density $P_d = \frac{M_S}{H \times A}$	t/m^3	Pd_i	1.23	Pd_f	1.58
Height of Soil Particles $H_S = \frac{M_S \times 1000}{P_S \times A}$	mm	Hs	9.677	Hs	9.677
Void Ratio $e = \frac{H - H_S}{H_S}$		e_i	1.149	e_f	0.682
Degree of Saturation $S = \frac{P_S \times w}{e}$	%	Si	98.6	Sf	142

BABBAGE GEOTECHNICAL LABORATORY

Job No:	Reg. No:	Sheet of	Issue Date:	Aug-99
42608/GE/L	1503	4 10	Rev. No:	4
PROJECT			Auth. By:	WEC
WEST COAST ROAD				
			Initials	Date

ONE DIMENSIONAL CONSOLIDATION
Test Method: NZS4402:1986:Test 7.1

Tested By:	JF	Jul-06
Compiled By:	JF	Jul-06
Checked By:	WEC	23/08/06

Bore No: BH1 **Sample Number:** T1 **Depth:** 1.5 - 2.0m

Applied Pressure kPa	Incremental Deflection mm	Thickness of Specimen mm	Comp Ratio	Height of Voids mm	Void Ratio e	Coefficient of Consolidation (log t) m²/year	Coefficient of Consolidation (sqrt t) m²/year
2.0	0.000	20.800	1.000	11.123	1.149		
7.5	-0.014	20.814	1.001	11.138	1.151		
12.9	0.003	20.812	1.001	11.135	1.151		
23.7	0.083	20.728	0.997	11.052	1.142	1.94	9.93
45.4	0.176	20.553	0.988	10.876	1.124	1.35	2.70
93.1	0.412	20.140	0.968	10.464	1.081	1.37	3.62
186.3	0.618	19.523	0.939	9.846	1.017	1.05	2.13
45.4	-0.286	19.809	0.952	10.132	1.047		
186.3	0.286	19.523	0.939	9.846	1.018		
383.6	0.944	18.579	0.893	8.903	0.920	0.99	1.33
747.7	1.084	17.495	0.841	7.818	0.808	0.88	1.00
1493.5	1.217	16.278	0.783	6.602	0.682	0.78	1.08
93.1	-1.040	17.318	0.833	7.641	0.790		
7.5	-1.213	18.531	0.891	8.854	0.915		

Overburden Pressure P_o kpa

Pressure P_i $P_o + 100$ kPa

Thickness at P_o H_o mm

Thickness at P_i H_i mm

Voids Ratio at P_o e_o

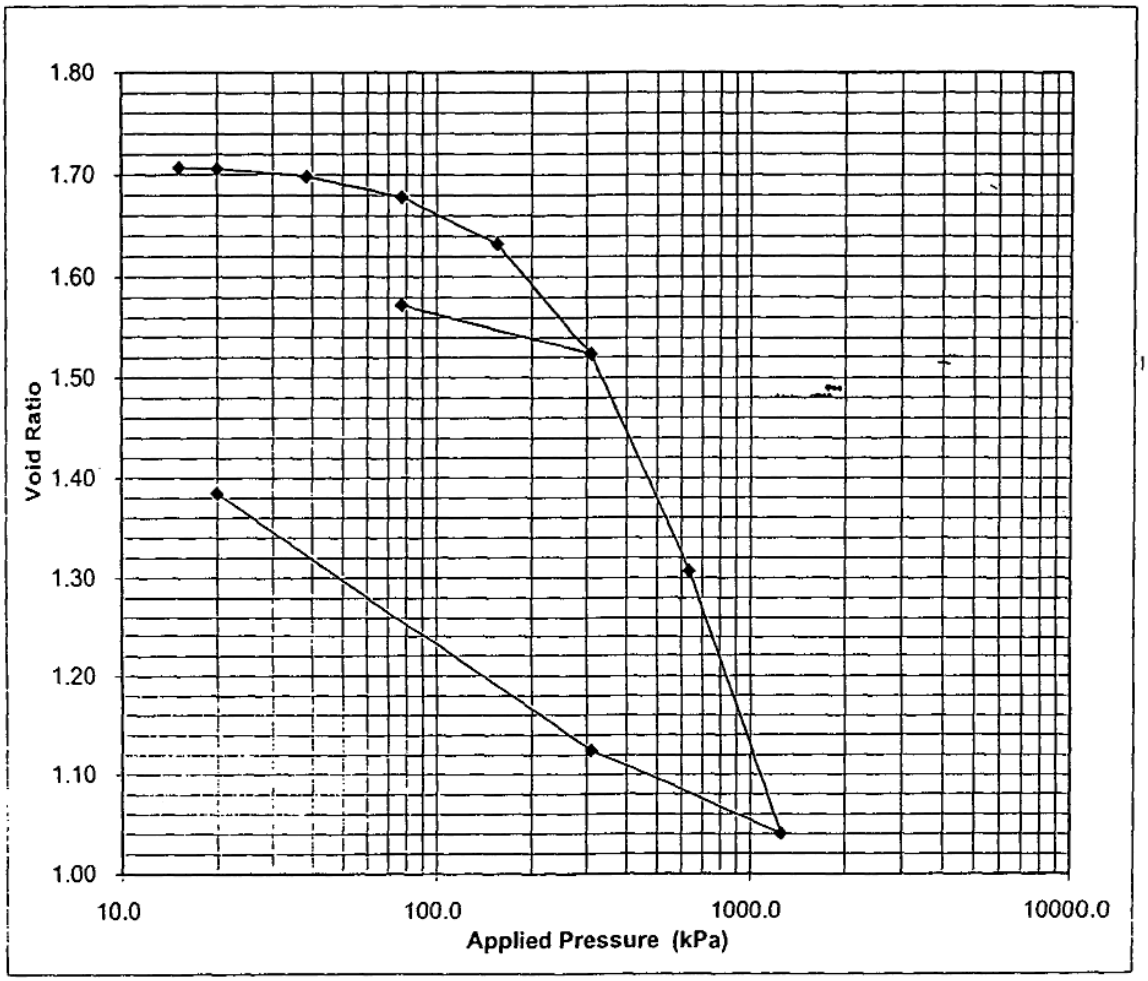
Voids Ratio at P_i e_i

Coefficient of Compressibility M_v m^2/MN

$$\frac{(e_o - e_i)}{(1+e_o)(P_i - P_o)} * 1000$$

	Job No:	Reg. No:	Sheet	of	Issue Date:	Aug-99
BGL BABBAGE GEOTECHNICAL LABORATORY	42608/GE/L	1503	5	10	Rev. No:	4
	PROJECT				Auth. By:	WEC
	WEST COAST ROAD					
					Initials	Date
ONE DIMENSIONAL CONSOLIDATION					Tested By:	JF Jul-06
Test Method: NZS4402:1986:Test 7.1					Compiled By:	JF Jul-06
					Checked By:	WEC 23/08/06

Bore No: BH1 **Sample Number:** T2 **Depth:** 3.0-3.5m



Applied Pressure kPa	Void Ratio e	MV m²/MN	Consolidation Coefficient Cv (log t) m²/year	Cv (sqrt t) m²/year
15.1	1.707			
20.0	1.706	0.060		
38.4	1.698	0.156	3.6	6.4
77.3	1.678	0.190	2.7	4.4
154.9	1.632	0.221	2.9	3.5
310.2	1.523	0.267	1.3	1.6
77.3	1.573	0.084		
310.2	1.523	0.083		
636.4	1.307	0.263	1.2	1.2
1257.7	1.040	0.186	1.0	1.0
310.2	1.125	0.044		
20.0	1.385	0.422		

BGL Babbage Geotechnical Laboratory	Job No: 42608/GE/L	Reg. No: 1503	Sheet of 6 10	Issue Date:	Aug-99
				Rev. No:	4
	PROJECT WEST COAST ROAD			Auth. By:	WEC
				Initials	Date
ONE DIMENSIONAL CONSOLIDATION Test Method: NZS4402:1986:Test 7.1			Tested By:	JF	Jul-06
			Compiled By:	JF	Jul-06
			Checked By:	WEC	23/08/06

RESULT SUMMARY:

Bore Number: BH1 **Sample Number:** T2 **Depth:** 3.0-3.5m

Sample History: Undisturbed ~~/ remoulded / compacted~~ / ~~other~~
Specimen from 75mm diameter tube
~~Compacted with ..... compactive effort / other~~

Sample preparation: Extruded from 75mm diameter tube in increments and trimmed around ring. 63.4mm diameter ring then pushed over sample.

Test details: Consolidation machine number : 7 Ring number : Silver
Area of ring : 3157mm^2
Solid density of soil particles, Ps = 2.65 t/m^3 : ~~measured~~/assumed

		INITIAL		FINAL	
Mass of dry specimen	Ms (g)		70.46		70.46
Thickness of specimen	H (mm)	Hi	22.800	Hf	17.186
Water content	w (%)	w_i	68.3	w_f	53.6
Dry density $P_d = \frac{M_S}{H \times A}$	t/m^3	Pd_i	0.98	Pd_f	1.30
Height of Soil Particles $H_S = \frac{M_S \times 1000}{P_S \times A}$	mm	Hs	8.423	Hs	8.423
Void Ratio $e = \frac{H - H_S}{H_S}$		e_i	1.707	e_f	1.040
Degree of Saturation $S = \frac{P_S \times w}{e}$	%	Si	106.0	Sf	137

BGL BABBAGE GEOTECHNICAL LABORATORY	Job No: 42608/GE/L	Reg. No: 1503	Sheet 7 of 10	Issue Date:	Aug-99
	PROJECT WEST COAST ROAD			Rev. No:	4
				Auth. By:	WEC
				Initials	Date
ONE DIMENSIONAL CONSOLIDATION Test Method: NZS4402:1986:Test 7.1			Tested By:	JF	Jul-06
			Compiled By:	JF	Jul-06
			Checked By:	WEC	23/08/06

Bore No: BH1 **Sample Number:** T2 **Depth:** 3.0-3.5m

Applied Pressure kPa	Incremental Deflection mm	Thickness of Specimen mm	Comp. Ratio %	Height of Voids mm	Void Ratio e	Coefficient of Consolidation (log t) m^2/year	Coefficient of Consolidation (sqrt t) m^2/year
15.1	0.000	22.800	1.000	14.377	1.707		
20.0	0.007	22.793	1.000	14.371	1.706		
38.4	0.066	22.728	0.997	14.305	1.698	3.55	6.41
77.3	0.167	22.560	0.989	14.138	1.678	2.69	4.42
154.9	0.388	22.172	0.972	13.750	1.632	2.94	3.53
310.2	0.920	21.252	0.932	12.830	1.523	1.28	1.62
77.3	-0.417	21.669	0.950	13.246	1.573		
310.2	0.417	21.252	0.932	12.830	1.523		
636.4	1.820	19.432	0.852	11.010	1.307	1.17	1.15
1257.7	2.246	17.186	0.754	8.763	1.040	0.98	0.96
310.2	-0.711	17.897	0.785	9.475	1.125		
20.0	-2.192	20.089	0.881	11.666	1.385		

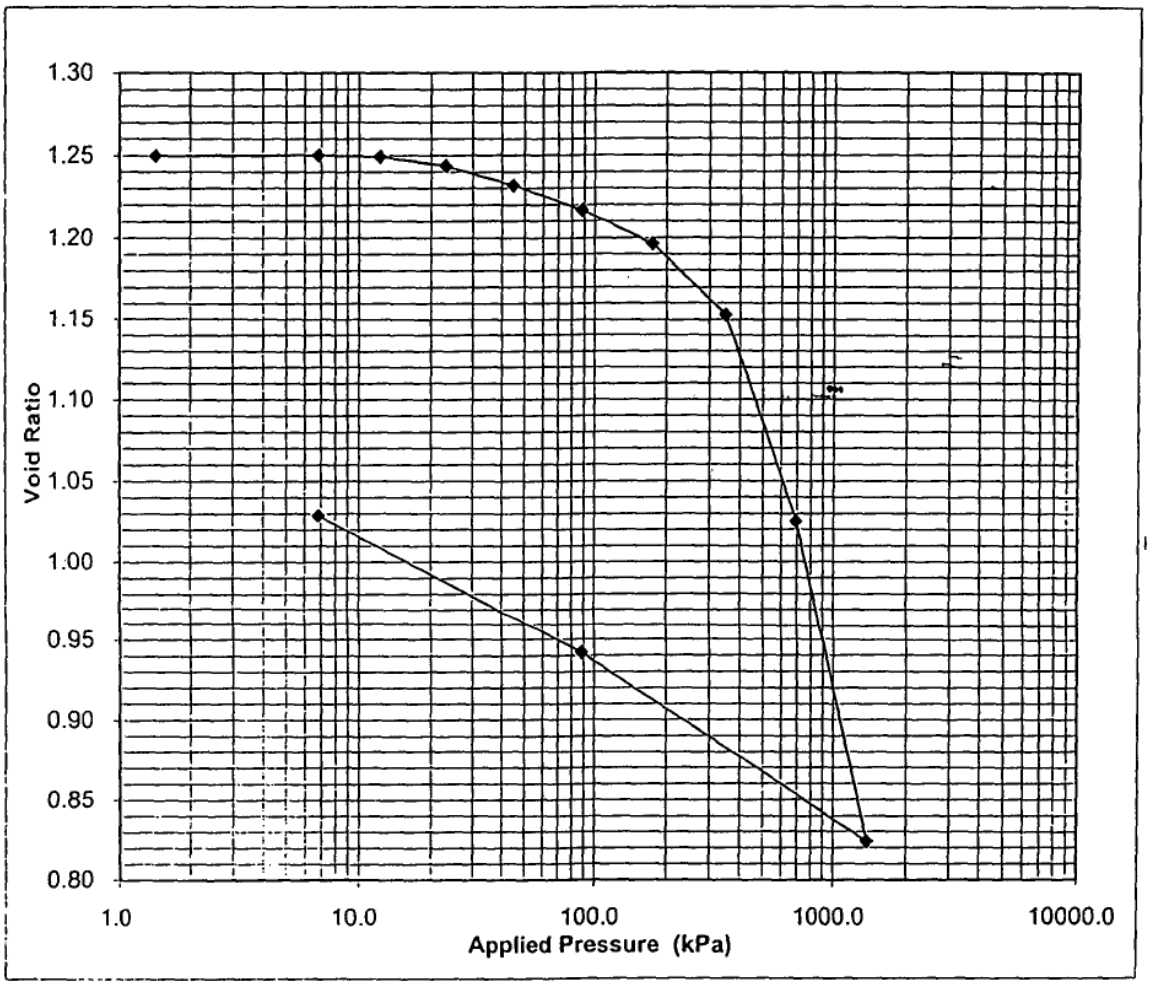
Overburden Pressure	P_o	kpa
Pressure P_i	$P_o + 100$	kPa
Thickness at P_o	H_o	mm
Thickness at P_i	H_i	mm
Voids Ratio at P_o	e_o	
Voids Ratio at P_i	e_i	

Coefficient of Compressibility M_v m^2/MN

$$\frac{(e_o - e_i)}{(1+e_o)(P_i - P_o)} \quad *1000$$

BABBAGE GEOTECHNICAL LABORATORY	Job No: 42608/GE/L	Reg. No: 1503	Sheet 8 of 10	Issue Date:	Aug-99
				Rev. No:	4
	PROJECT: WEST COAST ROAD			Auth. By:	WEC
				Initials	Date
ONE DIMENSIONAL CONSOLIDATION Test Method: NZS4402:1986:Test 7.1			Tested By:	JF	Aug-06
			Compiled By:	JF	Aug-06
			Checked By:	WEC	23/08/06

Bore No: BH2 **Sample Number:** T2 **Depth:** 5.0 - 5.5m



Applied Pressure kPa	Void Ratio e	Mv m²/MN	Consolidation Coefficient Cv (logt) m²/year	Cv (sqrt t) m²/year
1.4	1.250			
6.8	1.250	0.000		
12.3	1.249	0.094	18.1	48.2
23.1	1.244	0.222	18.0	30.8
44.8	1.232	0.246	18.0	30.7
88.1	1.217	0.156	16.0	26.7
174.8	1.196	0.105	17.5	34.4
348.3	1.153	0.114	11.9	20.4
695.1	1.025	0.171	2.5	6.6
1388.8	0.824	0.143	1.1	2.2
88.1	0.942	0.050		
6.8	1.029	0.550		

	Job No:	Reg. No:	Sheet of	Issue Date:	Aug-99
BGL BABBAGE GEOTECHNICAL LABORATORY	42608/GE/L	1503	9 10	Rev. No:	4
	PROJECT			Auth. By:	WEC
	WEST COAST ROAD				
				Initials	Date
ONE DIMENSIONAL CONSOLIDATION			Tested By:	JF	Aug-06
Test Method: NZS4402:1986:Test 7.1			Compiled By:	JF	Aug-06
			Checked By:	WEC	23/08/06

RESULT SUMMARY:

Bore Number: BH2 **Sample Number:** T2 **Depth:** 5.0 - 5.5m

Sample History: Undisturbed ~~/ remoulded / compacted / other~~
Specimen from 60mm diameter tube
~~Compacted with ..... compactive effort / other~~

Sample preparation: Extruded from 60mm diameter tube directly into ring, ends of sample then trimmed flat with edge of ring using a straight edge.

Test details: Consolidation machine number : 1 Ring number : Silver
Area of ring : 2827mm^2
Solid density of soil particles, Ps = 2.65t/m^3 : ~~measured~~/assumed

		INITIAL		FINAL	
Mass of dry specimen	Ms (g)		83.26		83.26
Thickness of specimen	H (mm)	Hi	25.000	Hf	20.269
Water content	w (%)	w_i	48.1	w_f	41.9
Dry density $P_d = \frac{M_S}{H \times A}$	t/m^3	Pd_i	1.18	Pd_f	1.45
Height of Soil Particles $H_S = \frac{M_S \times 1000}{P_S \times A}$	mm	Hs	11.112	Hs	11.112
Void Ratio $e = \frac{H - H_S}{H_S}$		e_i	1.250	e_f	0.824
Degree of Saturation $S = \frac{P_S \times w}{e}$	%	Si	102.0	Sf	135

BGL BABBAGE GEOTECHNICAL LABORATORY	Job No: 42608/GE/L	Reg. No: 1503	Sheet 10 of 10	Issue Date:	Aug-99
				Rev. No:	4
	PROJECT WEST COAST ROAD			Auth. By:	WEC
				Initials	Date
ONE DIMENSIONAL CONSOLIDATION			Tested By:	JF	Aug-06
Test Method: NZS4402:1986:Test 7.1			Compiled By:	JF	Aug-06
			Checked By:	WEC	23/08/06

Bore No: BH2 **Sample Number:** T2 **Depth:** 5.0 - 5.5m

Applied Pressure kPa	Incremental Deflection mm	Thickness of Specimen mm	Comp Ratio	Height of Voids mm	Void Ratio e	Coefficient of Consolidation (log t) m^2/year	Coefficient of Consolidation (sqrt t) m^2/year
1.4	0.000	25.000	1.000	13.888	1.250		
6.8	-0.005	25.005	1.000	13.893	1.250		
12.3	0.013	24.993	1.000	13.881	1.249	18.06	48.20
23.1	0.060	24.932	0.997	13.820	1.244	18.04	30.82
44.8	0.133	24.799	0.992	13.687	1.232	17.96	30.67
88.1	0.167	24.632	0.985	13.520	1.217	15.99	26.67
174.8	0.225	24.407	0.976	13.295	1.196	17.53	34.36
348.3	0.484	23.923	0.957	12.811	1.153	11.91	20.41
695.1	1.419	22.504	0.900	11.392	1.025	2.48	6.61
1388.8	2.235	20.269	0.811	9.157	0.824	1.10	2.25
88.1	-1.310	21.579	0.863	10.467	0.942		
6.8	-0.965	22.544	0.902	11.432	1.029		

Overburden Pressure	P_o		kpa
Pressure P_i	$P_o + 100$		kPa
Thickness at P_o	H_o		mm
Thickness at P_i	H_i		mm
Voids Ratio at P_o	e_o		
Voids Ratio at P_i	e_i		

Coefficient of Compressibility M_v m^2/MN

$$\frac{(e_o - e_i)}{(1+e_o)(P_i - P_o)} * 1000$$

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Please reply to: W.E. Campton

Babbage Consultants Limited
P O Box 2027
Auckland 1140, New Zealand

Attention: Russell Allison

Job Number: 42608/GE

Checked by:
WEC
2nd November 2006

Dear Sir,

Re: West Coast Road
Triaxial Testing - Quick Undrained
Report Number 42608/QUT Aug 06 Rev A

The following 2 pages presents the results of Compressive Strength in Undrained Triaxial Compression without Measurement of Pore Water Pressure testing on two tube samples collected by this laboratory on the 18th July 2006. The 60 mmØ tube samples were tested in accordance with the following standard:

BS1377 :1990 :Part 7 Section 8

Each sample was set up in a triaxial cell with a covering membrane (0.4mm thick), and the cell filled with water. Cell pressure was then raised to 100kPa, and tested without confirming saturation or allowing for consolidation.

The loading machine was adjusted and rate of compression set to induce failure at 5 min to 10 min (from triaxial test results). Load versus strain was measured until failure, or until 20% strain.

The table below summarises the test results.

Sample Number	Depth	Dimensions	Bulk Density	Moisture Content	Dry Density	Deviator Stress	Strain %
BH1, T1	1.5m	60mmDx 125mmL	1.72t/m^3	44.9%	1.18t/m^3	54kPa	8.1%
BH2, T1	3.0m	60mmDx111mmL	1.52t/m^3	70.4%	0.90t/m^3	123kPa	3.2%

Yours faithfully,

Wayne Campton
Signatory (Laboratory Manager)
Babbage Geotechnical Laboratory

new zealand accredited laboratory

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation. This report may not be reproduced except in full.

BGL BABBAGE GEOTECHNICAL LABORATORY	Job No: 42608	Reg. No: 1503	Report No: 42608/QUT Rev A	Page 2 of 3
				Issue Date: Aug-06

PROJECT: West Coast Road

		Initials	Date
Undrained Shear Strength in Triaxial Compression	**Tested By:**	wec	Jul-06
Without PWP Measurement	**Compiled By:**	comp	Aug-06
Test Method: BS1377:1990:Part 7 Section 8	**Checked By:**	wec	2/11/06

Bore Number: BH1 **Sample Number:** T1 **Depth:** 1.5

Test Performed on: Whole soil / ~~Fraction passing 19mm test sieve~~
Sample History: Undisturbed ~~/ remoulded / recompacted / unknown~~
Sample Method & Type: From core sample ~~/ larger tube / block sample / pressed into tube / compacted with standard/heavy compactive effort~~

Cell Confining Pressure Set at: 100 kPa

Sample Description:

Membrane Thickness	0.4mm
Membrane Correction	1

Determination of Bulk Density:		
Diameter of Specimen:	(mm)	60.00
Initial Area of Specimen:	(mm^2)	2827.43
Initial Length:	(mm)	125.00
Initial Mass:	(g)	609.61
Volume	(mls)	353.43
Bulk Density:	(t/m^3)	1.725
Proving Ring No:		10-13232
Calibration Constant	(N/mm)	1491.75
Rate of Strain:	(%/min)	1.25

Determination of Water Content:		
Container Number:		96
Mass container + wet soil:		187.851
Mass container + dry soil:		146.091
Check container + dry soil		146.091
Mass of container:		53.014
Water Content:	(%)	44.9
Dry Density:	(t/m^3)	1.191

Time	Compression Gauge (mm)	Specimen Compression (mm)	Strain	Load Gauge (mm)	Axial Force (N)	Corrected Area (mm^2)	Measured Deviator Stress
14:01:26	0.334	0.000	0.000	-2.949	0.0	2827.4	0
14:01:57	1.063	0.729	0.006	-2.925	36.7	2844.0	13
14:02:27	1.843	1.509	0.012	-2.897	78.7	2862.0	27
14:02:58	2.624	2.290	0.018	-2.882	100.0	2880.2	35
14:03:28	3.409	3.075	0.025	-2.871	116.6	2898.7	40
14:03:58	4.197	3.863	0.031	-2.869	120.1	2917.6	41
14:04:29	4.979	4.644	0.037	-2.860	133.2	2936.5	45
14:04:59	5.760	5.426	0.043	-2.856	139.3	2955.7	47
14:05:30	6.545	6.210	0.050	-2.851	146.0	2975.3	49
14:06:00	7.334	7.000	0.056	-2.847	153.0	2995.2	51
14:07:31	9.697	9.363	0.075	-2.839	163.8	3056.4	54
14:08:02	10.485	10.150	0.081	-2.835	169.9	3077.3	55
14:08:32	11.263	10.928	0.087	-2.846	153.4	3098.3	50
14:09:02	12.048	11.714	0.094	-2.844	156.8	3119.8	50
14:09:33	12.821	12.487	0.100	-2.859	135.0	3141.2	43

Failure Conditions: **Maximum Deviator Stress** **54** kPa
Cu **27** kPa

Strain at failure: 8.1 % 10.15 mm Mode of Failure: plastic

BGL Babbage Geotechnical Laboratory	Job No: 42608	Reg. No: 1503	Report No: 42608/QUT Rev A	Page 3 of 3
	PROJECT: West Coast Road			Issue Date: Aug-06

		Initials	Date
Undrained Shear Strength in Triaxial Compression	**Tested By:**	wec	Jul-06
Without PWP Measurement	**Compiled By:**	comp	Aug-06
Test Method: BS1377:1990:Part 7 Section 8	**Checked By:**	wec	2/11/06

Bore Number: BH2 **Sample Number:** T1 **Depth:** 3

Test Performed on: Whole soil / ~~Fraction passing 19mm test sieve~~
Sample History: Undisturbed ~~/ remoulded / recompacted / unknown~~
Sample Method & Type: From core sample ~~/ larger tube / block sample / pressed into tube / compacted with standard/heavy compactive effort~~

Cell Confining Pressure Set at: 100 kPa

Sample Description:

Membrane Thickness	0.4mm
Membrane Correction	0.3

Determination of Bulk Density:		
Diameter of Specimen:	(mm)	60.00
Initial Area of Specimen:	(mm^2)	2827.43
Initial Length:	(mm)	111.50
Initial Mass:	(g)	477.93
Volume	(mls)	315.26
Bulk Density:	(t/m^3)	1.516
Proving Ring No:		10-13232
Calibration Constant	(N/mm)	1491.75
Rate of Strain:	(mm/min)	0.81

Determination of Water Content:		
Container Number:		97
Mass container + wet soil:		152.883
Mass container + dry soil:		111.684
Check container + dry soil		111.684
Mass of container:		53.151
Water Content:	(%)	70.4
Dry Density:	(t/m^3)	0.890

Time	Compression Gauge (mm)	Specimen Compression (mm)	Strain	Load Gauge (mm)	Axial Force (N)	Corrected Area (mm^2)	Measured Deviator Stress
15:32:38	-2.121	0.000	0.000	-2.927	0.0	2827.4	0
15:33:08	-1.674	0.446	0.004	-2.917	14.9	2838.8	5
15:33:38	-1.177	0.944	0.008	-2.907	30.2	2851.6	11
15:34:09	-0.710	1.410	0.013	-2.890	56.0	2863.7	20
15:34:39	-0.339	1.781	0.016	-2.794	198.6	2873.3	69
15:35:10	0.079	2.200	0.020	-2.738	283.2	2884.3	98
15:35:40	0.525	2.646	0.024	-2.706	330.6	2896.2	114
15:36:10	1.004	3.125	0.028	-2.692	351.7	2909.0	121
15:36:41	1.486	3.607	0.032	-2.685	361.5	2921.9	124
15:37:11	1.975	4.096	0.037	-2.687	359.3	2935.3	122
15:37:42	2.472	4.593	0.041	-2.694	347.5	2948.9	118
15:38:12	2.971	5.091	0.046	-2.703	334.1	2962.7	113
15:38:43	3.330	5.451	0.049	-2.761	248.9	2972.8	84

Failure Conditions: **Maximum Deviator Stress** **123** kPa
Cu **62** kPa

Strain at failure: 3.2 % Mode of Failure: planar
3.61 mm

Appendix D

Slope Stability Analysis

	Gamma kN/m3	C kPa	Phi deg	Piezo Surf.	Ru
CLAY Stiff	19	5	30	1	0
CLAY Soft/Firm	13	2	27	1	0
CLAY Very Stiff	20	7	32	1	0

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42608/GE
West Coast Road
7th November 2006
AA

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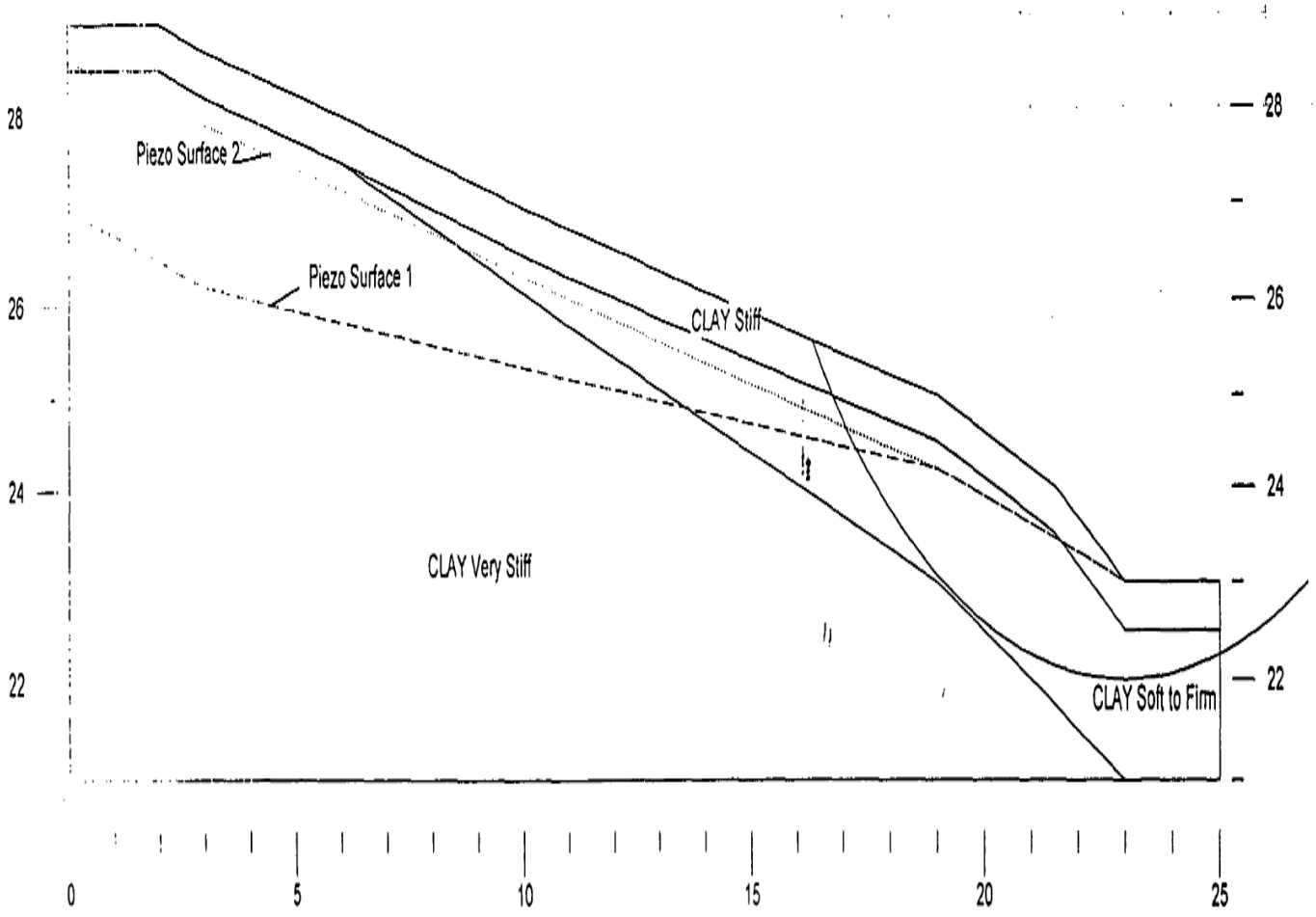

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	Gamma	C	Phi	Piezo	Ru
	kN/m3	kPa	deg	Surf.	
CLAY Stiff	18	5	30	2	0
CLAY Soft/Firm	18	2	27	2	0
CLAY Very Stiff	20	7	32	2	0

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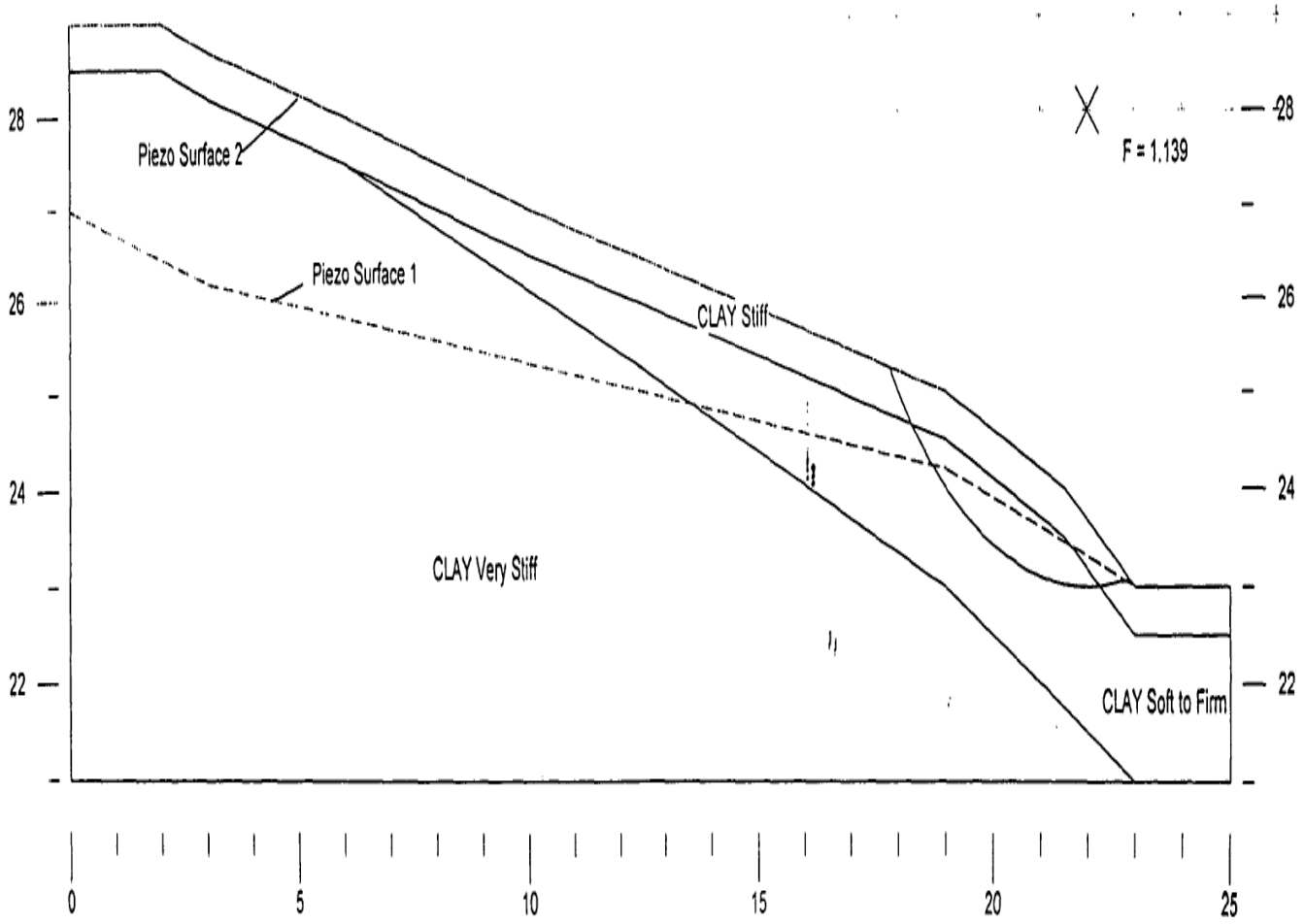
7th November 2006
AA



	Gamma kN/m3	C kPa	Phi deg	Piezo Surf.	Ru
Fill	17	5	30	0	0
CLAY Stiff	18	5	30	0	0
CLAY Firm	18	2	27	0	0
CLAY Stiff	18	5	30	0	0

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West Coast Road
7 November 2006
Section BB

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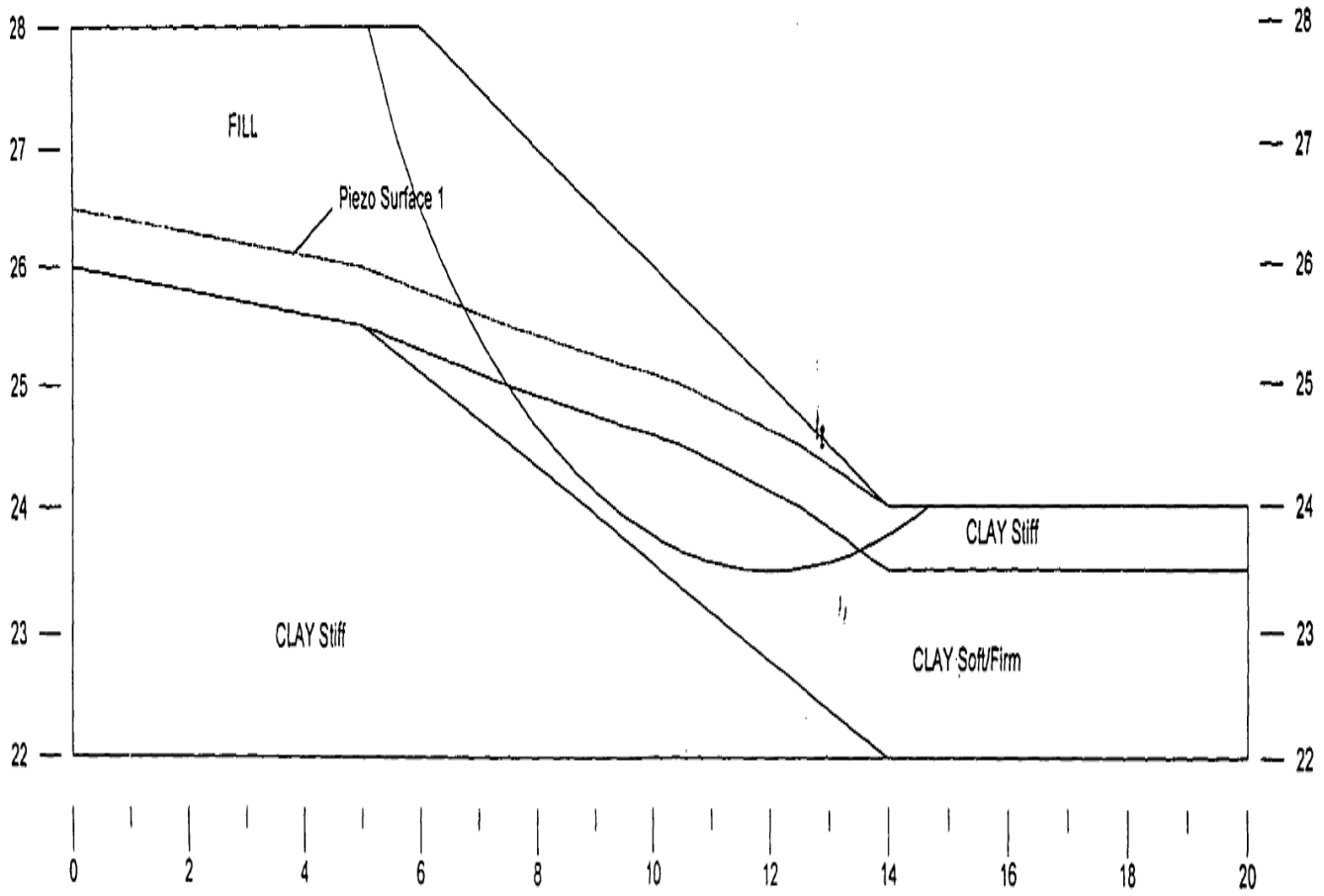

	Gamma kN/m3	C kPa	Phi deg	Piezo Surf.	Ru
Fill	17	5	30	1	0
CLAY Stiff	18	5	30	1	0
CLAY Firm	18	2	27	1	0
CLAY Stiff	18	5	30	1	0

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West Coast Road
7 November 2006
Section BB

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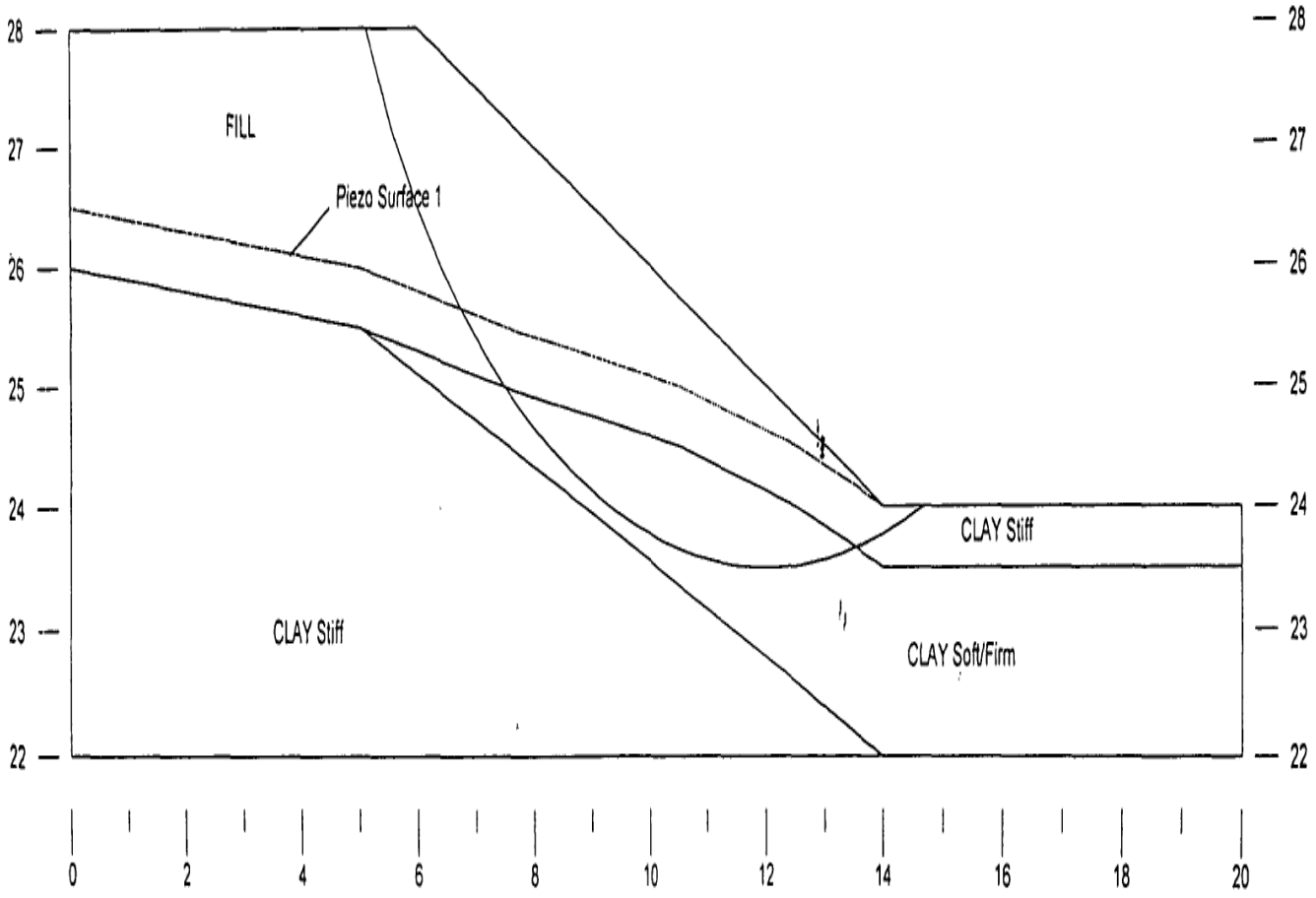


WEST COAST ROAD (NO.423-429), HOUSING DEVELOPMENT STAGES 2 AND 3 AND BALANCE STAGE 1

FOR

NEW ZEALAND HOUSING FOUNDATION

EARTHWORKS COMPLETION REPORT

Ref: 42608/GE
March 2008

Client: New Zealand Housing Foundation

Project: West Coast Road Stages 2 and 3

Job Number: 42608

Report Title: Earthworks Completion Report

Document Reference: BDOC03675709

Report Date: March 2008

Issue	Date	Status	Prepared By	Reviewed By
-		First Issue	W E Campton	N.S. Luxford

CONTENTS

1.0 INTRODUCTION 1

2.0 CONSTRUCTION SEQUENCE SUMMARY 1

3.0 CONSTRUCTION MONITORING AND TESTING 2
- 3.1 General 2
- 3.2 Road Subgrades 4
- 3.3 Building Foundations 4

4.0 SUMMARY AND RECOMMENDATIONS 5
- 4.1 General 5
- 4.2 Suitability of Earthfill 6
- 4.3 Suitability of Natural Soils 6
- 4.4 Retaining Walls 6
- 4.5 Road Subgrades 7

5.0 LIMITATIONS 7
- 5.1 Restriction of Intended Purpose 7
- 5.2 Legal Interpretation 7
- 5.3 Reliability of Information 7

APPENDIX A

Statement of Professional Opinion

Site Location Plan — Drawing 42608/G01

As-Built Cut and Fill Isopach Plan Stg 1 — Drawing No. 42608/AB05
As-Built Cut and Fill Isopach Plan Stg 2 and 3 — Drawing No. 42608/AB12
Fill Test Location Plans — Drawing No .42608/G06
Drawing No. 42608/G07

As-Built Drainage Plans — Drawing No.42608/AB08
42608/AB09

Retaining Wall Plan — Drawing No. 42608/C51

Retaining Wall Detail — Drawing No. 42608/C52

APPENDIX B

Fill Test Result Summary
Settlement Marker Records

1.0 INTRODUCTION

Babbage Consultants Ltd were engaged by New Zealand Housing Foundation to monitor the construction of earthworks and retaining walls for the West Coast Road Subdivision carried out in the 2006/2007 earthworks season. This report presents the results of work carried out by Babbage to verify the Stage 2 and Stage 3 earthworks and construction of the associated ponds and retaining walls and lots 19 to 22 of Stage 1. Stage 1 has been reported previously – refer to our Earthworks Completion Report dated October 2007, ref 43608/GE and excepted these four lots.

The development covers Lots 2 & 3 DP 339810, 423 – 429 West Coast Road, Henderson, as shown on the Site Location Plan in Appendix A. Stage 2 is bounded to the south by existing residential properties abutting West Coast Road and to the east by residential properties adjacent to Woodbank Drive. Most of the western boundary is generally marked by Parrs Stream, and the Stage 1 development demarks the northern extent. Access to Stage 2 is via Pyramid Place. Stage 3 is on the western bank of Parrs Stream, with access off West Coast Road to the south, and the Albionvale Road residential development abuts the western and northern boundary.

A walk-over survey of the site was undertaken as part of our geotechnical investigation prior to development. No apparent signs of previous slope instability were observed.

The two stages cover an area of approximately 2.3ha and includes residential Lots 36 to 60, with Lots 61 to 64 being road and drainage reserves. We have also included Lots 19 to 22 which were part of stage 1 works, but had been occupied by contractor's site offices and a topsoil stockpile. These have now been removed from the site. The majority of the proposed residential dwellings are understood to comprise two-storey structures.

2.0 CONSTRUCTION SEQUENCE SUMMARY

Earthworks commenced on site in December 2006, with the construction of the permanent stormwater pond on the northern portion of the stage 1. Once this stage was substantially complete, the southern area (Stage Two) was stripped

of topsoil and saturated alluvial deposits that were identified in the geotechnical investigation phase. Underfill drainage was installed, along with deeper batter drains to ensure soft soils would consolidate as earthworks progressed. The volume and extent of saturated soils proved to be less than anticipated from information provided by our geotechnical investigation. Fill areas alongside the southern boundary and the southeast side of Parrs Creek were then brought up to design levels. A surplus of approximately 20,000m^3 of clean clay fill was removed from site during these works. A smaller surplus had been calculated after we had anticipated excavating soft alluvial materials from Stage 2. A decision to leave these in place meant that the clay was not required, and this was transported from site.

Areas of the site that were found to be contaminated with pesticides from previous land use and zinc from neighbouring buildings were remediated during earthworks. Pesticide affected soils were removed from site and samples taken to confirm that all materials had been removed. Zinc-contaminated sediments were found in the sludge sediments at the base of the stormwater pond located on the western side of Parrs Creek (Stage 3), just to the north of West Coast Road.

Once earthworks were completed on Stages One and Two, and drainage lines were able to be constructed, Stage Three earthworks commenced. Site access off West Coast Road was formed and platform levels to the west of Parrs Creek were built up. The contaminated sludge was removed and the silt pond backfilled. This operation was carried out in two parts, with the southern portion of the pond backfilled in late April 2007, and the northern portion backfilled in the 2007/8 constructions season once drainage lines had been completed.

3.0 CONSTRUCTION MONITORING AND TESTING

3.1 GENERAL

The stripped gullies in all fill areas were inspected by Babbage Consultants Ltd during earthworks construction. Underfill drainage was placed and observed during these regular inspections. Approval was given to commence filling once we were satisfied that all deleterious material had been removed from the fill areas, and vegetation had been removed.

The specification for placement of earthworks fill material was prepared by BCL. The specification required that the fill be placed in layers up to 200mm thick and compacted by at least 6 passes of a 10 ton self-propelled or a towed tamping type steel wheeled roller. We understand that approximately 10,000m3 of material was placed in fill areas in the 2006/2007 earthworks season, with minor works in late 2007/early 2008 to complete Stage 3 trimming.

The relative compaction, determined by comparing the in-situ density with that of a sample compacted in the laboratory accordance with Test 4.1.1 of NZS4402:1986, was to be greater than 95%. The specification also required that the maximum in situ air voids of the fill was to be 8%. The minimum average in situ shear strength of the fill was required to be greater than 120kPa with no individual value less than 100kPa.

The in situ density of the fill material has been determined using a nuclear densometer. The nuclear densometer has been calibrated in accordance with NZS4407:1991, Test 4.2.3 by using three density blocks in an accredited testing workshop. The in situ moisture content has been determined by testing a sample recovered from the test site in our laboratory in accordance with NZS4402:1986, Test 2.1. The in situ dry density and air voids have been calculated using the laboratory moisture content. The in situ shear strength of the fill was measured using a hand held Pilcon Shear Vane. Areas of fill that failed to meet the specified criteria were reworked and retested or observed by a Babbage representative and identified as being satisfactorily compacted.

The bulk of earthworks fill placement for Stage 1 and 2 were programmed for the one earthworks season. The site was visited by BCL to undertake fill testing during the 2007 construction season. A total of 35 in-situ density tests were completed during these visits. This also included fill placement on Stage 3, once settlement ponds were decommissioned.

The location of in situ density tests are shown on Drawing Nos. G06 and G07 – Fill Test Location Plans, in Appendix A. The dates that the fill testing has been undertaken and results of the fill testing are presented on the Fill Test Result Summary attached in the Appendix B.

A number of settlement markers were installed on Stage 2 fill areas where alluvial soils remain. These were monitored until it was confirmed that all settlement was

substantially completed. Recordings were terminated in November 2007 when no significant settlement was recorded (see attached records in Appendix B).

3.2 ROAD SUBGRADES

The specifications for pavement design under roads called for 250mm of basecourse on top of lime stabilised subgrade. An alternative design of 200mm sub-basecourse and 150mm basecourse was considered if lime stabilisation did not improve the subgrade. Scala penetrometer readings were taken on all road subgrades after lime stabilisation and these confirmed that substantial improvement had occurred.

3.3 BUILDING FOUNDATIONS

The near surface materials exposed in the cut areas are typically stiff to very stiff and support the passage of construction plant when dry. In general all cut and fill areas are suitable in which to construct foundations complying with the requirements of NZS3604:1999 except where noted below.

On Lots 46 to 56 (Stage II) and Lots 57 to 60 (Stage III) where structures are located close to the common boundary with Parrs Stream all footings located within a zone of 1(v) in 3 (h) measured from the toe of the batter falling to the stream should be founded on piles. This is to minimise the risk of loss of support should localised frittering and/or creep and movement of this batter slope occur. These piles should be designed to provide their support of the building load below this 1 in 3 batter using the assumption of a safe adhesion of 25kPa.

The placement of fill over compressible deposits on Lots 44 to 53 had the potential to cause consolidation and induce settlement. Settlement monitoring pins were installed to enable the rate and amount of settlement to be observed and the consolidation rate assessed. As mentioned previously, these monitoring pins were checked over time to determine when development could proceed in this area. This decision was made in November 2007 when no significant settlement between successive readings was observed.

Any perimeter foundations that are not taken to 600mm below finished ground level (and especially where waffle slabs are proposed) should be carried on piles. Where waffle slabs are used, these piles should be provided around the perimeter of the slabs. Areas which are stripped of topsoil prior to placement of waffle slabs or slabs

on grade which are allowed to dry out should be thoroughly soaked to return the moisture content to a moist state prior to construction of the slab.

A check on topsoil depths after spreading on Lots 19 to 23 (Stage 1) and Lots 36 to 56 (Stage 2) shows that topsoil generally varies from 200mm to 400mm thick. Stage 3 had not had topsoil spread at time of preparation of this report, although other fill placement had been completed. Lot 55 showed a depth of moist highly plastic material to 1m. This Lot is close to Parrs Stream and ground slopes towards the stream directly from the road. Footings on this lot will need to be taken below this layer. Foundations for this lot will need to be piled (see above 1 in 3 batter criteria), and footings inspected prior to construction.

All topsoil should be removed from beneath slab on grade floors in all Lot development.

4.0 SUMMARY AND RECOMMENDATIONS

4.1 GENERAL

In our opinion, based on our site observations and testing, the fill materials on West Coast Road (Nos. 423 – 429) Stages 2 and 3 and balance of Stage 1, have generally been placed in accordance with the Specification and NZS4431:1989 Code of Practice for Earthfill for Residential Development, except that the minimum requirement for the peak in situ shear strength of the fill materials are as detailed in Sections 4.2 of this report. In our opinion there is no evidence to indicate that land formed on this part of the subdivision will be subject to any instability unless future earthworks create such instability.

Any dwellings created under the normal items of NZS3604:1999 within the normal building envelope will in our opinion be within stable land in the lots with the noted exception of lots abutting Parrs Stream (see section 3.3 – Lots 23, 46 to 55 and lots 57 to 60). These building platforms require piles designed as per Section 3.3.

Our geotechnical assessment of the subdivision classified most soils as Class M from AS2870:1996. We have not undertaken any testing to confirm this, however descriptions of fill materials during fill certification were consistent with the earlier geotechnical assessment. We recommend that strip footings be taken to 600mm below finished ground surface to allow for shrinkage – swell movements.

This will not restrict uplift of "waffle-slab" foundations constructed from polystyrene packed concrete. As such we recommend that any such proposed foundation be placed after thoroughly wetting up of the soil to minimise the risk of swelling and that the perimeter of each slab is extended to a minimum depth of 600mm below finished ground level or piled to minimise the affects of shrinkage and swell. Prior to construction it is recommended that the subgrade is inspected by a Geotechnical Engineer to confirm the shrinkage/swell potential

4.2 SUITABILITY OF EARTHFILL – LOTS 36, 37, 44 TO 60

In our opinion, based on our site observations and testing, the fill materials as shown on Drawing G12 are generally suitable for the development of light timber framed buildings designed in accordance with NZS3604:1999. We recommend that combined floor loads be less than 15kPa, including the weight of any proposed slab and fill, and ultimate foundation bearing pressures be less than *300*kPa (*i.e. an allowable* bearing pressure of 100kPa *using a factor of safety of 3*). The natural insitu silts and clays are anticipated to also be suitable for foundations designed to similar bearing pressures.

We note that footings should be taken to at least 600mm below finished ground level to minimise the effects of shrinkage / swell movements.

4.3 SUITABILITY OF NATURAL SOILS (LOTS 19 -22 STAGE 1) (LOTS 38 – 42 STAGE 2 & LOT 61 STAGE 3)

From our inspection of cut platforms and drainage lines within areas of cut we can confirm that natural soils exposed are as anticipated from our geotechnical appraisal of the site. Any dwellings created under the normal items of NZS3604:1999 within the normal building envelope will in our opinion be within stable land in the lots.

We note that footings should be taken to at least 600mm below finished ground level to minimise the effects of shrinkage / swell movements. We recommend that normal inspection of footings during the building process be carried out by a suitably qualified geotechnical engineer or his representative to confirm the ground conditions.

4.4 RETAINING WALLS

Retaining walls adjacent to vehicle accessways have been designed and constructed to support a 5kPa surcharge. All other walls have not been designed and constructed

to support a surcharge and therefore it is recommended that no additional fill or structure is located at the top of such walls within a minimum horizontal distance equal to the retained height of the wall.

4.5 ROAD SUBGRADES

Testing of road subgrades after lime stabilisation confirmed that the design CBR criteria was met in both cut and fill areas. Roads were constructed using basecourse at the specified metal depths.

5.0 LIMITATIONS

5.1 RESTRICTION OF INTENDED PURPOSE

This report has been prepared solely for the benefit of New Zealand Housing Foundation as our client with respect to the brief and the benefit of the Waitakere City Council. The reliance by other parties on the information or opinions contained in the report shall, without our prior review and agreement in writing, be at such party's sole risk.

5.2 LEGAL INTERPRETATION

Opinions and judgements expressed herein are based on our understanding and interpretation of current regulatory standards, and should not be construed as legal opinions. Where opinions or judgements are to be relied on they should be independently verified with appropriate legal advice.

5.3 RELIABILITY OF INFORMATION

Recommendations and opinions in this report are based on data from our Investigation and control testing on this site. As we were not on site full time during earthworks, the nature and continuity of subsoil conditions could vary from the assumed model.

During excavation and construction the site should be examined by an Engineer or Engineering Geologist competent to judge whether the exposed subsoils are compatible with inferred conditions.

Babbage Consultants would be pleased to provide this service and believe that the development would benefit from this continuity. In any event it is essential that

Babbage Consultants Ltd be contacted if there is any significant variation in subsoil conditions from those described in this report.

This report has been prepared by Wayne Campton and reviewed by N.S. (Paddy) Luxford.

Respectfully submitted
Babbage Consultants Limited

N S Luxford.....
Geotechnical Engineering Director

Appendices

Appendix A

Statement of Professional Opinion	
Site Location Plan	Drawing 42608/G01
As-Built Cut and Fill Isopach Plan Stg 1	Drawing No. 42608/AB05
As-Built Cut and Fill Isopach Plan Stg 2 and 3	Drawing No. 42608/AB12
Fill Test Location Plans	Drawing No .42608/G06 Drawing No. 42608/G07
As-Built Drainage Plans	Drawing No.42608/AB08 42608/AB09
Retaining Wall Plan	Drawing No. 42608/C51
Retaining Wall Detail	Drawing No. 42608/C52

To:	Waitakere City Council Private Bag 93 109 Henderson Waitakere City 1231

STATEMENT OF PROFESSIONAL OPINION AS TO SUITABILITY OF LAND FOR RESIDENTIAL DEVELOPMENT

Subdivision: **423-429 West Coast Road, Stage 2 & 3**
Lots 2 & 3 DP.339810

Owner/Developer: **New Zealand Housing Foundation**

Location: **Henderson**

I, **N S Luxford** of **Babbage Consultants Ltd**, hereby confirm that:

1. I am a Chartered Professional Engineer experienced in the field of geotechnical engineering and was retained by **New Zealand Housing Foundation** as the Geotechnical Engineer on the above subdivision.

2. The extent of my inspections, and the results of all tests carried out during construction, are described in my report entitled **"West Coast Road (No.423-429), Housing Development Stages 2 and 3 and Balance Lot 1 Earthworks Completion Report", Ref. 42608/GE, March 2008**.

3. In my professional opinion, not to be construed as a guarantee, I consider that:

   (a) The earth fills shown on **Drawing 42608/AB05 and AB12** attached to the above referenced Earthworks Completion Report, have generally been placed in compliance with **NZS4431:1989 Code of Practice for Earthfill for Residential Developments**.

   (b) The completed works give due regard to land slope and foundation stability considerations.

   (c) The filled ground, is suitable for the development of residential buildings, designed in accordance with NZS3604:1999, provided combined floor loads are less than 15kPa, including the weight of the slab and fill.

   (d) The original ground not affected by filling is suitable for the development of residential structures designed in accordance with NZS3604:1999, provided combined floor loads are less than 15kPa, including the weight of the slab and fill.

   (e) The earthworks associated with the roads and reserves have been carried out in a manner appropriate for their intended purpose.

   (f) The following special limitations should be observed:

      (i) Any building foundation constructed above a gradient line of 1v to 3h from the toe of the fill slope should be piled and be subject to specific design by a suitably qualified engineer.

      (ii) The excavations for foundations in natural materials should be subject to normal inspections to confirm that they comply with the requirements of NZS3604:1999.

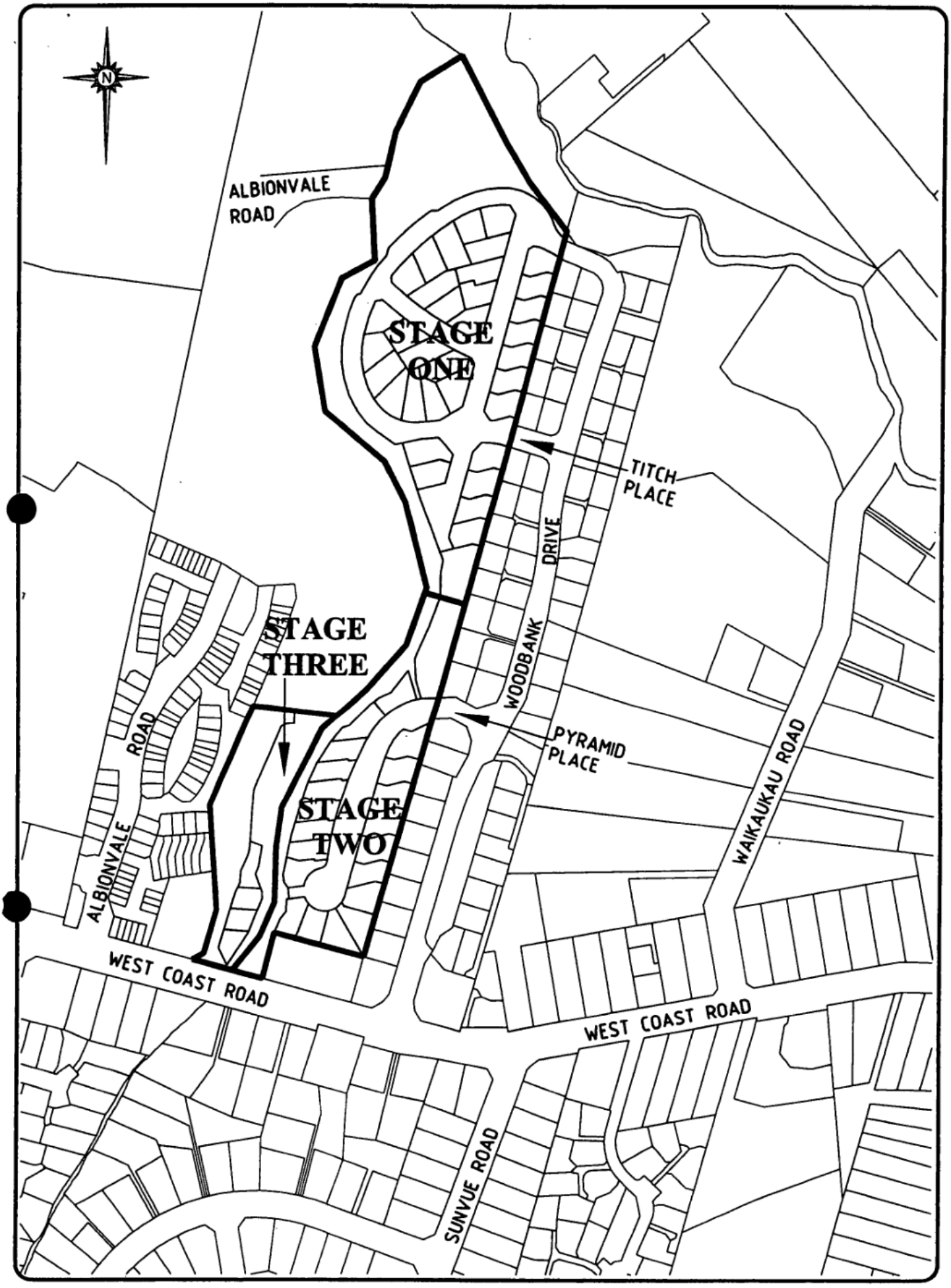
      (iii) The minimum depth of all perimeter foundations for future buildings, are to be 600mm below finished ground level to minimise the effects of shrinkage swell movements on the structure.

(iv) Lot 55 showed moist highly plastic material to a depth of 1m. Pile foundations should be taken below this material and inspected by a suitably qualified geotechnical engineer.

4. This professional opinion is furnished to the **Waitakere City Council and New Zealand Housing Foundation** for their purposes alone on the express condition that it will not be relied upon by any other person and does not remove the necessity for the normal inspection of foundation conditions at the time of erection of any dwelling.

Signed: ..... Date: **14th March 2008**

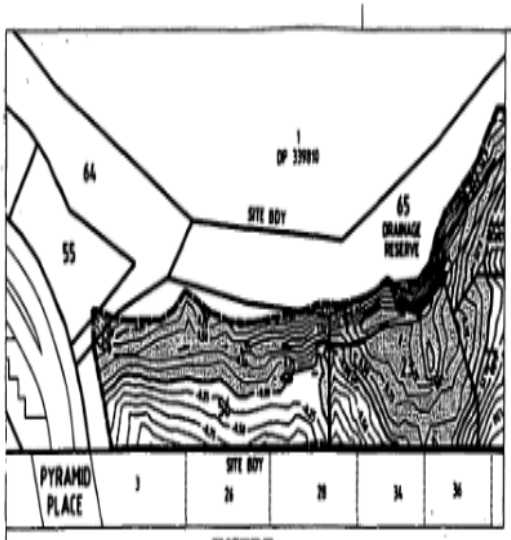
N S Luxford
Chartered Professional Engineer (CPEng No 41147)



Babbage CONSULTANTS
109 FANSHAWE STREET, AUCKLAND
PO BOX 2027, AUCKLAND 1, NEW ZEALAND
PHONE 09 379 9980, FAX 09 377 1170

WEST COAST ROAD HOUSING DEVELOPMENT FOR NZ HOUSING FOUNDATION

JOB NO:	42608
TITLE:	SITE LOCATION PLAN
SCALE:	NOT TO SCALE
DRAWING:	G01 (REV A)



INSERT
SCALE 1:500(A1)

KEY

- CUT CONTOURS
- FILL CONTOURS
- ZERO CUT/FILL
- EXTENT OF EARTHWORKS

NOTES

1. FILL AREAS ARE SHOWN SHADED
2. CONTOURS SHOWN ARE AT 0.25m INTERVALS.
3. LEVEL DATUM - LANDS AND SURVEY LEVEL DATUM 1946.

I KEVIN RAYMOND MERKLE, LICENSED SURVEYOR, HEREBY CERTIFY THAT ALL AS BUILT DATA SHOWN ON THIS PLAN IS ACCURATELY PLOTTED IN RELATION TO LOT BOUNDARIES, IS IN TERMS OF GEODETIC DATUM 2000 (NT, EDEN CIRCUIT) AND LANDS AND SURVEY LEVEL DATUM 1946.

DATE:

K.R. MERKLE
LICENSED SURVEYOR

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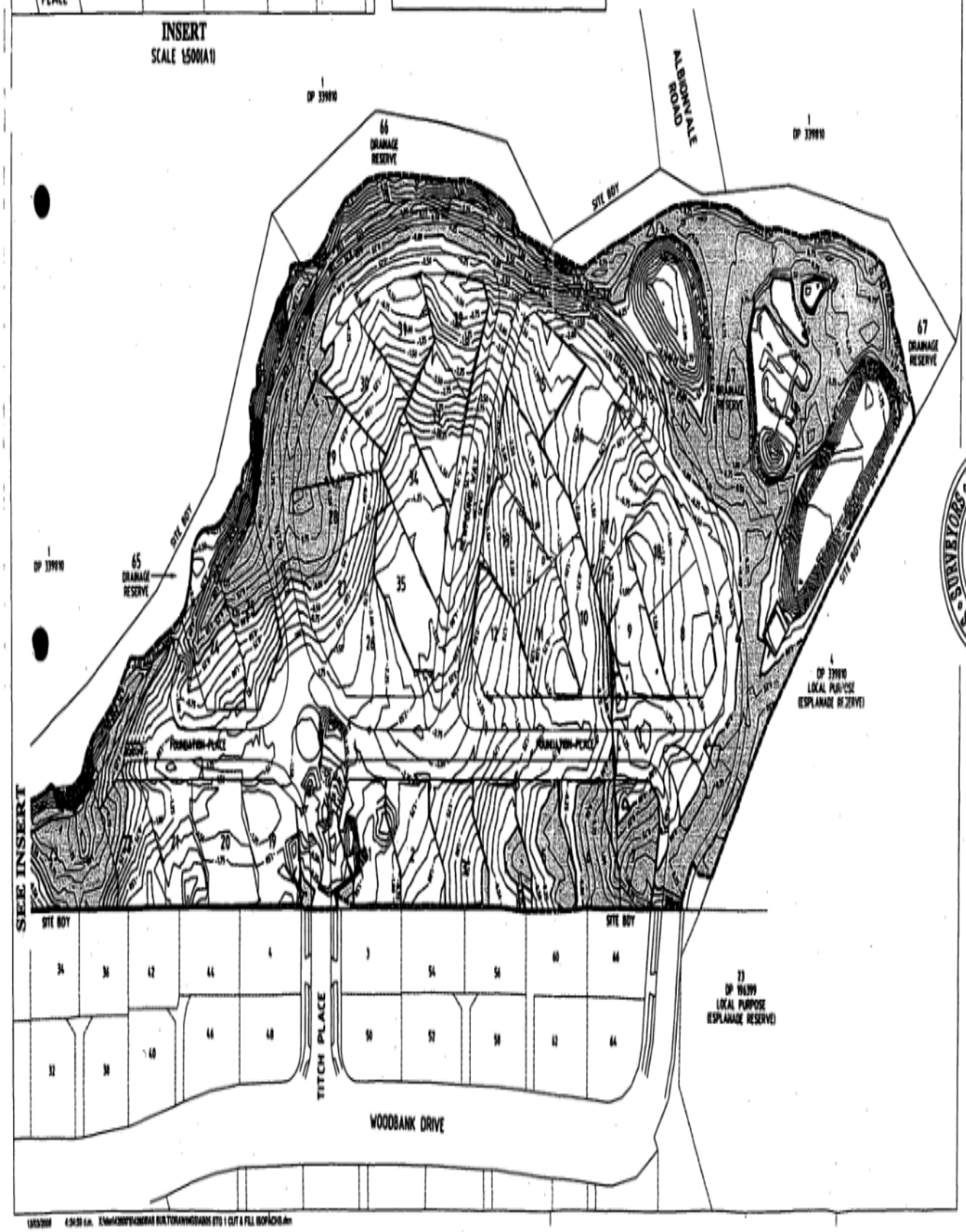
DRAWING NOTES

REV	DATE	DESCRIPTION	DRAWN	CHECK
A	13.08.08	ISSUED FOR SITE 19 - 21 ADDED	MJD	PK

DRAWING REVISIONS



ARCHITECTS • SURVEYORS • ENGINEERS
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AUCKLAND 1 - NEW ZEALAND
PHONE 09 - 379 8866 : FAX 09 - 377 1170
akl@babbage.co.nz

CLIENT / PROJECT

423 - 429 WEST COAST ROAD
HOUSING DEVELOPMENT
FOR
NZ HOUSING FOUNDATION

DRAWING TITLE

STAGE ONE
CUT AND FILL
ISOPACH AS BUILT

	DATE	INITIAL
DESIGNED		
DRAWN	OCT 2007	MJD
CHECKED		
APPROVED		

SCALE (A1)

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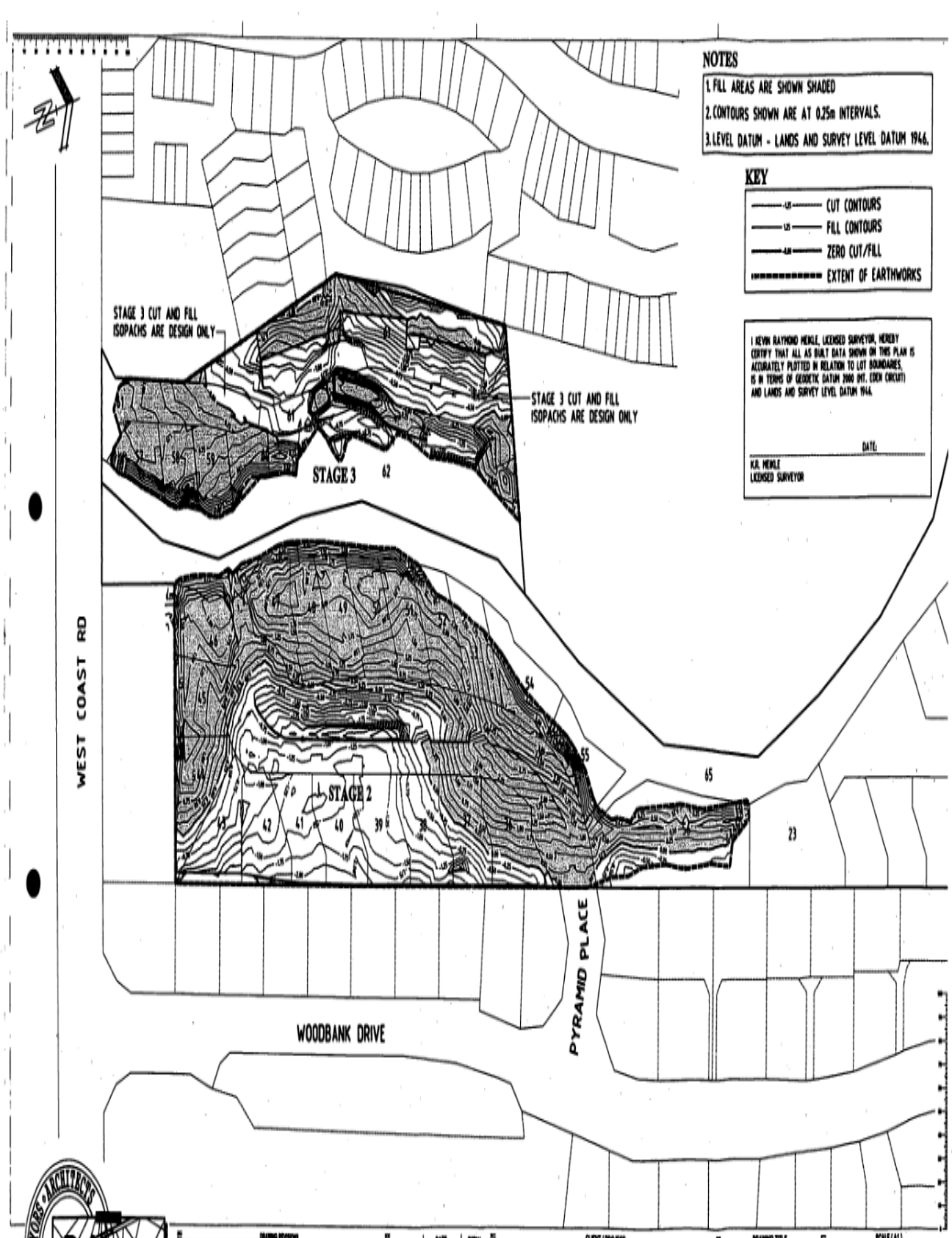

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SURVEYORS • ARCHITECTS • ENGINEERS

DRAWING REVISIONS				
REV	DATE	DESCRIPTION	DRAWN	CHECK
A	13.03.08	STAGE 3 ISOPACHS ADDED	MJD	PK

	DATE	INITIAL
SURVEYED	JAN 2008	ROC
DRAWN	FEB 2008	MJD
CHECKED	FEB 2008	PK
APPROVED		

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CLIENT / PROJECT
WEST COAST ROAD HOUSING DEVELOPMENT
FOR
NZ HOUSING FOUNDATION

DRAWING TITLE
CUT & FILL ISOPACHS AS BUILT PLAN - STAGES 2 AND 3

SCALE (A1)
1:500

JOB NUMBER	DRAWING NUMBER	REVISION
42608	AB12	A

13/03/2008 4:32:17 p.m. Z:\dgn\42608\42608AS BUILTDRAWINGS\AB12 CUT & FILL ISOPACHS.01

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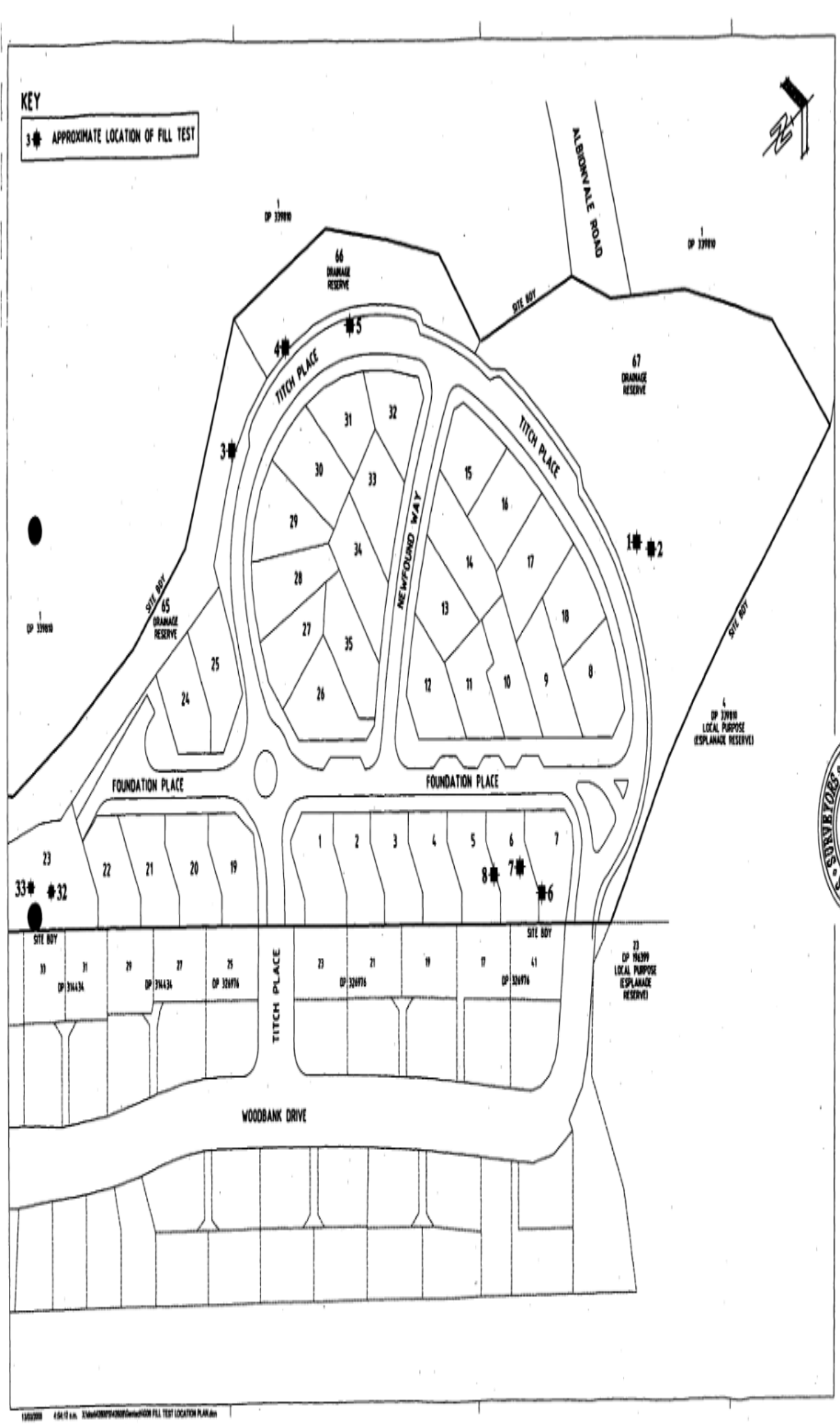

REV	DATE	DESCRIPTION	DRAWN	CHECK
A	11.8.17	TEST PITS 32 AND 33 ADDED	MJD	WC

DRAWING REVISIONS

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admin@babbage.co.nz

CLIENT / PROJECT

WEST COAST ROAD HOUSING DEVELOPMENT

FOR

NZ HOUSING FOUNDATION

DRAWING TITLE

FILL TEST LOCATION PLAN

	DATE	INITIAL
DESIGNED		
DRAWN	AUGUST 2017	MJD
CHECKED	AUGUST 2017	RA
APPROVED		

SCALE (A1)

1:500

JOB NUMBER	DRAWING NUMBER	REVISION
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13/8/2018 4:54:17 p.m. X:\Jobs\42600\PS\42608\Contract\4GDR FILL TEST LOCATION PLAN.dwg

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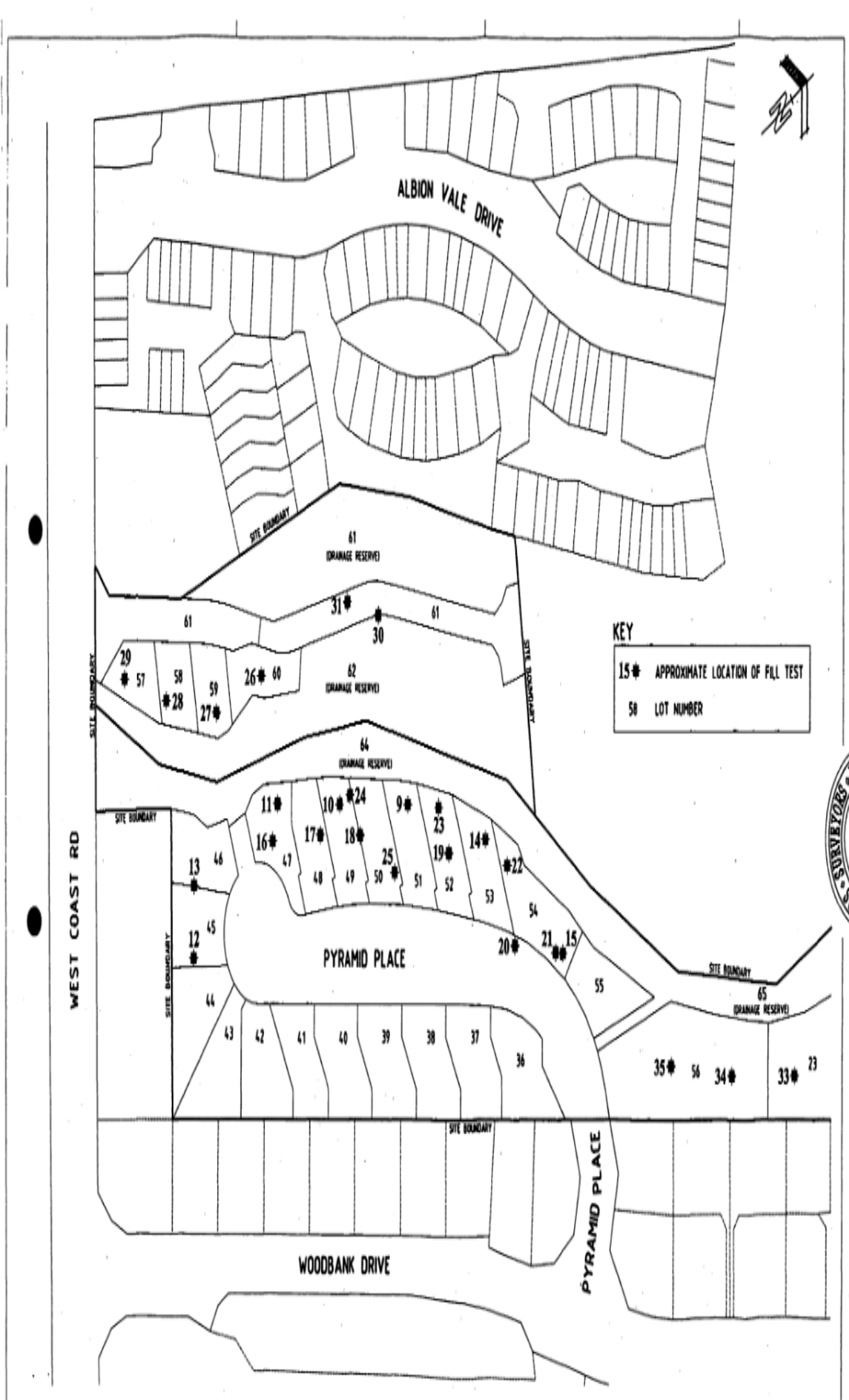

REV	DATE	DESCRIPTION	DRAWN	CHECKED
A	13.03.08	DESCRIPTION PITS 35, 37, 39, 41 ADDED	MJD	WC

DRAWING REVISIONS

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CLIENT / PROJECT

WEST COAST ROAD
HOUSING DEVELOPMENT
FOR
NZ HOUSING FOUNDATION

DRAWING TITLE

FILL TEST LOCATION PLAN 2

	DATE	INITIAL
DESIGNED		
DRAWN	FEB 2008	MJD
CHECKED	FEB 2008	WC
APPROVED		

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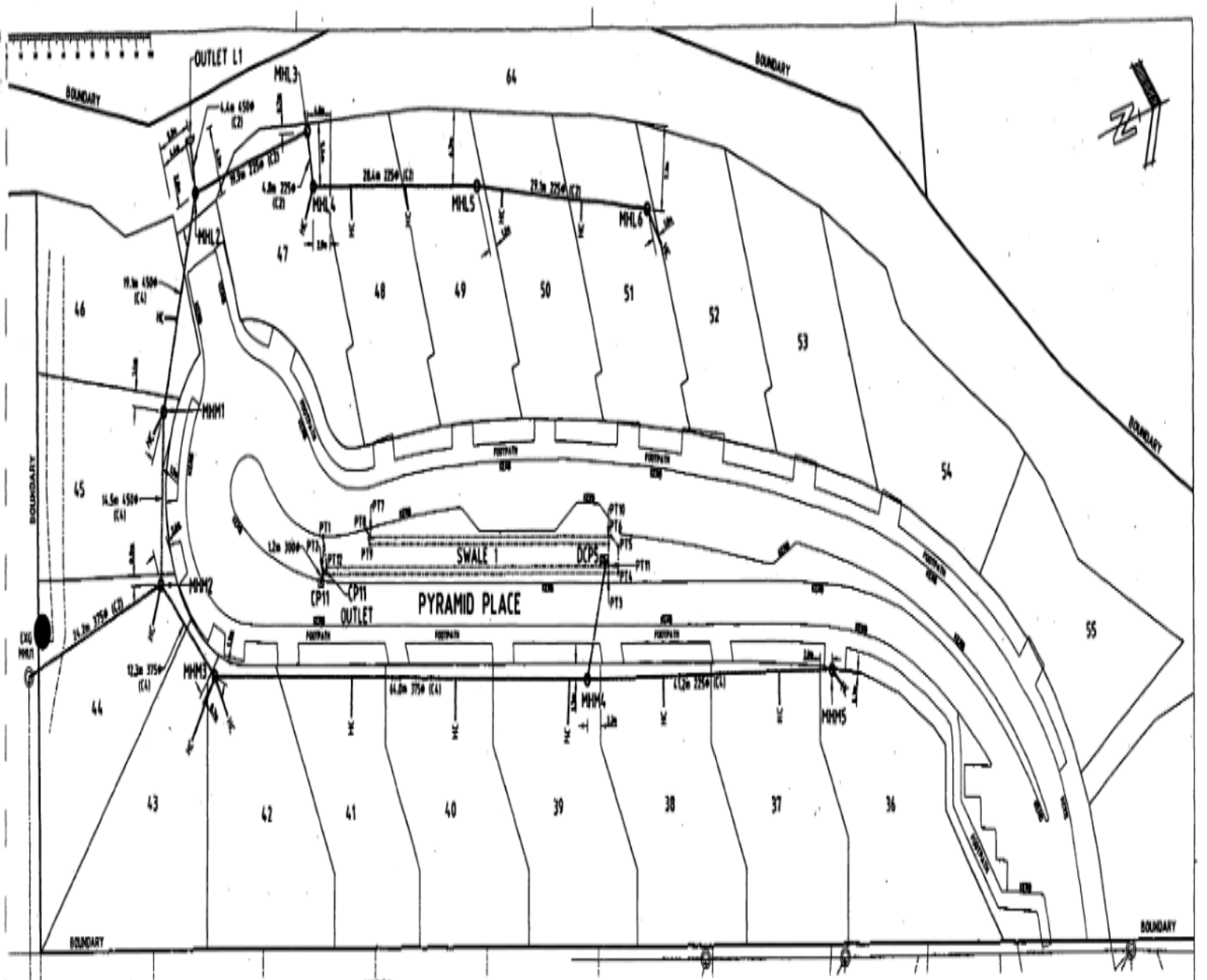

KEY

- NEW STORMWATER LINE
- EXISTING STORMWATER LINE
- BANK LINE
- MHM3 MANHOLE
- CP11 CATCHPIT (SINGLE)
- DCP5 CATCHPIT (DOUBLE)
- HC HOUSE CONNECTION
- (C2) PIPE CLASS

NOTES

1. LEVELS ARE IN TERMS OF LANDS AND SURVEY (AUCKLAND) DATUM 1946.
2. COORDINATES ARE IN TERMS OF GEODETIC DATUM 1949.
3. ALL STORMWATER PIPES ARE CONCRETE RUBBER RING JOINTED UNLESS SHOWN OTHERWISE.
4. ALL MANHOLES ARE 1050ø UNLESS SHOWN OTHERWISE.
5. ALL CATCHPIT LEADS ARE 225ø UNLESS SHOWN OTHERWISE.
6. ALL HOUSE CONNECTIONS ARE 100ø uPVC SN16 UNLESS SHOWN OTHERWISE.
7. PIPE DISTANCES SHOWN ARE TO CENTRES OF MANHOLES.
8. STORMWATER LEAD INVERT AND HOUSE CONNECTION LOCATION INFORMATION HAVE BEEN SUPPLIED BY EARTHCO CIVIL LTD.
9. ALL CONCRETE PIPES WERE MANUFACTURED BY HUMES AND BEDDED ON GAP 20.
10. ALL uPVC PIPES MANUFACTURED BY IPLEX PIPELINES AND BEDDED SAP 7.
11. ALL PIPELINE UNDERCUTS BACKFILLED WITH A MIXTURE OF HARDFILL 100 AND GAP 65.
12. ALL OUTLET STRUCTURES ARE CAST IN-SITU WINGWALL OUTFALLS WITH BAFFLES AND ROCK RIP RAP SET IN CONCRETE.
13. ALL STORMWATER RETICULATION WORKS WERE CARRIED OUT BY EARTHCO CIVIL LTD DURING JANUARY - NOVEMBER 2007.

FEATURE	EASTING	NORTHING	L/D LEVEL	IL (OUT)	IL (IN)	IL (IN)	IL (IN)
OUTLET L1	288917.17	698916.80		24.68 450ø			
MH L2	288321.52	698918.40	25.83	24.76 450ø	24.88 225ø	24.80 100ø	
MH L3	288321.11	698636.37	26.15	25.03 225ø	25.08 225ø		
MH L4	288328.13	698936.14	27.49	25.43 225ø	25.48 225ø	25.95 100ø	
MH L5	288333.20	699063.07	27.59	25.84 225ø	25.91 225ø		
MH L6	288342.44	699191.31	28.08	26.54 225ø	26.71 100ø		
MH M1	288337.89	698906.53	28.33	25.08 450ø	25.10 450ø	26.14 100ø	
MH M2	288301.83	698822.83	28.88	25.25 450ø	25.28 375ø	27.11 100ø	25.31 375ø
MH M3	288301.72	698806.85	29.39	25.42 375ø	27.08 100ø	27.08 100ø	25.47 375ø
MH M4	288376.13	698871.76	29.61	25.85 375ø	26.01 225ø	26.04 100ø	
MH M5	288387.82	698711.82	29.81	27.06 225ø	28.08 100ø		
EXG MH U1	288364.83	698876.74	28.81	27.84 450ø	27.72 450ø		
DCP6	288369.27	698877.40	28.64	26.11 225ø			
CP11	288358.66	698826.42	28.83	27.79 300ø			
C11 OUTLET	288367.74	698830.14		27.77 300ø			

COORDINATE SCHEDULE

ITEM	EASTING	NORTHING	HEIGHT	ITEM	EASTING	NORTHING	HEIGHT	ITEM	EASTING	NORTHING	HEIGHT
PT1	288368.01	698930.89	27.30	PT5	288368.80	698878.67	27.65	PT9	288367.71	698838.33	27.11
PT2	288368.11	698928.89	27.57	PT6	288367.48	698878.71	27.86	PT10	288367.90	698878.18	28.78
PT3	288370.30	698877.53	28.06	PT7	288367.18	698838.83	27.28	PT11	288368.80	698877.88	28.78
PT4	288370.78	698879.11	27.80	PT8	288366.34	698838.18	27.30	PT12	288367.88	698830.62	27.25

I NOEL STUART LUDFORD, CHARTERED PROFESSIONAL ENGINEER, HEREBY CERTIFY THAT THE STORMWATER RETICULATION POSITIONS, SCHEDULE OF COORDINATES, L/D LEVELS, DIMENSIONS AND PIPE SIZES ARE CORRECT AND THAT THE INFORMATION IS ACCURATE TO WITHIN NORMAL ENGINEERING AND SURVEY TOLERANCES.

DATE:

N. S. LUDFORD
CHARTERED PROFESSIONAL ENGINEER

Babbage CONSULTANTS
SURVEYORS • ARCHITECTS • ENGINEERS

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PO BOX 3527
AUCKLAND 1 - NEW ZEALAND
PHONE 09 - 379 8882 - FAX 09 - 377 1170

DRAWING REVISIONS				
REV	DATE	DESCRIPTION	DRAWN	CHECK

	DATE	INITIAL
SURVEYED	JAN 2008	RCC
DRAWN	JAN 2008	MBO
CHECKED	JAN 2008	PK
APPROVED		

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CLIENT / PROJECT

WEST COAST ROAD HOUSING DEVELOPMENT

FOR

NZ HOUSING FOUNDATION

DRAWING TITLE

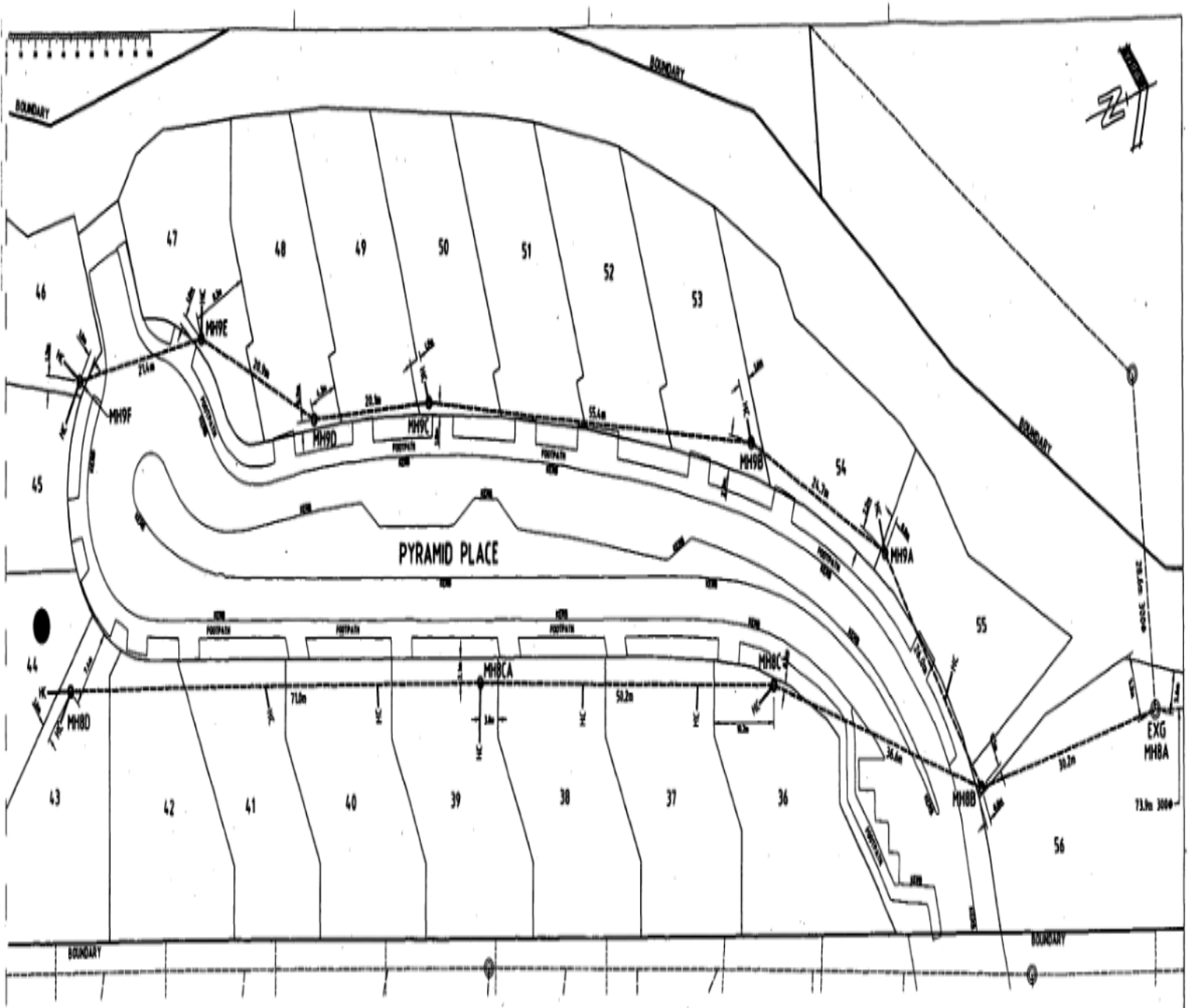
STORMWATER AS BUILT PLAN STAGE 2

SCALE (A1)

1:250

JOB NUMBER	DRAWING NUMBER	REVISION
42808	AB08	-

25/02/2008 4:03:18 p.m. X:\dgn\42808\42808AB BUILTDRAWINGS\08AB STORMWATER AS BUILT



NOTES

1. LEVELS ARE IN TERMS OF LANDS AND SURVEY (AUCKLAND) DATUM 1946.
2. COORDINATES ARE IN TERMS OF GEODETIC DATUM 1949.
3. ALL WASTEWATER PIPES ARE 150ø uPVC SN16 UNLESS SHOWN OTHERWISE.
4. ALL MANHOLES ARE 1050ø UNLESS SHOWN OTHERWISE. ALL MANHOLES WERE MANUFACTURED BY HUMES.
5. ALL HOUSE CONNECTIONS ARE 100ø uPVC SN16 UNLESS SHOWN OTHERWISE.
6. PIPE DISTANCES SHOWN ARE TO CENTRES OF MANHOLES.
7. ALL uPVC PIPES AND GEW MANHOLE CONNECTORS WERE MANUFACTURED BY IPLEX PIPELINES AND BEDDED ON SAP 7.
8. ALL PIPELINE UNDERCUTS BACKFILLED WITH A MIXTURE OF HARDFILL 100 AND GAP 65.
9. WASTEWATER LEAD INVERT AND HOUSE CONNECTION LOCATION INFORMATION HAVE BEEN SUPPLIED BY EARTHCO CIVIL LIMITED.
10. ALL WASTEWATER RETICULATION WORKS WERE CARRIED OUT BY EARTHCO CIVIL LTD DURING JANUARY - NOVEMBER 2007.

KEY

- NEW WASTEWATER LINE
- EXISTING WASTEWATER LINE
- MH8B ⊙ MANHOLE
- HC — HOUSE CONNECTION

I NIGEL STUART LUDFORD, CHARTERED PROFESSIONAL ENGINEER, HEREBY CERTIFY THAT THE WASTEWATER RETICULATION POSITIONS, SCHEDULE OF COORDINATES, LID LEVELS, DIMENSIONS AND PIPE SIZES ARE CORRECT AND THAT THE INFORMATION IS ACCURATE TO WITHIN NORMAL ENGINEERING AND SURVEY TOLERANCES.

DATE:

N. S. LUDFORD
CHARTERED PROFESSIONAL ENGINEER

FEATURE	EASTING	NORTHING	LID LEVEL	IL (OUT)	IL (IN)	IL (IN)	IL (IN)
EXG MH 8A	286410.44	696781.63	28.01	23.88 300ø	24.36 100ø	24.32 100ø	23.88 300ø
MH 8B	286409.14	696751.50	28.32	25.36 150ø	25.43 150ø	25.39 150ø	
MH 8C	286391.66	696719.31	29.72	26.49 150ø	26.64 100ø	26.54 150ø	
MH 8CA	286378.70	696670.66	29.77	27.21 150ø	27.31 100ø	27.26 150ø	
MH 8D	286361.22	696601.54	29.44	27.95 150ø	28.02 100ø	27.99 100ø	
MH 9A	286365.66	696740.46	28.09	25.57 150ø	25.69 150ø	25.72 100ø	
MH 9B	286370.81	696720.74	28.21	25.78 150ø	25.80 150ø	25.94 100ø	
MH 9C	286353.48	696668.12	28.09	26.12 150ø	26.18 150ø	26.28 100ø	
MH 9D	286349.76	696648.33	27.76	26.32 150ø	26.36 150ø	26.40 100ø	
MH 9E	286336.15	696630.92	27.63	26.53 150ø	26.55 150ø	26.62 100ø	
MH 9F	286336.21	696620.60	27.92	26.71 150ø	26.78 100ø	26.73 100ø	

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	DATE	INITIAL
DESIGNED	JAN 2008	NSC
DRAWN	JAN 2008	MSO
CHECKED	JAN 2008	PK
APPROVED		

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CLIENT / PROJECT

WEST COAST ROAD HOUSING DEVELOPMENT FOR NZ HOUSING FOUNDATION

DRAWING TITLE

WASTEWATER AS BUILT PLAN STAGE 2

SCALE (A1)

1:250

JOB NUMBER	DRAWING NUMBER	REVISION
42608	AB09	-

29/02/2008 4:03:51 p.m. X:\dgn\42608\042608WAS BUILT\DRAWINGS\AB09 WASTEWATER AS BUILT.

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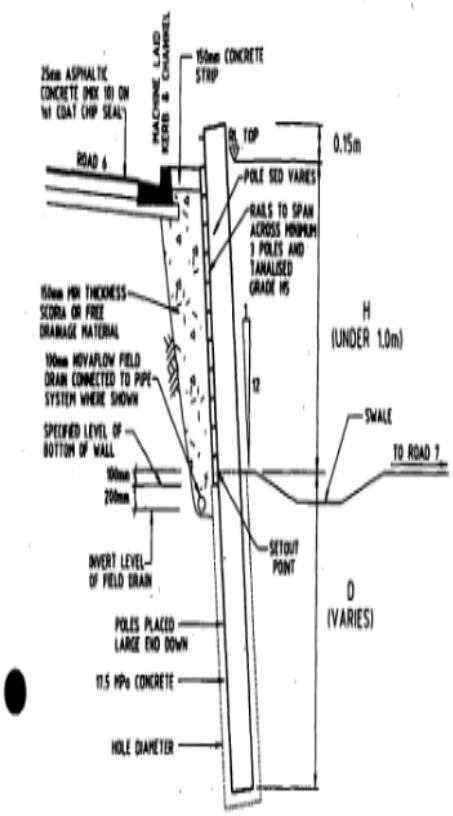
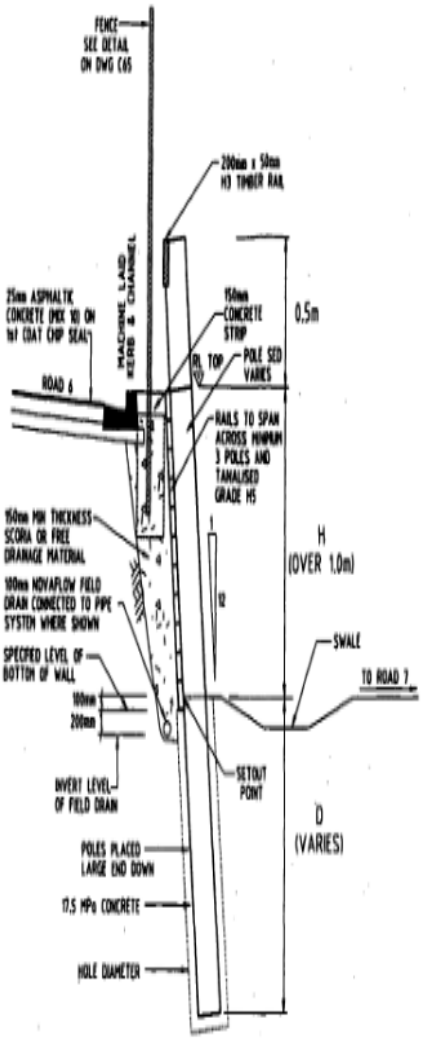


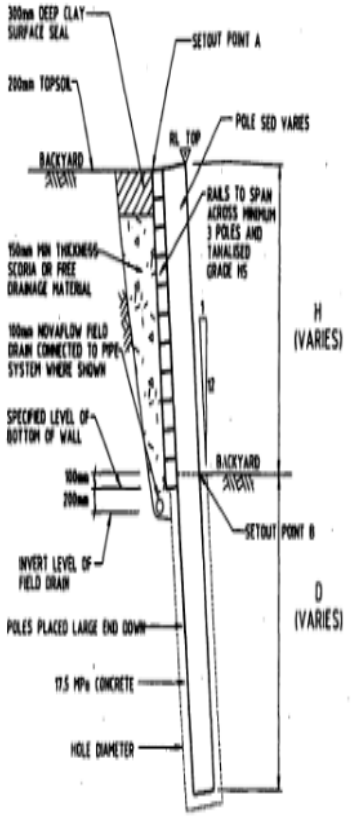
TYPICAL SECTION OF POLE RETAINING WALL UNDER 1.0m HIGH BETWEEN ROAD 6 AND SWALE

(NOT TO SCALE)



TYPICAL SECTION OF POLE RETAINING WALL OVER 1.0m HIGH BETWEEN ROAD 6 AND SWALE

(NOT TO SCALE)



TYPICAL SECTION OF POLE RETAINING WALL BETWEEN BACKYARDS

(NOT TO SCALE)

REV	DATE	DESCRIPTION	DRAWN	CHECK
G	30/08/07	TYPICAL DRAIN BARRIER SECTION ADDED	MRO	PK
F	27/07/07	TYPE B TABLE AMENDED	PK	
E	27/07/07	TYPE A TABLE AMENDED	PK	
D	27/07/07	PIPE CLEARANCE FROM PILES DETAIL ADDED	PK	
C	12/07/07	WIRES AMENDMENTS	PK	
B	06/07/07	WIRES AMENDMENTS	PK	
A	21/06/07	TABLES ADDED	PK	DMR

DRAWING REVISIONS

NOTES:

1. ALL WORKS TO COMPLY WITH WAITAKERE CITY COUNCIL STANDARDS.
2. ALL RETAINING WALL POLES TO BE HIGH DENSITY.
3. FINAL LOCATION OF RETAINING WALLS TO BE DETERMINED ON SITE AT TIME OF CONSTRUCTION.
4. RETAINING WALL LONGSECTION - BOTTOM OF WALL LEVELS ARE FINISHED PAVEMENT/GROUND LEVEL.
5. ALL TIMBER POLE RETAINING WALLS ARE TYPE A EXCEPT RETAINING WALL 50, WHICH IS TYPE B.
6. ALL PILE HOLES ARE TO BE PREDRILLED.

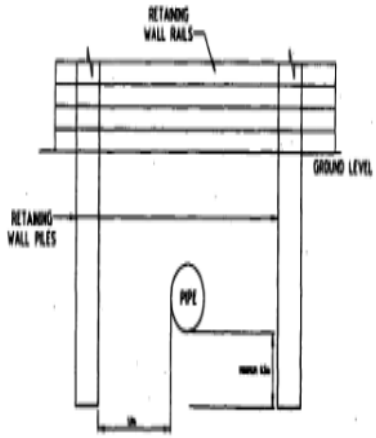
TYPE A (NO SURCHARGE)

(ALL POLE RETAINING WALLS EXCEPT RETAINING WALL 50)

MAXIMUM RETAINED HEIGHT (m)	POLE SIZE SED (mm)	HOLE DIAMETER (mm)	POLE SPACING (m)	EMBEDMENT DEPTH (m)	RAIL THICKNESS (mm)
0.60-1.00	100	300	1.0	1.0	45
1.00-1.50	150	350	1.0	1.5	45
1.50-2.00	200	400	1.0	2.0	45
2.00-2.50	250	450	1.0	2.5	90
2.50-3.00	300	600	1.0	3.0	90
3.00-3.50	350	600	1.0	3.5	90

TYPE B (5kPa SURCHARGE) (POLE RETAINING WALL 50)

MAXIMUM RETAINED HEIGHT (m)	POLE SIZE SED (mm)	HOLE DIAMETER (mm)	POLE SPACING (m)	EMBEDMENT DEPTH (m)	RAIL THICKNESS (mm)
0.60-0.80	100	300	1.0	1.0	45
0.80-1.30	150	350	1.0	1.3	45
1.30-1.80	200	450	1.0	1.8	45
1.80-2.30	250	450	1.0	2.3	50
2.30-2.70	300	500	1.0	2.7	50



TYPICAL CROSS SECTION DETAIL FOR PIPE CLEARANCE FROM PILES

(NOT TO SCALE)

NOTE:

SETOUT POINT A - SET OUT POINT BETWEEN HOUSE LOT BOUNDARIES
SETOUT POINT B - SET OUT POINT BETWEEN HOUSE LOT BOUNDARY AND ROAD RESERVE

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akld@babbage.co.nz

CLIENT / PROJECT

WEST COAST ROAD HOUSING DEVELOPMENT

FOR

NZ HOUSING FOUNDATION

DRAWING TITLE

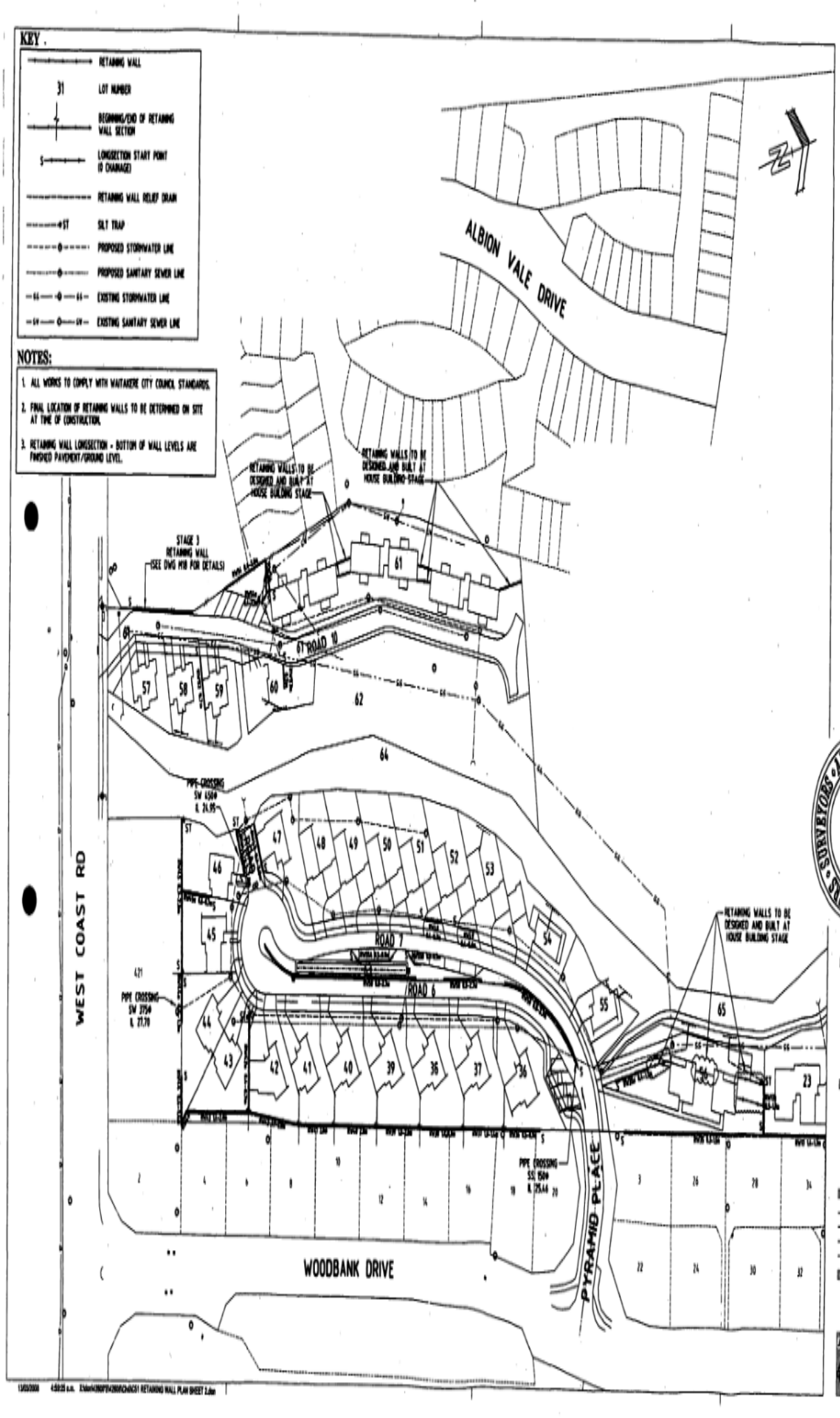
RETAINING WALL DETAILS

	DATE	INITIAL
DESIGNED		
DRAWN	19.07.06	DMR
CHECKED		
APPROVED		

SCALE (A1)

NTS

JOB NUMBER	DRAWING NUMBER	REVISION
4260B	C52	G



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DRAWING NOTES

REV	DATE	DESCRIPTION	DRAWN	CHKD
E	07/2008	STAGE 3 RW ADDED RW26 DELETED	PK	NSL
D	12/2007	RW26 AMENDED RW34 & 35 ADDED	PK	NSL
C	11/2007	RELIEF DRAINS AND SILT TRAPS ADDED	PK	
B	09/2007	DRAINAGE UPDATED	PK	
A	08/2007	VARIOUS AMENDMENTS	PK	BAR

DRAWING REVISIONS

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PHONE 09 - 379 0000 · FAX 09 - 377 1170

CLIENT / PROJECT

WEST COAST ROAD HOUSING DEVELOPMENT

FOR

NZ HOUSING FOUNDATION

DRAWING TITLE

RETAINING WALL PLAN (SHEET 2)

	DATE	INITIAL
DESIGNED	JUNE 2006	PK
DRAWN	JUNE 2006	PK
CHECKED		
APPROVED		

SCALE (A1)

1:500

JOB NUMBER	DRAWING NUMBER	REVISION
42608	C51	E

APPENDIX B

Fill Test Result Summary
Settlement Marker Records

Job Number: 42608/GE	Project: 423 – 429 West Coast Road, Henderson	FILL TEST RESULT SUMMARY

Test No.	Test Date (Report No.)	Bulk Density (t/m^3)	Dry Density (t/m^3)	Moisture Content (%)	Air Voids (%)	Field Shear Strength (kPa)	Relative Compaction (%)	Pass / Fail	Comments
1	11/12/06 (DFT1)	1.892	1.52	24.0	6.2	4 X UTP	-	pass	Testing of crossing over gas pipeline easement.
2		1.886	1.52	23.6	6.8	4 X UTP	-	pass	
3	15/1/07 (DFT2)	1.826	1.42	28.4	6.3	124, 134, 163, >225	-	pass	
4		1.785	1.32	35.1	4.1	121, 124, 141, 173	-	pass	
5		1.845	1.46	26.7	6.6	134, 140, 146, 148	-	pass	
6		1.819	1.26	44.7	0	111, 114, 121, 124	-	pass	
7	17/1/07 (DFT3)	1.772	1.32	35.0	4.9	124, 139, 194, UTP	-	pass	
8		1.853	1.46	26.9	6.0	226, 3 X UTP	-	pass	
9	23/1/07 (DFT4)	1.836	1.42	29.7	4.9	102, 137, 2 X >225	-	pass	
10		1.816	1.28	42.0	0	127, 198, 204, >225	-	pass	
11		1.725	1.20	44.2	2.3	134, 156, 163, 211	99	pass	
12		1.977	1.64	20.9	4.6	4 X >225	-	pass	
13		1.812	1.34	36.3	2.0	137, 148, 151, 182	100	pass	
14		1.804	1.34	34.4	3.6	121, 124, 137, 148	-	pass	
15		1.844	1.32	40.7	0	124, 131, 132, 148	-	pass	
16	26/1/07 (DFT5)	1.822	1.34	35.2	2.1	127, 191, 2 X >225	-	pass	
17		1.763	1.24	43.2	0.7	126, 143, 160, 211	100	pass	
18		1.850	1.38	33.8	1.5	131, 140, 148, 163	-	pass	
19		1.858	1.42	30.2	3.5	131, 140, 188, 194	-	pass	
20		1.788	1.28	40.8	0.6	102, 102, 114, 114	-	pass	
21	1/2/07 (DFT6)	1.904	1.48	29.6	1.5	127, 134, 140, 179	100	pass	
22		1.912	1.48	29.0	1.5	102, 151, 159, 163	-	pass	
23		1.897	1.48	28.9	2.4	111, 143, 163, 194	-	pass	
24		1.882	1.48	27.3	4.3	131, 182, 207, >225	100	pass	
25		1.776	1.22	45.4	0	166, 191, 201, 213	-	pass	
26	19/2/07 (DFT7)	1.910	1.52	25.9	3.9	184, 3 X UTP	-	pass	
27		1.884	1.44	30.9	1.6	194, 3 X UTP	>100	pass	
28		1.883	1.50	25.6	5.5	121, 157, 2 X >225	-	pass	
29		1.892	1.40	35.4	0	157, 216, 2 X >225	-	pass	

Job Number: 42608/GE	Project: 423 – 429 West Coast Road, Henderson	FILL TEST RESULT SUMMARY

Test No.	Test Date (Report No.)	Bulk Density (t/m^3)	Dry Density (t/m^3)	Moisture Content (%)	Air Voids (%)	Field Shear Strength (kPa)	Relative Compaction (%)	Pass / Fail	Comments
30	27/4/07 (DFT8)	1.833	1.34	36.0	1.0	156, 163, 176, 213	-	pass	Backfilling of silt pond.
31		1.843	1.38	34.3	1.5	114, 114, 118, 127	-	pass	
32	12/03/08	HA	Fill to 1.5m	0.5m = >226kPa	1.0m = >226kPa	1.5m = 160kPa	2.0m = 126kPa		Check of fill in Lot 23 and 56 – shown as cut in earthworks plans, but some filling took place once area was trimmed. All reasonable show shear strength in fill materials
33		HA	Fill to 1.2m	0.5m = 210kPa	1.0m = 142kPa	1.5m = 137kPa			
34		HA	Fill to 1.2m	0.5m = >226kPa	1.0m = 174kPa	1.5m = 113kPa			
35		HA	Fill to 1.0m	0.5m = UTP	1.0m = >226kPa				

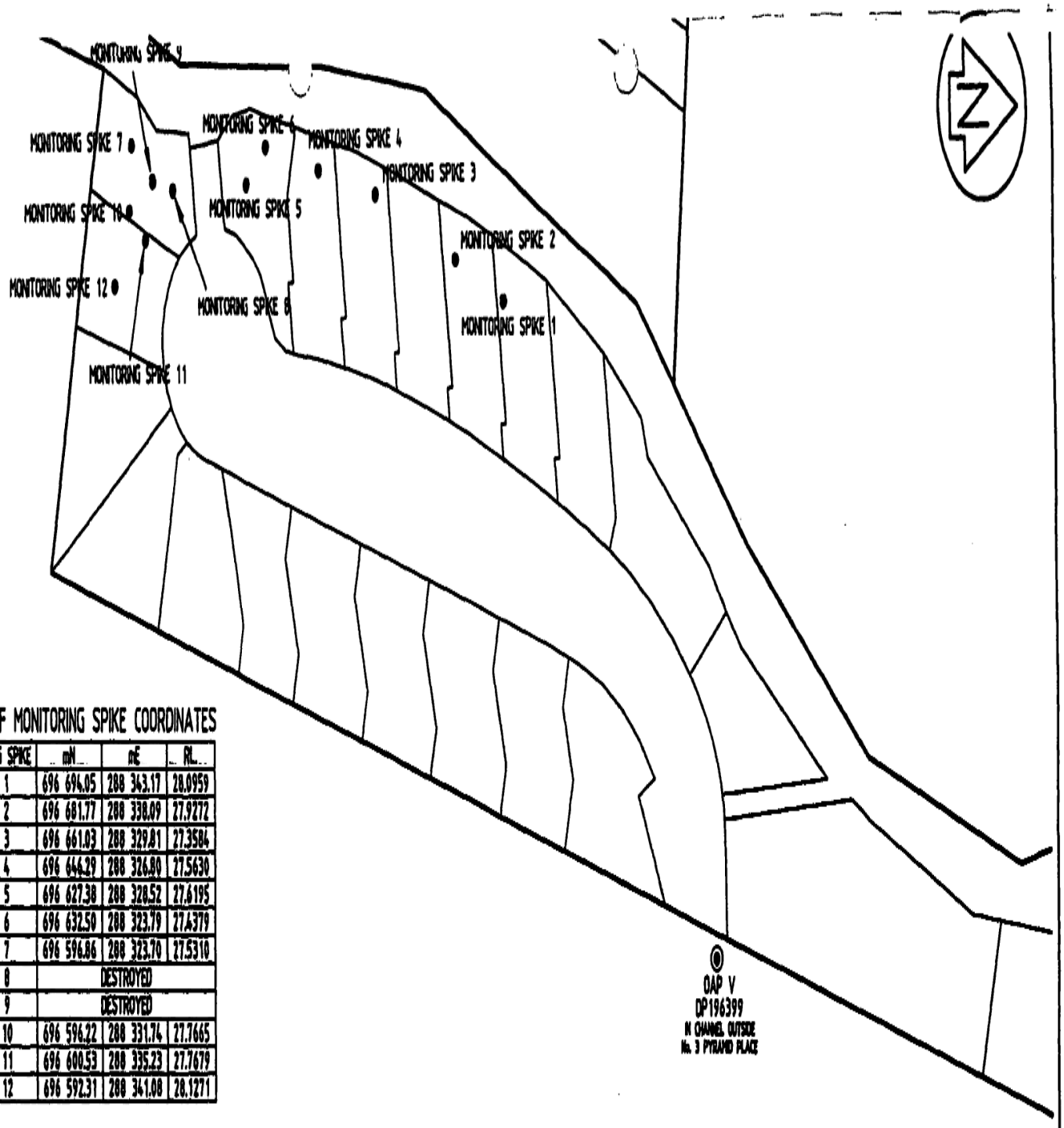

TABLE OF MONITORING SPIKE COORDINATES

MONITORING SPIKE	mN	mE	RL
SPIKE 1	696 694.05	288 343.17	28.0959
SPIKE 2	696 681.77	288 338.09	27.9272
SPIKE 3	696 661.03	288 329.81	27.3584
SPIKE 4	696 646.29	288 326.80	27.5630
SPIKE 5	696 627.38	288 328.52	27.6195
SPIKE 6	696 632.50	288 323.79	27.4379
SPIKE 7	696 596.86	288 323.70	27.5310
SPIKE 8	DESTROYED		
SPIKE 9	DESTROYED		
SPIKE 10	696 596.22	288 331.74	27.7665
SPIKE 11	696 600.53	288 335.23	27.7679
SPIKE 12	696 592.31	288 341.08	28.1271

DATE : 23rd NOVEMBER 2007

NOTES:
1. Datums: Hz - Mt Eden 1949
   Vt - Auckland 1949
2. Origin: Both Coordinate and Levels
   ORM IV DP196399
3. Spike Hz Coordinates have been established using GPS.
4. The level on ORM IV was established by a looped leveling run from SM 46 & SM 47 on West Coast Road
5. All spikes are 12mm dia. reinforcing bar 1m long, under plastic toby boxes
6. RL's for the Monitoring Spikes are on the attached Excel file
   FILE: J:\CAD\DATA\42600\42600-MONITORING ROD SURVEY.xls

ORM IV
DP196399
696 728.99 mN
288 464.50 mE
RL. 32.50
N CHANNEL OUTSIDE
No. 21 WOODBANK DRIVE

OAP VI
DP196399
N CHANNEL OUTSIDE
No. 17 WOODBANK DRIVE

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0 10 20 30 40 50 mm

FILE: J:\CAD\DATA\42600\DWGS\PS_ADMONITOR

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109 FANSHAWE STREET, AUCKLAND
PO BOX 2027, AUCKLAND 1, NEW ZEALAND
PHONE 09 379 9980, FAX 09 377 1170

WEST COAST ROAD
27th MARCH 2007

	BY	DATE	CHKD	DATE
SURVEYED				
DESIGNED				
DRAWN				
APPROVED				

TITLE: STAGE 2 FILL MONITORING SPIKE SETOUT

SCALE: 1:750 AT A3

JOB N° 42600

DRAWING N°

REV

42608 - WEST COAST ROAD

STAGE 2 FILL MONITORING

AS AT: 31st JULY 2007

Monitoring Rod #	27th March 2007	24th April 2007	29th June 2007	31st July 2007	23rd November 2007	Δ_1	Δ_2
	R.L.	R.L.	R.L.	R.L.		Difference from last month	Difference from beginning
1	28.1017	28.0988	28.1007	28.1000	28.0959	-0.0041	-0.0058
2	27.9291	27.9264	27.9297	27.9291	27.9270	-0.0021	-0.0021
3	27.3618	27.3598	27.3626	27.3618	27.3584	-0.0032	-0.0034
4	27.5707	27.5681	27.5685	27.5681	27.5630	-0.0051	-0.0077
5	27.6318	27.6284	27.6284	27.6258	27.6195	-0.0063	-0.0123
6	27.4514	27.4427	27.4448	27.4419	27.4379	-0.0040	-0.0135
7	27.5354	27.5301	27.5345	27.5339	27.5310	-0.0029	-0.0044
8	27.5920	27.5887	Destroyed			Destroyed	Destroyed
9	27.6668	27.6629	Destroyed			Destroyed	Destroyed
10	27.8017	27.7982	27.8014	27.8009	27.7665	-0.0344 *	-0.0352
11	27.7746	27.7724	27.7736	27.7729	27.7679	-0.0050	-0.0067
12	28.1300	28.1281	28.1308	28.1300	28.1271	-0.0029	-0.0029

SUSPECTED DISTURBANCE

Appendix 14

Iwi Consultation

Babbage CONSULTANTS

BABBAGE CONSULTANTS LIMITED
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EMAIL: admin@babbage.co.nz

Te Kawerau a Maki Trust
Private Bag 93109
Henderson

Job Number: 42608
MP
23 June 2006

Attention: Saul Roberts

Dear Saul

Housing Development - West Coast Rd (No. 423-429), Henderson

New Zealand Housing Foundation are proposing to construct a residential development comprising 77 units at the above address.

The proposal will provide entry level, affordable housing options for families.

The proposal has been comprehensively designed and planned. The watercourse that runs through the site has been given particular attention. The application proposes to restore the riparian habitat of the watercourse margins with native plantings. Furthermore, we are proposing extensive sediment and erosion control and stormwater discharge measures to protect the water quality and "Mauri" of the watercourse.

Please refer to the Assessment of environmental effects attached for more detail.

We would appreciate your consideration and ultimately views on this development. We would be happy to meet you on site to walk you through the proposal.

Please do not hesitate to contact the undersigned on 027 283 8855.

Yours faithfully

Matthew Paetz
Senior Planner
Babbage Consultants Limited

Appendix 13

Geotechnical Assessment

Client: **NZ Housing Foundation**

Project: **West Coast Road Housing Development**

Job Number: **42608**

Report Title: **Geotechnical Assessment**

Document Reference: **BDOC02880325**

Report Date: **June 2006**

Issue	Date	Status	Prepared By	Reviewed By
-	26/06/06	First Issue	R J Allison	M J D Stapleton

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2.1 LOCATION AND TOPOGRAPHY 1
2.2 AERIAL PHOTOGRAPHS 2

3.0 PROPOSED DEVELOPMENT 2

4.0 SITE INVESTIGATION 4

5.0 LABORATORY TESTING 4

6.0 GEOLOGY AND STRATIGRAPHY 5
6.1 GEOLOGY 5
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7.0 GROUNDWATER CONDITIONS 5

8.0 DISCUSSION 6
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8.2 EARTHWORKS 7
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8.6 FOOTBRIDGE 12
8.7 STORMWATER PONDS 12

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Appendix A: Drawings

Site Location Plan — Drawing No. 42608/G01
Borehole Location Plan (Sheet 1) — Drawing No. 42608/G02
Borehole Location Plan (Sheet 2) — Drawing No. 42608/G03
Preliminary Cut and Fill Isopac Plan (Sheet 1) — Drawing No. 42608/G04
Preliminary Cut and Fill Isopac Plan (Sheet 2) — Drawing No. 42608/G05

Appendix B: Geotechnical Investigations

Summaries of Soil Profile and Testing
Explanation of Terms and Symbols

Appendix C: Laboratory Testing

Geotechnical Test Reports

1.0 INTRODUCTION

Babbage Consultants Ltd (Babbage) were appointed by NZ Housing Foundation to carry out a geotechnical investigation to support subdivision and earthworks consent applications for the proposed residential development at 423 to 429 West Coast Road, Glen Eden in Waitakere City.

This report presents the results of the geotechnical investigation and provides recommendations for the development of the site.

2.0 SITE DESCRIPTION

2.1 LOCATION AND TOPOGRAPHY

The site is located at 423-429 West Coast Road, Glen Eden in Waitakere City, as shown on the Site Location Plan in Appendix A.

The site covers an area of approximately 5.7 hectares and is bound to the south by West Coast Road and to the east by Woodbank Drive and associated residential development. Most of the western boundary is generally marked by Parrs Stream that flows northwards into the Waikumete Stream that flows approximately parallel to the northern boundary. However, in the south west the boundary extends westward of Parrs Stream to the existing residential development off Albionvale Road.

The site generally comprises rough grassland with areas of scrubby bush and exotic trees in the vicinity of the stream with small localised areas of thicker bush in the southern and northern parts of the site. A line of mature pine trees trend east west across the southern part of the site (between HA10 and 11). A stormwater pond is located in the south western part of the site to the west of Parrs Stream.

The land generally slopes gently downwards towards Parrs Stream. The existing ground levels in the southern part of the site reduce from approximately RL32m in the south east to approximately RL24m in the vicinity of the stream.

Over the southern and central part of the site the existing slope gradients are typically between 1(v) in 3.5(h) to 1(v) in 6(h).

In the northern part of the site the ground level generally reduces from approximately RL29m close to Titch Place on the eastern boundary to approximately RL18m adjacent to the northern boundary.

From the walkover survey there are no apparent signs of significant previous slope instability, although much of the site is heavily vegetated with grass and bush and therefore this may mask such features as shallow scarps.

2.2 AERIAL PHOTOGRAPHS

To assess possible previous areas of fill placement on the site, aerial photographs from 1940, 1959 and 2001 were viewed. The photographs indicate the site has remained largely unchanged, with the exception of some minor residential development in the south eastern part of the site and the construction of the stormwater pond in approximately 2001. The residential development appears to have comprised a single dwelling in 1940 with additional outbuildings being evident in 1959. These buildings are not evident in 2001.

Minor areas of fill appear to have been placed in the vicinity of the eastern boundaries in the central and northern part of the site, associated with the construction of the residential dwellings along Woodbank Drive. Fill also appears to have been placed to form the eastern side of the existing stormwater pond.

No significant signs of instability were identified in the air photos reviewed for this report.

3.0 PROPOSED DEVELOPMENT

The proposed development is for a residential subdivision of approximately 60 lots, to be constructed in three stages. Stage 1 includes the northern part of the site, Stage 2 the south eastern and Stage 3 the south western. In addition it is

proposed to relocate the existing stormwater pond in the south western part of the site and construct an additional stormwater pond in the north western corner of the site.

A footbridge is also to proposed to link the Stage 1 area to the land to the west of Parr's Stream.

A preliminary development layout is shown on the Borehole Location Plans in Appendix A.

The majority of the proposed residential dwellings are understood to comprise two storey structures, although Stage 3 is understood to comprise two and three storey structures with basement level parking although the parking space may not be enclosed.

Significant earthworks are to be carried out to develop the site to form a series of building platforms rising from the 100 year flood level adjacent to the stream. In Stage 1, preliminary earthworks design indicate cut depths of approximately 4.5m over the central part of the site and the placement of up to 1.5m of fill adjacent to the 100 year flood level along the margins of the stream.

In Stage 2, it is proposed to construct a significant fill platform above the 100 year flood level between a new access road and the stream. The proposed fill heights range from approximately 1.5m in the southern end to 3.0m in the northern end of the fill. Some cut of the land adjacent to the eastern boundary is proposed, with the depth of cut ranging from approximately 2.75m in the south east corner to 1m in the north west corner.

In Stage 3, maximum cut depths are anticipated to be approximately 2.5m with maximum fill heights of approximately 1.75m.

It is understood that no retaining structures are permitted to be constructed immediately adjacent to the flood plain and therefore fill batters are proposed along the 100 year flood level. Remote from the flood plain, retaining structures are proposed to support areas of cut and fill where significant changes in ground level occur between the various building platforms and access roads.

The preliminary earthworks plan is shown on Drawing No's 42608/G04 and G05 in Appendix A.

4.0 SITE INVESTIGATION

Following a detailed walkover of the site by our Senior Geotechnical Engineer the fieldwork was carried out between the 22nd and 25th May 2006 and comprised 23 hand auger boreholes to depths of between 0.8m and 3.15m below ground level, designated HA1 to HA23. The approximate location of the boreholes is shown on the Borehole Location Plan (Drawing No's 42608/G02 and G03) included in Appendix A.

Hand held shear vane tests were generally carried out at approximately 0.5m depth intervals within each borehole and remoulded samples taken at approximately 0.5m depth intervals. The material recovered from the boreholes was logged by a Babbage engineering geologist and the samples were returned to the Babbage Geotechnical Laboratory for inspection and possible testing. The results of the in situ testing and sampling are shown on the Summaries of Soil Profile and Testing in Appendix B.

5.0 LABORATORY TESTING

The following tests were carried out on samples recovered from the boreholes:

- Moisture Content 67 No

The results of the above tests are presented on the Summaries of Soil Profile and Testing in Appendix B and in the Babbage Geotechnical Laboratory Report in Appendix C.

6.0 GEOLOGY AND STRATIGRAPHY

6.1 GEOLOGY

The IGNS's Geological Map of the Auckland Urban Area, 1:50,000, Sheet R11, 1992 indicates the geology at the site to generally comprise deposits of the Puketoka Formation comprising pumiceous muds, sands and gravels with muddy peat and lignite.

6.2 STRATIGRAPHY

In general we consider the materials encountered in the boreholes are consistent with those indicated on the geological map. The ground conditions, as indicated in the boreholes, generally confirm the anticipated geology, and generally comprise a 0.1m to 0.8m thick layer of topsoil overlying stiff to very stiff clays interbedded with silt and sand horizons, frequently containing pumiceous material. Localised areas of fill approximately 0.6m to 0.8m in thickness were encountered in HA4 and HA14.

However, in the central and southern part of the site adjacent to the stream, the boreholes identify the presence of soft to firm clays containing organics (see HA3, 4, 7, 10, 11 and 12). These clays are generally highly plastic and range in colour from light brownish grey and orange to blue grey.

In HA20 and HA21, located adjacent to the stream where the proposed footbridge is to be located, the very stiff clay was underlain at approximately 1.0m and 0.8m respectively, by completely to highly weathered siltstone and sandstone. In HA22, in the north eastern part of the site, moderately weathered mudstone was encountered at 1.9m bgl.

7.0 GROUNDWATER CONDITIONS

Groundwater seepages were recorded in all the boreholes, with the exception of HA4, HA20 and HA21 at depths of between 0.1m and 2.9m bgl during the fieldwork. In general and as anticipated, groundwater was encountered at

shallow depth in the boreholes located adjacent to the stream and at greater depths in the boreholes located on the higher ground.

8.0 DISCUSSION

8.1 STABILITY

From a review of aerial photographs and observations made during the walkover survey, there do not appear to be any signs of significant instability on the site.

From the preliminary earthworks plan (Drawing No's 42608/G04 and G05, included in Appendix A) it is apparent that the upper part of the existing slopes are to be generally cut and the areas immediately above the 100 year flood level filled to form building platforms for the proposed development. These earthworks will result in an overall reduction in the slope gradient and therefore, provided that good engineering practice is adopted, it is our opinion that the site is in general stable and suitable for the proposed development.

The fill embankments along the 100 year flood level, are however currently indicated to be 1(v) in 2(h) slopes. These slopes although only 2m to 3m high are however considered to be steeper than can be tolerated in a controlled fill batter in the long term at least on the soft foundation material detected in the southern part of the site. The presence of soft to firm materials extending beyond the depth of our investigations beneath a significant area of fill in our opinion requires further investigation to support the detailed engineering design, We anticipate that further investigations may recommend that either the outer fill slope be battered back to a shallower gradient or stabilised possibly in conjunction with improvement of the natural subgrade. For preliminary design purposes it is our opinion that side slopes formed from suitable clay fill are likely to remain stable at gradients no steeper than 1(v) to 3(h).

It is understood that retaining structures are not permitted adjacent to the 100 year flood level and therefore if 1(v) in 2(h) gradients are preferred, consideration could therefore be given to constructing the batters using

mechanical stabilisation techniques. Such reinforced slopes can be planted and if desired can be constructed at gradients steeper than 1(v) in 1(h). However, consideration has to be given to the placement of structures within the zone of reinforcement extending back from the face of the slope.

A range of retaining walls will be required to support both cuts and fills. The deeper cuts along the eastern boundary may require the use of walls designed to resist at rest earth pressures to prevent movement affecting adjoining houses on shallow foundations. Alternatively the walls could be constructed at flatter angles or moved away from the eastern boundary although both options would reduce the available fill. We consider the relative position of the existing dwellings along the eastern boundary will need to be confirmed by survey. We note the deepest cut of approximately 2.75m along the eastern boundary will create a subgrade close to the existing groundwater table. The wall type and the effect of construction techniques on soil strength as well as the desire of future owners to drain the area will need to be considered during detailed design.

8.2 EARTHWORKS

As discussed in Section 3, significant earthworks are proposed on site to achieve the required platform levels for the proposed structures and access roads. The maximum depth of cut is approximately 4.5m in the central part of the Stage 1 area whilst the maximum thickness of fill is approximately 3.0m along the 100 year flood level in the Stage 2 area.

Whilst it is anticipated that most if not all of the localised areas of fill material detected on site will be removed during the surface strip and excavation for the benches, it is recommended that once the surface strip of topsoil and vegetation has been carried out and formation levels reached, the surface is inspected by a Geotechnical Engineer familiar with this report to confirm that no unsuitable material remains.

The results of the laboratory tests indicate the soils in areas of proposed cut have insitu moisture contents of between approximately 35% and 50%. We estimate the moisture contents are likely to be 5 – 10% above the plastic limit fo

the materials to be excavated. Therefore, it is anticipated that drying of the material will be required prior to reuse as fill.

We note that excavation in the vicinity of HA19 are likely to be affected by the presence of high moisture content silty sand beneath clay. The high moisture content sand, although apparently medium dense, is in our opinion likely to give rise to weaving and rutting under the repeated traffic movements of rubber tyred construction plant. Affected areas are likely to need over-excavation and recompaction or replacement with hardfill as appropriate.

In the case of the proposed fill batters to be constructed along the 100 year flood level, the placement of between 2m and 3m of fill will result in consolidation settlement of the underlying soils. The magnitude of this consolidation settlement and the rate at which it occurs will be largely controlled by the compressibility and permeability of the underlying soils. The findings of the boreholes indicate that in the Stage 1 area, the soils are likely to comprise stiff to very stiff sandy clays of moderate plasticity. However, in the Stage 2 area, the clays are indicated to be soft to firm, organic and of high plasticity.

Based on the above, it is our opinion that whilst consolidation settlement beneath the proposed fill batters in the Stage 1 area could be between 10mm and 20mm, assuming medium compressibility clays are present, in the Stage 2 area, where the clays are indicated to be highly compressible, consolidation settlement of between 100mm and 150mm may result beneath parts of the fill batters.

In order to minimise the effect of consolidation settlement on the proposed structures, we consider that the fill in the Stage 2 area should be placed during the initial stages of development and subsequent construction delayed for a minimum period of 6 months. The settlement of the fill could be monitored during this period to confirm the rate and amount of settlement taking place, thereby providing confidence in the assessment of likely settlement after development to ensure that it is within acceptable limits.

It should be noted that the above preliminary consolidation settlement values and time periods have been derived from assumed parameters. Additional

investigations will be required to more accurately assess the consolidation characteristics of the underlying soils for detailed design.

The placement of up to 3m of fill and any additional preload, on the soft to firm clays will require to be carried out under strict control in order to avoid potential bearing capacity failure of the underlying clays. The clay is indicated to have an undrained shear strength of 18kPa at 1m bgl in HA11 0.2m below th underside of topsoil in that location. We note this strength will not support conventional construction plant and the topsoil would require removal using a hydraulic excavator rather than a motorscraper. This soft to firm soil is susceptible to bearing capacity failure for applied bearing pressures in excess of approximately 35kPa. If the full height of fill is placed over a short period of time and no drainage is installed within the underlying clays, it is our opinion that localised bearing capacity failure of the soft to firm clays may occur.

In order to minimise the risk of bearing capacity failure beneath the fill batter it is recommended that additional vertical drainage is installed beneath the area of fill and the rate of filling is strictly controlled to permit the dissipation of excess pore pressures within the underlying clays. This may be achieved by installing vertical "wick" drains and a drainage blanket prior to filling. Alternatively, consideration may be given to installing stone columns instead of "wick" drains. These would have the advantage of providing additional vertical support to the fill batter.

Prior to the placement of fill it is expected that some form of subsoil drainage will be installed to ensure that groundwater seepage is not impeded by the placement of the fill, particularly behind the proposed retaining structures. In addition, based on the groundwater seepages encountered during the borings, groundwater may be encountered at shallow depth within cut areas and therefore adequate provision for drainage will require to be made in these areas.

It is recommended that all fill is certified where the thickness exceeds 0.6m or where structures or roads are to be located on the fill.

8.3 PAVEMENT

At the time of the investigation the cut and fill levels were not known and therefore no specific Scala penetrometer tests were carried out to assess the in situ CBR of the soil for the design of roads or car parking.

For the design of roads and car parking it is considered that a CBR value of 3 can be used for preliminary design for in situ soil and certified fill. It is however recommended that once the earthworks are complete, confirmatory Scala penetrometer tests are carried out to at least 0.5m depth below finished subgrade to confirm the preliminary design CBR value.

8.4 RETAINING WALLS

At the time of preparing this report, the details regarding the location and height of proposed retaining walls are not known.

For preliminary design of retaining walls with a horizontal ground surface above and below the wall it is considered that the following design parameters may be adopted for in situ soil or certified fill:-

Coefficient of active earth pressure	= 0.3
Coefficient of passive earth pressure	= 3.0
Coefficent of at rest earth pressure	= 0.5
Bulk unit weight	= 18 kN/m^3

For pole retaining walls where undrained shear strength (c_u) values are sometimes used for design it is considered that an unfactored c_u value of 60kPa may be adopted for preliminary design in insitu soil and 80kPa in certified fill. It is however recommended that for detailed design the c_u value is confirmed by a Geotechnical Engineer for the particular ground conditions along the line of the retaining wall. On this basis locally unfavourable ground conditions may be taken into account or the design value increased in favourable ground conditions.

It is noted that an existing sanitary sewer and stormwater line run parallel to the eastern boundary of the site and therefore the design of retaining walls in these

areas will require consider these services. In addition, the proximity of adjacent dwellings will also require consideration, especially where deep areas of cut are proposed.

8.5 FOUNDATIONS

Based on the findings of the investigation it is considered that the foundations for the proposed structures may be designed in accordance with NZS 3604:1999 "Timber Framed Buildings". This recommendation applies only to foundations within in situ soil or certified fill and no foundations should be founded in topsoil or uncertified fill.

In areas of proposed cut, the boreholes indicate the clays to be generally moderately plastic and therefore it is considered the foundations should be founded at least 450mm below finished ground level to take account of possible shrinkage swell affects. Where highly plastic clays occur, the founding depth should be increased to 600mm. We consider the founding depths should be confirmed following completion of the proposed earthworks.

In the case of structures located on the fill adjacent to the 100 year flood level, shallow foundations are likely to be constructed within certified fill. In order to minimise differential and total settlements as a result of the variation in thickness of the fill material, it is recommended that strict control is placed on the quality and compaction of the fill beneath the proposed structures. In addition, it is recommended that a serviceability limit state bearing strength of 100kPa is not exceeded for strip or pad foundations constructed within the fill material and that pad sizes should not exceed 1.0m x 1.0m in plan and strip foundations not exceed 1m width. Final development over the fill in the Stage 2 area will however be dependant on consolidation of the materials beneath the fill rather than the strength of the fill itself. Monitoring of the fill should confirm when development is appropriate.

It is understood that the proposed structures in Lots 54 and 55 are to be constructed on piled foundations that extend into the flood plain. As such, it is recommended that additional investigations are carried out in these areas to

determine the likely depth to which piles will require to be constructed to adequately support the structures.

8.6 FOOTBRIDGE

The findings of boreholes AH20 and AH21 indicate the ground conditions in the vicinity of the proposed footbridge to comprise very stiff clay overlying siltstone / sandstone at between 0.8m and 1.0m bgl. As such, it is considered the abutments may be constructed within the very stiff clays or underlying siltstone / sandstone and designed for a serviceability limit state bearing strength of 100kPa.

It is recommended that flood levels and potential scour are considered when carrying out detailed design of the abutments and superstructure.

8.7 STORMWATER PONDS

It is understood that the existing stormwater pond in the Stage 3 area is to be relocated approximately 20m to 30m to the north east. Details of the proposed pond construction are not known at this stage, although it is anticipated that the eastern part of the pond is likely to be formed from clay fill, similar to the existing.

The findings of borehole AH5 indicate the ground conditions in this area to comprise low permeability clays and clayey silts. Groundwater was indicated to be at approximately 2m bgl, although no long term monitoring was carried out. Therefore, it is considered the base of the proposed pond is likely to be formed within low permeability materials and require little reworking to form an adequate seal. Where areas of higher permeability materials are encountered, it is recommended that low permeabilty clay fill is placed and compacted to form a suitable seal. For preliminary design purposes, it is recommended that external side slopes to earth bunds are constructed at gradients no steeper than 1(v) in 3(h).

In the case of the proposed stormwater pond in the Stage 1 area, the findings of borehole AH23 indicate the presence of sands from 0.85m to 1.80m bgl

overlying alternating clay and sand horizons. Groundwater was indicated to be at 1.2m bgl, although no long term monitoring was carried out.

Whilst details of the proposed stormwater pond are not known at this stage, it is anticipated that the sides and base may be within soils that are too permeable to provide suitable retention of water. As such, it is considered that for preliminary design purposes an allowance is made to form a low permeability liner. This may be constructed from low permeability clay or by using a suitable geotextile. It is recommended that external side slopes to earth bunds are constructed at gradients no steeper than 1(v) in 3(h).

9.0 CONCLUSIONS

Based on the fieldwork covered by this investigation it is considered that the site is suitable for residential subdivision in accordance with the proposed earthworks and subject to the recommendations contained within this report.

10.0 RECOMMENDATIONS

10.1 It is recommended that an additional geotechnical investigation is carried out to to support detailed design of the earthworks to provide further site specific information on the consolidation characteristics of the soils in the vicinity of the proposed fill batter along the 100 year flood level.

10.2 It is recommended that fill slopes on soft foundation soils do not exceed 1(v) in 3(h) unless suitably reinforced/mechanically stabilised.

10.3 It is recommended that all fill be certified beneath areas where development takes place (e.g. beneath buildings, roads etc). In the case of the fill along the 100 year flood level in Stage 2, it is recommended that development be postponed for at least 6 months after the fill has been placed in order to permit resulting consolidation settlement of the underlying clays. In order to increase the rate of consolidation settlement and minimise the risk of bearing capacity failure beneath the fill batter it is recommended that additional vertical drainage

is installed beneath the area of fill and the rate of filling is strictly controlled to permit the dissipation of excess pore pressures within the underlying clays.

10.4 It is recommended that subsoil drainage is installed beneath areas of fill and in particular to the rear of retaining structures. In addition, the results of the groundwater monitoring indicate that groundwater may be encountered at shallow depth within cut areas and therefore adequate provision for drainage will require to be made in these areas.

10.5 For road and car park design it is recommended that a CBR of 3 for the insitu soil and certified fill be used for preliminary design. Once the earthworks are complete it is recommended that confirmatory Scala penetrometer tests are carried out along the proposed roads and car park areas to confirm the design CBR value.

10.6 For retaining wall design it is recommended that the following design parameters are adopted for the insitu soils and certified fill for the case of horizontal ground surface above and below the wall.

Coefficient of active earth pressure	= 0.3
Coefficient of passive earth pressure	= 3.0
Coefficent of at rest earth pressure	= 0.5
Bulk unit weight	= 18 kN/m^3

10.7 For pole retaining walls designed using an undrained shear strength (cu) value for the soil below the retained height it is recommended that an unfactored c_u value of 60kPa is used for preliminary design in residual soil and 80kPa in certified fill. For detailed design it is recommended that the actual ground conditions at the retaining wall location are assessed by a Geotechnical Engineer to take into account possible strength variations across the site. The position the proposed cut along the eastern boundary relative to dwellings along Woodbank Drive should be determined by survey and taken into account in the detailed design.

10.8 It is recommended that the foundations for residential dwellings are designed in accordance with NZS 3604:1999, with the exception of those for Lots 54 and 55

and the two to three storey structures in Stage 3, where specific design will be required. It is recommended that a serviceability limit state bearing strength of 100kPa is not exceeded for strip or pad foundations constructed within the fill material and that pad sizes should not exceed 1.0m x 1.0m in plan and strip foundations not exceed 1m width. It is recommended that the foundations are founded at least 450mm below finished ground level to take into account possible shrinkage swell affects. Where highly plastic clay forms the founding material then this depth should be increased to 600mm.

10.4 It is recommended that for preliminary design, all external batter slopes to the proposed stormwater ponds are constructed at gradients no steeper than 1(v) in 3(h). In the case of the northernmost stormwater pond, it is recommended the design includes for the provision of a low permeability clay or geotextile liner.

11.0 LIMITATIONS

11.1 RESTRICTION OF INTENDED PURPOSE

This report has been prepared solely for the benefit of our client NZ Housing Foundation with respect to the proposed redevelopment of the site, as described in Section 3. The reliance by other parties on the information or opinions contained in the report shall, without our prior review and agreement in writing, be at such party's sole risk.

11.2 LEGAL INTERPRETATION

Opinions and judgements expressed herein are based on our understanding and interpretation of current regulatory standards, and should not be construed as legal opinions. Where opinions or judgements are to be relied on they should be independently verified with appropriate legal advice.

11.3 RELIABILITY OF INFORMATION

Recommendations and opinions in this report are based on data from the boreholes described in Section 6 of this report. The nature and continuity of subsoil conditions away from the boreholes are inferred and it must be

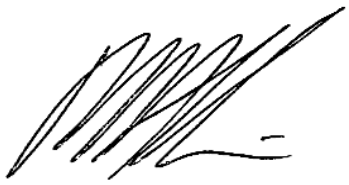
appreciated that actual conditions could vary considerably from the assumed model.

During excavation and construction the site should be examined by a Geotechnical Engineer competent to judge whether the exposed subsoils are compatible with the inferred conditions on which the report has been based. It is possible that the nature of the exposed subsoils may require further investigation and the modification of the design based upon this report.

Babbage would be pleased to provide this service and believe that the project would benefit from such continuity. In any event, it is essential Babbage be advised if there is any variation in subsoil conditions from those described in the report as it may affect the design parameters recommended in the report.

This report has been prepared by Russell Allison and reviewed by Malcolm Stapleton.

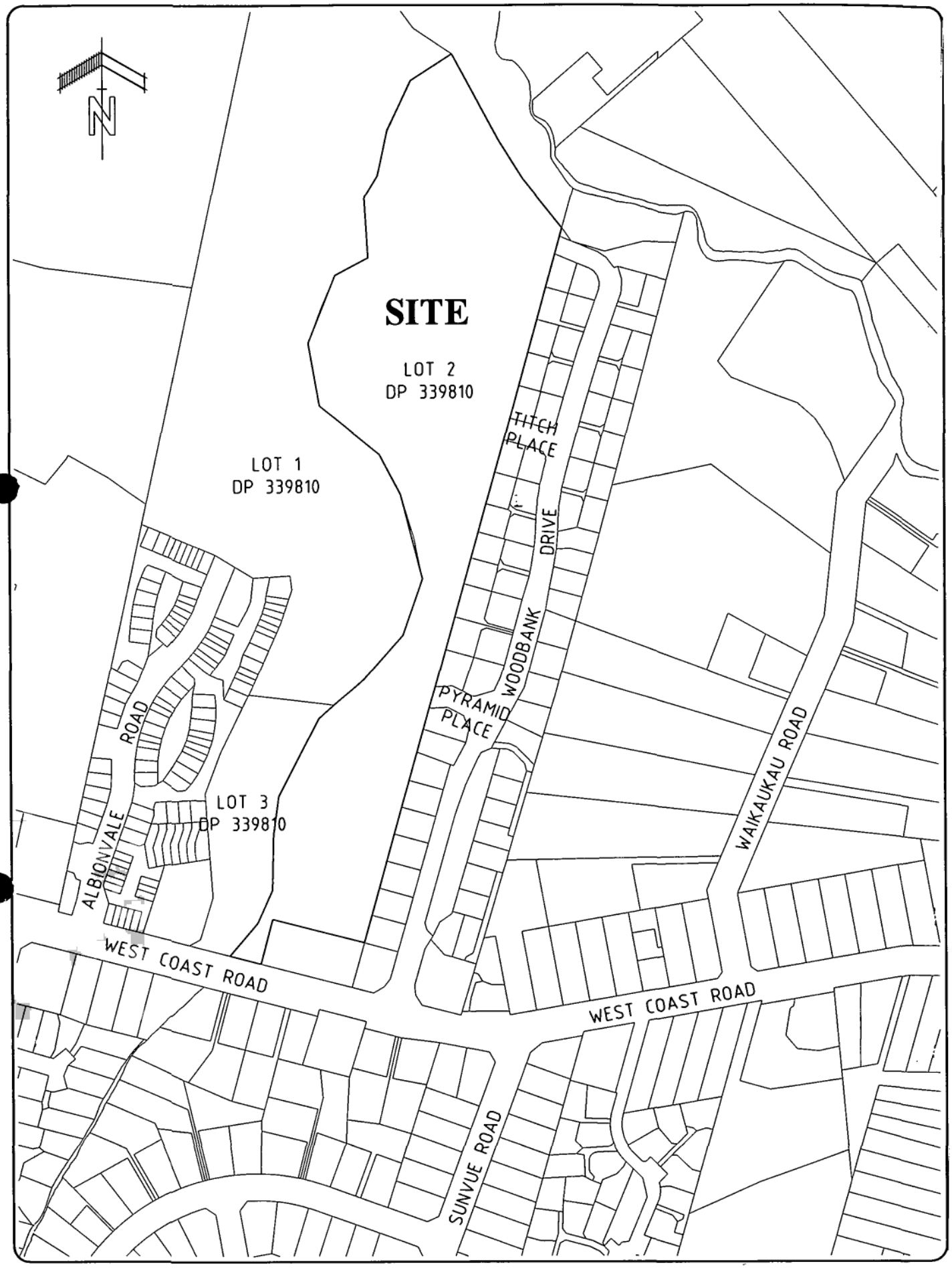
Respectfully submitted
Babbage Consultants Limited



R J Allison
Senior Geotechnical Engineer

Appendix A

Drawings



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PHONE 09 379 9980, FAX 09 377 1170

WEST COAST ROAD HOUSING DEVELOPMENT FOR NZ HOUSING FOUNDATION

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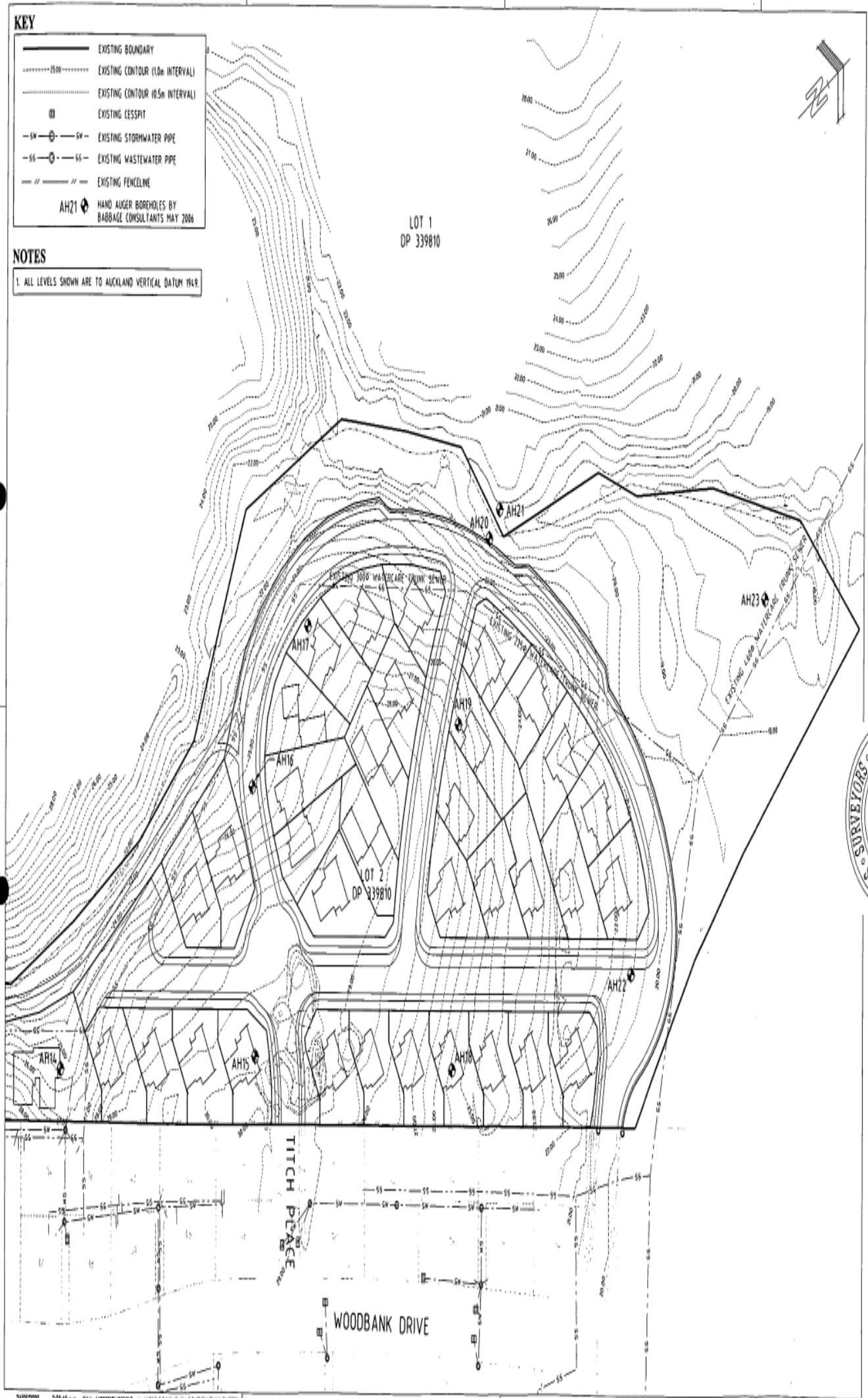
TITLE:	SITE LOCALITY PLAN
SCALE:	NOT TO SCALE
DRAWING:	G01



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DRAWING NOTES

REV	DATE	DESCRIPTION	DRAWN	CHECK

DRAWING REVISIONS

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CLIENT / PROJECT

WEST COAST ROAD HOUSING DEVELOPMENT

FOR

NZ HOUSING FOUNDATION

DRAWING TITLE

BOREHOLE LOCATION PLAN (SHEET 1)

	DATE	INITIAL
DESIGNED		
DRAWN	JUNE 2006	GNB
CHECKED		
APPROVED		

SCALE (A1)

1:500

JOB NUMBER	DRAWING NUMBER	REVISION
42608	G02	-

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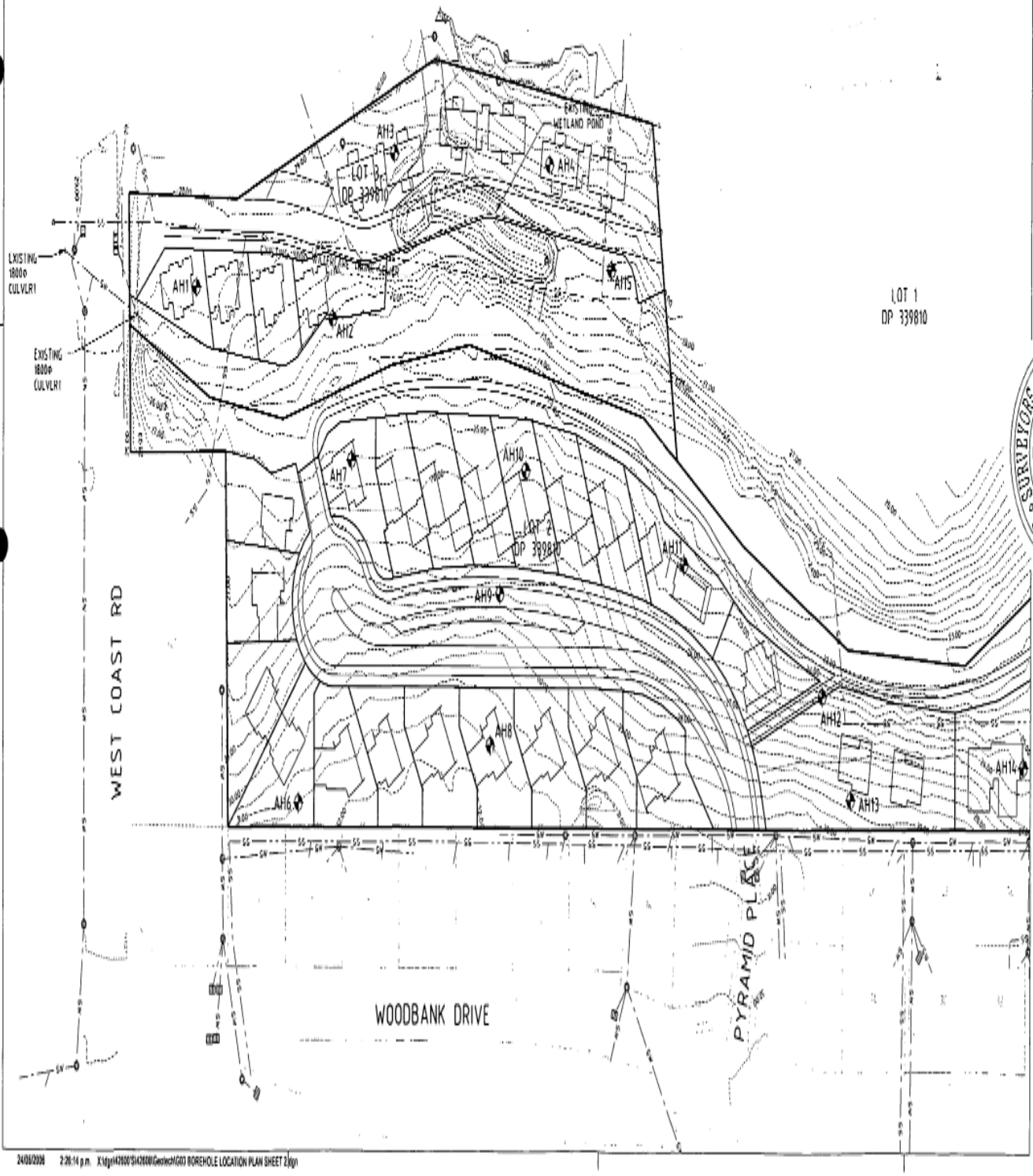
DRAWING NOTES

KEY

- EXISTING BOUNDARY
- 25.00 EXISTING CONTOUR (1.0m INTERVAL)
- EXISTING CONTOUR (0.5m INTERVAL)
- EXISTING CESSPIT
- SW EXISTING STORMWATER PIPE
- SS EXISTING WASTEWATER PIPE
- EXISTING FENCELINE
- AH7 HAND AUGER BOREHOLES BY BABBAGE CONSULTANTS MAY 2006

NOTES

1. ALL LEVELS SHOWN ARE TO AUCKLAND VERTICAL DATUM 1949.



Rev	Date	Description	Drawn	Check

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CLIENT / PROJECT

WEST COAST ROAD HOUSING DEVELOPMENT

FOR

NZ HOUSING FOUNDATION

DRAWING TITLE

BOREHOLE LOCATION PLAN (SHEET 2)

	DATE	INITIAL
DESIGNED		
DRAWN	JUNE 2006	CNB
CHECKED		
APPROVED		

SCALE (A1)

1:500

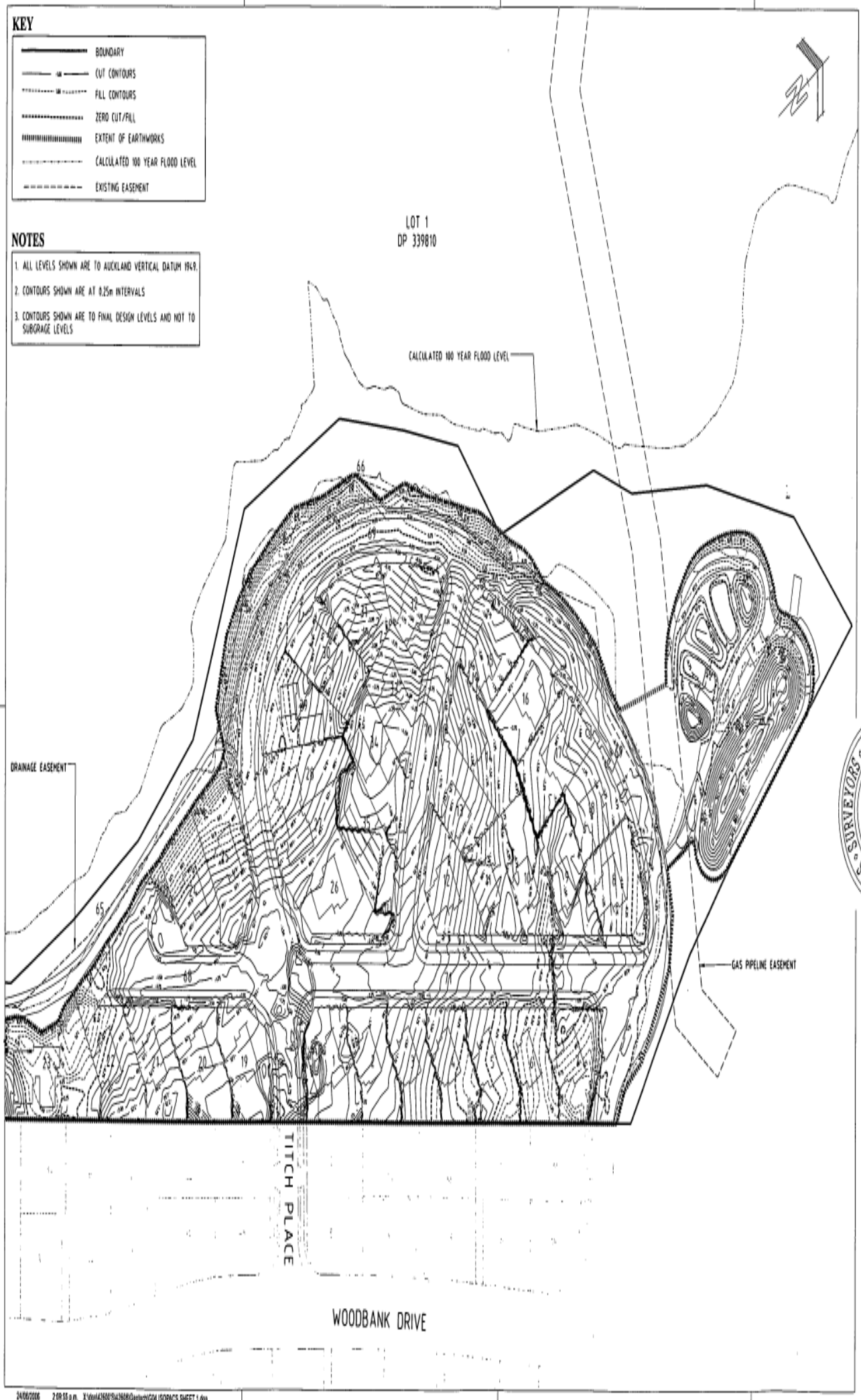
JOB NUMBER	DRAWING NUMBER	REVISION
42608	G03	-

KEY

- BOUNDARY
- CUT CONTOURS
- FILL CONTOURS
- ZERO CUT/FILL
- EXTENT OF EARTHWORKS
- CALCULATED 100 YEAR FLOOD LEVEL
- EXISTING EASEMENT

NOTES

1. ALL LEVELS SHOWN ARE TO AUCKLAND VERTICAL DATUM 1949.
2. CONTOURS SHOWN ARE AT 0.25m INTERVALS
3. CONTOURS SHOWN ARE TO FINAL DESIGN LEVELS AND NOT TO SUBGRADE LEVELS



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REV	DATE	DESCRIPTION	DRAWN	CHECK

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CLIENT / PROJECT

WEST COAST ROAD HOUSING DEVELOPMENT

FOR

NZ HOUSING FOUNDATION

DRAWING TITLE

CUT AND FILL ISOPAC PLAN (SHEET 1)

	DATE	INITIAL
DESIGNED		
DRAWN	JUNE 2006	GW
CHECKED		
APPROVED		

SCALE (A1)

1:500

JOB NUMBER	DRAWING NUMBER	REVISION
42608	G04	-

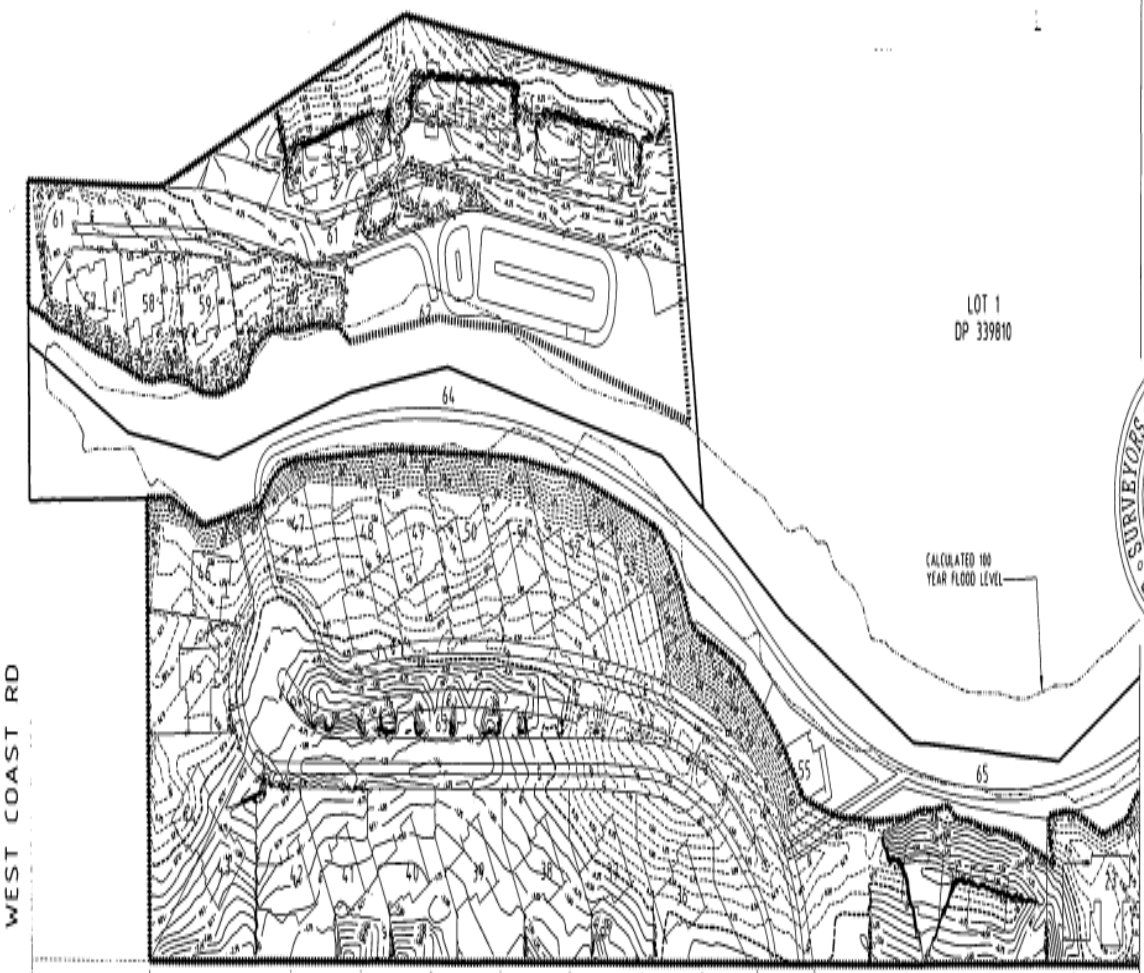
24/06/2006 2:09:55 p.m. X:\dgn\42600\94260BG\sets\hrG04 ISOPACS SHEET 1.dgn

KEY

- BOUNDARY
- CUT CONTOURS
- FILL CONTOURS
- ZERO CUT/FILL
- EXTENT OF EARTHWORKS
- CALCULATED 100 YEAR FLOOD LEVEL
- EXISTING EASEMENT

NOTES

1. ALL LEVELS SHOWN ARE TO AUCKLAND VERTICAL DATUM 1949.
2. CONTOURS SHOWN ARE AT 0.25m INTERVALS
3. CONTOURS SHOWN ARE TO FINAL DESIGN LEVELS AND NOT TO SUBGRADE LEVELS



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DRAWING NOTES

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CLIENT / PROJECT

WEST COAST ROAD
HOUSING DEVELOPMENT

FOR

NZ HOUSING FOUNDATION

DRAWING TITLE

CUT AND FILL ISOPAC PLAN (SHEET 2)

	DATE	INITIAL
DESIGNED		
DRAWN	JUNE 2006	GW
CHECKED		
APPROVED		

SCALE (A1)

1:500

JOB NUMBER	DRAWING NUMBER	REVISION
42608	G05	-

24/08/2006 2:09:23 p.m. X:\dept\42600\942608\Geotech\GDS ISOPACS SHEET 2.dgn

Appendix B

Geotechnical Investigations

Babbage CONSULTANTS

SUMMARY OF SOIL PROFILE & TESTING

JOB No.	42608
PROJECT: WEST COAST ROAD	
HOLE No.	HA1

DATE STARTED: 25/05/2006	METHOD: HA	RIG: 50 dia Hand Auger	SHEET 1 of 1
DATE FINISHED: 25/05/2006	DRILLED BY: Babbage Consultants Ltd	FLUID: None	LOGGED BY: CM/GC

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

SAMPLES RECOVERED & TEST RESULTS

MOISTURE CONTENTS = ●
LIMITS: PLASTIC = × LIQUID = +
20 40 60
IN SITU VANE (kPa) = ✳
50 100 150

OTHER TESTS
Corrected Shear Vane Result **
U = peak / R = remoulded
SPT / Scala Penetrometer

DEPTH (m)	SOIL SYMBOL		GEOLOGIC UNIT	GROUND WATER	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	OTHER TESTS
		TOPSOIL: Silt, firm, slightly plastic, dark brown								
0.40		CLAY: silty, fine sandy, very stiff, slightly plastic, light brown, moist				A1				>222kPa (U)
0.70		CLAY: very stiff, moderately plastic, light grey, moist								
1.00						A2				181kPa (U) 68kPa (R)
		water seepage at 1.2m	Alluvium - Puketoka Formation							
		firm, white pumice grains, occasional rootlets				A3	HA			83kPa (U) 69kPa (R)
2.00						A4				83kPa (U) 55kPa (R)
2.50		CLAY: silty, minor fine sandy, very stiff, moderately plastic, blueish grey				A5				158kPa (U) 62kPa (R)
		orange staining								
3.00						A6				>222kPa (U)
3.15		End of Borehole at 3.15 m								

Remarks:

** IN HOUSE METHOD BASED ON BS1377

Babbage CONSULTANTS

SUMMARY OF SOIL PROFILE & TESTING

JOB No.	42608
PROJECT: WEST COAST ROAD	
HOLE No.	HA2

DATE STARTED: 25/05/2006	METHOD: HA	RIG: 50 dia Hand Auger	SHEET 1 of 1
DATE FINISHED: 25/05/2006	DRILLED BY: Babbage Consultants Ltd	FLUID: None	LOGGED BY: CM/GC

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

SAMPLES RECOVERED & TEST RESULTS

MOISTURE CONTENTS = ●
LIMITS: PLASTIC = × LIQUID = +
20 40 60
IN SITU VANE (kPa) = ✳
50 100 150

OTHER TESTS
Corrected Shear Vane Result **
U = peak / R = remoulded
SPT / Scala Penetrometer

DEPTH (m)	SOIL SYMBOL		GEOLOGIC UNIT	GROUND WATER	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	OTHER TESTS
		TOPSOIL: Silt, firm, slightly plastic, dark brown								
0.30		CLAY: silty, stiff, moderately plastic, light brown grey mottled								
						A1				92kPa (U) 47kPa (R)
1.00						A2				69kPa (U) 31kPa (R)
1.20		black organic mottles								
1.50		grey with orange mottles, some organics	Alluvium - Puketoka Formation			A3	HA			82kPa (U) 59kPa (R)
2.00		water seepage at 2.0m				A4				83kPa (U) 23kPa (R)
2.40		SILT: sandy, some clay, stiff, moderately plastic, light grey with orange mottles, very moist				A5				75kPa (U) 47kPa (R)
3.00						A6				90kPa (U) 60kPa (R)
3.15		End of Borehole at 3.15 m								

Remarks:

** IN HOUSE METHOD BASED ON BS1377

Babbage CONSULTANTS

SUMMARY OF SOIL PROFILE & TESTING

JOB No.	42608
PROJECT: WEST COAST ROAD	
HOLE No.	HA3

DATE STARTED: 25/05/2006	METHOD: HA	RIG: 50 dia Hand Auger	SHEET 1 of 1
DATE FINISHED: 25/05/2006	DRILLED BY: Babbage Consultants Ltd	FLUID: None	LOGGED BY: CM/GC

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

SAMPLES RECOVERED & TEST RESULTS

MOISTURE CONTENTS = ●
LIMITS: PLASTIC = × LIQUID = +
20 40 60
IN SITU VANE (kPa) = ✳
50 100 150

OTHER TESTS
Corrected Shear Vane Result **
U = peak / R = remoulded
SPT / Scala Penetrometer

DEPTH (m)	SOIL SYMBOL		GEOLOGIC UNIT	GROUND WATER	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	OTHER TESTS
0.00		TOPSOIL: Silt, firm, slightly plastic, dark brown								
0.30		CLAY: silty, very stiff, slightly to moderately plastic, light brown with orange mottles				A1				134kPa (U) 69kPa (R)
1.00		minor fine sand, very stiff				A2				107kPa (U) 62kPa (R)
1.30		stiff, moderate to high plastic, light brown grey with orange streaks	Alluvium - Puketoka Formation							
		free water at 1.6m		↓		A3	HA			75kPa (U) 18kPa (R)
2.00						A4				79kPa (U) 34kPa (R)
2.60		pumiceous grains, sandy				A5				117kPa (U) 34kPa (R)
3.00		soft to firm				A6				31kPa (U) 18kPa (R)
3.15		End of Borehole at 3.15 m								

Remarks:

** IN HOUSE METHOD BASED ON BS1377

Babbage CONSULTANTS

SUMMARY OF SOIL PROFILE & TESTING

JOB No. 42608

PROJECT: WEST COAST ROAD

HOLE No. HA4

DATE STARTED: 25/05/2006	METHOD: HA	RIG: 50 dia Hand Auger	SHEET 1 of 1
DATE FINISHED: 25/05/2006	DRILLED BY: Babbage Consultants Ltd	FLUID: None	LOGGED BY: CM/GC

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

SAMPLES RECOVERED & TEST RESULTS

MOISTURE CONTENTS = ●
LIMITS: PLASTIC = × LIQUID = +
20 40 60
IN SITU VANE (kPa) = ✳
50 100 150

OTHER TESTS
Corrected Shear Vane Result **
U = peak / R = remoulded
SPT / Scala Penetrometer

DEPTH (m)	SOIL SYMBOL	DESCRIPTION	GEOLOGIC UNIT	GROUND WATER	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	OTHER TESTS
0.00		TOPSOIL: Silt, firm, slightly plastic, dark brown	FILL							
0.40		FILL: Silt, clay, stiff, moderately plastic, brown greys			X	A1				55kPa (U) 34kPa (R)
0.80		CLAY: silty, very stiff, moderately plastic, light brownish grey with orange streaks, rootlets, moist	Alluvium - Puketoka Formation		X	A2	HA			103kPa (U) 59kPa (R)
1.00					X	A3				109kPa (U) 62kPa (R)
2.00					X	A4				114kPa (U) 71kPa (R)
2.20		pumiceous grains, sandy, stiff to very stiff, light grey with white flecks								
2.40		slightly organic, blackish staining			X	A5				95kPa (U) 65kPa (R)
2.60		silty, stiff, moderately plastic, light brown with orange mottles								
3.00					X	A6				68kPa (U) 38kPa (R)
3.15		End of Borehole at 3.15 m								

Remarks:

** IN HOUSE METHOD BASED ON BS1377

Babbage CONSULTANTS

SUMMARY OF SOIL PROFILE & TESTING

JOB No. 42608

PROJECT: WEST COAST ROAD

HOLE No. HA5

DATE STARTED: 25/05/2006	METHOD: HA	RIG: 50 dia Hand Auger	SHEET 1 of 1
DATE FINISHED: 25/05/2006	DRILLED BY: Babbage Consultants Ltd	FLUID: None	LOGGED BY: CM/GC

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

SAMPLES RECOVERED & TEST RESULTS

MOISTURE CONTENTS = ●
LIMITS: PLASTIC = X LIQUID = +
20 40 60
IN SITU VANE (kPa) = ✳
50 100 150

OTHER TESTS
Corrected Shear Vane Result **
U = peak / R = remoulded
SPT / Scala Penetrometer

DEPTH (m)	SOIL DESCRIPTION	GEOLOGIC UNIT	GROUND WATER	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	OTHER TESTS
0.00	TOPSOIL: Silt, firm, slightly plastic, dark brown								
0.20	CLAY: silty, very stiff, moderate to highly plastic, light brownish grey with orange mottles								
				X	A1				122kPa (U) 68kPa (R)
	stiff, whiteish								
1.00				X	A2				97kPa (U) 49kPa (R)
1.50	SILT: clayey, stiff, moderately plastic, light grey with orange mottles, white pumiceous grains	Alluvium - Puketoka Formation		X	A3	HA			95kPa (U) 62kPa (R)
2.00	free water at 2.0m		←	X	A4				75kPa (U) 44kPa (R)
2.50	CLAY: silty, minor fine sandy, stiff to very stiff, moderately plastic, light grey with orange mottles, wet, rootlets			X	A5				101kPa (U) 47kPa (R)
3.00				X	A6				97kPa (U) 47kPa (R)
3.15	End of Borehole at 3.15 m								

Remarks:

** IN HOUSE METHOD BASED ON BS1377

Babbage CONSULTANTS

SUMMARY OF SOIL PROFILE & TESTING

JOB No. 42608

PROJECT: WEST COAST ROAD

HOLE No. HA6

DATE STARTED: 23/05/2006	METHOD: HA	RIG: 50 dia Hand Auger	SHEET 1 of 1
DATE FINISHED: 23/05/2006	DRILLED BY: Babbage Consultants Ltd	FLUID: None	LOGGED BY: CM/KF

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

SAMPLES RECOVERED & TEST RESULTS

MOISTURE CONTENTS = ●
LIMITS: PLASTIC = × LIQUID = +
20 40 60
IN SITU VANE (kPa) = ✳
50 100 150

OTHER TESTS
Corrected Shear Vane Result **
U = peak / R = remoulded
SPT / Scala Penetrometer

DEPTH (m)	SOIL SYMBOL		GEOLOGIC UNIT	GROUND WATER	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	OTHER TESTS
		TOPSOIL: Silt, firm, slightly plastic, dark brown								
0.40		CLAY: silty, very stiff, moderate to highly plastic, mottled mid grey orange				A1				148kPa (U) 44kPa (R)
		less orange staining, light brown								
1.00						A2				148kPa (U) 65kPa (R)
			Alluvium - Puketoka Formation			A3	HA			129kPa (U) 67kPa (R)
2.00						A4				110kPa (U) 57kPa (R)
		free water at 2.1m								
2.30		sandy with dark brown (organic) mottles								
2.60						A5				112kPa (U) 26kPa (R)
		silty, fine sandy, moderate to high plastic, light grey with orange streaks								
3.00						A6				109kPa (U) 42kPa (R)
3.15		End of Borehole at 3.15 m								

Remarks:

** IN HOUSE METHOD BASED ON BS1377

Babbage CONSULTANTS

SUMMARY OF SOIL PROFILE & TESTING

JOB No.	42608
PROJECT: WEST COAST ROAD	
HOLE No.	HA7

DATE STARTED: 23/05/2006	METHOD: HA	RIG: 50 dia Hand Auger	SHEET 1 of 1
DATE FINISHED: 23/05/2006	DRILLED BY: Babbage Consultants Ltd	FLUID: None	LOGGED BY: GC/SL

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

SAMPLES RECOVERED & TEST RESULTS

MOISTURE CONTENTS = ●
LIMITS: PLASTIC = × LIQUID = +
20 40 60
IN SITU VANE (kPa) = ✳
50 100 150

OTHER TESTS
Corrected Shear Vane Result **
U = peak / R = remoulded
SPT / Scala Penetrometer

DEPTH (m)	SOIL SYMBOL	DESCRIPTION	GEOLOGIC UNIT	GROUND WATER	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	OTHER TESTS
0.00		TOPSOIL: Silt, firm, slightly plastic, dark brown	Alluvium - Puketoka Formation	←						
0.45		CLAY: silty, stiff, moderate to highly plastic, grey with yellow mottles free water at 0.6m				A1				79kPa (U) 36kPa (R)
1.00		slightly silty, firm, high plastic, mid grey orange with white flecks				A2				34kPa (U) 23kPa (R)
						A3	HA			73kPa (U) 33kPa (R)
1.70		CLAY: sandy, firm, moderately plastic, blueish grey with numerous roots								
2.00						A4				47kPa (U) 21kPa (R)
2.30		slightly decomposed wood fragments								
2.50		silty, firm, high plastic, blueish grey				A5				34kPa (U) 18kPa (R)
3.00						A6				31kPa (U) 18kPa (R)
3.15		End of Borehole at 3.15 m								

Remarks:

** IN HOUSE METHOD BASED ON BS1377

Babbage CONSULTANTS

SUMMARY OF SOIL PROFILE & TESTING

JOB No.	42608
PROJECT: WEST COAST ROAD	
HOLE No.	HA8

DATE STARTED: 23/05/2006	METHOD: HA	RIG: 50 dia Hand Auger	SHEET 1 of 1
DATE FINISHED: 23/05/2006	DRILLED BY: Babbage Consultants Ltd	FLUID: None	LOGGED BY: GC/SL

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

DEPTH (m)	Description	GEOLOGIC UNIT	GROUND WATER
0.00	TOPSOIL: Silt, firm, slightly plastic, dark brown		
0.20	CLAY: silty, very stiff, moderately plastic, light blueish grey with orange mottles		
1.00	light grey with orange mottles	Alluvium - Puketoka Formation	
1.80	CLAY: sandy (fine grained), stiff, moderately plastic, light grey with orange mottles, moist		
2.00	free water at 2.0m		
	becoming high plastic		
3.00			
3.15	End of Borehole at 3.15 m		

SAMPLES RECOVERED & TEST RESULTS

CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE
	A1	HA		
	A2			
	A3			
	A4			
	A5			
	A6			

MOISTURE CONTENTS = ●
LIMITS: PLASTIC = × LIQUID = +
20 40 60
IN SITU VANE (kPa) = ✳
50 100 150

OTHER TESTS
Corrected Shear Vane Result **
U = peak / R = remoulded
SPT / Scala Penetrometer

A1	101kPa (U) 53kPa (R)
A2	117kPa (U) 68kPa (R)
A3	114kPa (U) 71kPa (R)
A4	84kPa (U) 50kPa (R)
A5	73kPa (U) 65kPa (R)
A6	53kPa (U) 31kPa (R)

Remarks:

** IN HOUSE METHOD BASED ON BS1377

Babbage CONSULTANTS

SUMMARY OF SOIL PROFILE & TESTING

JOB No.	42608
PROJECT: WEST COAST ROAD	
HOLE No.	HA9

DATE STARTED: 23/05/2006	METHOD: HA	RIG: 50 dia Hand Auger	SHEET 1 of 1
DATE FINISHED: 23/05/2006	DRILLED BY: Babbage Consultants Ltd	FLUID: None	LOGGED BY: CM/KF

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

SAMPLES RECOVERED & TEST RESULTS

MOISTURE CONTENTS = ●
LIMITS: PLASTIC = × LIQUID = +
20 40 60
IN SITU VANE (kPa) = ✳
50 100 150

OTHER TESTS
Corrected Shear Vane Result **
U = peak / R = remoulded
SPT / Scala Penetrometer

DEPTH (m)	SOIL SYMBOL	GEOLOGIC UNIT	GROUND WATER	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	OTHER TESTS
0.00									
	TOPSOIL: Silt, firm, slightly plastic, dark brown								
0.25	CLAY: sandy, very stiff, moderately plastic, light grey yellow with dark brown streaks.	Alluvium - Puketoka Formation			A1				109kPa (U) 40kPa (R)
1.00					A2				140kPa (U) 73kPa (R)
					A3	HA			123kPa (U) 63kPa (R)
	increasing sand, white pumice flecks, very moist								
2.00									
2.10	Stiff.				A4				82kPa (U) 44kPa (R)
	CLAY: minor sand, stiff, high plastic, light grey with orange streaks.								
2.50	organic stained band, dark brown grey				A5				77kPa (U) 35kPa (R)
2.80	CLAY: minor sand, stiff, high plastic, light grey with orange streaks.								
3.00					A6				53kPa (U) 25kPa (R)
3.15	End of Borehole at 3.15 m								

Remarks:

** IN HOUSE METHOD BASED ON BS1377

Babbage CONSULTANTS	SUMMARY OF SOIL PROFILE & TESTING	JOB No.	42608
	PROJECT: WEST COAST ROAD	HOLE No.	HA10
DATE STARTED: 23/05/2006	METHOD: HA	RIG: 50 dia Hand Auger	SHEET 1 of 1
DATE FINISHED: 23/05/2006	DRILLED BY: Babbage Consultants Ltd	FLUID: None	LOGGED BY: GC/SL

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

DEPTH (m)	SOIL SYMBOL	SOIL/ROCK DESCRIPTION	GEOLOGIC UNIT	GROUND WATER	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	MOISTURE CONTENTS = ● LIMITS: PLASTIC = X LIQUID = + (20 40 60) IN SITU VANE (kPa) = ✳ (50 100 150)	OTHER TESTS (Corrected Shear Vane Result ** U = peak / R = remoulded; SPT / Scala Penetrometer)
0.00		TOPSOIL: Silt, firm, slightly plastic, dark brown	Alluvium - Puketoka Formation								
0.25		CLAY: silty, very stiff, moderately plastic, light grey with orange mottles, moist								✳	148kPa (U) 62kPa (R)
0.60		SAND: clayey, (fine grained), medium dense, (very stiff), slightly to non plastic, light grey with orange mottles, moist			X	A1					
1.00					X	A2				●	Unable to Penetrate
										✳	120kPa (U) 68kPa (R)
1.70		CLAY: silty, very stiff, moderately plastic, grey with orange mottles			X	A3	HA				
2.00		stiff			X	A4				✳	73kPa (U) 31kPa (R)
2.40		very stiff, purple brown (organic stained)			X	A5				✳	109kPa (U) 68kPa (R)
2.70		ORGANIC CLAY, silty, firm, moderately plastic, dark grey and brown.									
3.00					X	A6				✳	38kPa (U) 29kPa (R)
3.15		End of Borehole at 3.15 m									

Remarks:

** IN HOUSE METHOD BASED ON BS1377

SUMMARY OF SOIL PROFILE & TESTING

Babbage CONSULTANTS

PROJECT: WEST COAST ROAD		JOB No.	42608
		HOLE No.	HA11
DATE STARTED: 23/05/2006	METHOD: HA	RIG: 50 dia Hand Auger	SHEET 1 of 1
DATE FINISHED: 23/05/2006	DRILLED BY: Babbage Consultants Ltd	FLUID: None	LOGGED BY: CM/KF

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

DEPTH (m)	SOIL SYMBOL	SOIL/ROCK DESCRIPTION	GEOLOGIC UNIT	GROUND WATER
0.00		TOPSOIL/Organic SILT, very soft to soft, slightly plastic, dark brown, saturated - water from surface	Alluvium - Puketoka Formation	←
0.80		CLAY: silty, soft to firm, moderate to high plastic, light grey with brown mottles, some decomposed wood fragments		
1.00		becoming stiff, moderate to high plastic, blueish grey with brown rootlets		
2.00				
3.00				
3.15		End of Borehole at 3.15 m		

SAMPLES RECOVERED & TEST RESULTS

CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE
	A1	HA		
	A2			
	A3			
	A4			
	A5			
	A6			

MOISTURE CONTENTS = ●
LIMITS: PLASTIC = × LIQUID = +
20 40 60
IN SITU VANE (kPa) = ✳
50 100 150

OTHER TESTS
Corrected Shear Vane Result **
U = peak / R = remoulded
SPT / Scala Penetrometer

48kPa (U)	15kPa (R)
18kPa (U)	13kPa (R)
35kPa (U)	18kPa (R)
94kPa (U)	20kPa (R)
109kPa (U)	26kPa (R)
63kPa (U)	22kPa (R)

80.4

Remarks:

** IN HOUSE METHOD BASED ON BS1377

Babbage CONSULTANTS

SUMMARY OF SOIL PROFILE & TESTING

JOB No. 42608

PROJECT: WEST COAST ROAD

HOLE No. HA12

DATE STARTED: 23/05/2006	METHOD: HA	RIG: 50 dia Hand Auger	SHEET 1 of 1
DATE FINISHED: 23/05/2006	DRILLED BY: Babbage Consultants Ltd	FLUID: None	LOGGED BY: SL/WEC

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

SAMPLES RECOVERED & TEST RESULTS

MOISTURE CONTENTS = ●
LIMITS: PLASTIC = × LIQUID = +
20 40 60
IN SITU VANE (kPa) = ✳
50 100 150

OTHER TESTS
Corrected Shear Vane Result **
U = peak / R = remoulded
SPT / Scala Penetrometer

DEPTH (m)	SOIL SYMBOL	DESCRIPTION	GEOLOGIC UNIT	GROUND WATER	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	OTHER TESTS
0.00		TOPSOIL: Silt, firm, slightly plastic, dark brown								
0.20		CLAY: silty, stiff, slight to moderately plastic, brown, rootlets								
						A1				94kPa (U) 47kPa (R)
		moderate to high plastic, yellow light grey, very moist from 0.4m								
		free water at 0.8								
1.00		soft to firm, moderate to high plastic, mid grey orange, saturated	Alluvium - Puketoka Formation			A2				23kPa (U) 8kPa (R)
										24kPa (U) 12kPa (R)
		blueish grey from 1.5m				A3	HA			
1.80		CLAY: silty, minor fine sand, stiff, moderate to high plastic, blueish grey								
2.00						A4				75kPa (U) 47kPa (R)
						A5				95kPa (U) 31kPa (R)
3.00		very stiff				A6				134kPa (U) 49kPa (R)
3.15		End of Borehole at 3.15 m								

Remarks:

** IN HOUSE METHOD BASED ON BS1377

Babbage CONSULTANTS

SUMMARY OF SOIL PROFILE & TESTING

JOB No. 42608

PROJECT: WEST COAST ROAD

HOLE No. HA13

DATE STARTED: 22/05/2006	METHOD: HA	RIG: 50mm dia Auger	SHEET 1 of 1
DATE FINISHED: 22/05/2006	DRILLED BY: Babbage Consultants Ltd	FLUID: None	LOGGED BY: SL

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

DEPTH (m)	SOIL SYMBOL	SOIL/ROCK DESCRIPTION	GEOLOGIC UNIT	GROUND WATER
0.00		TOPSOIL: Silt, firm, slightly plastic, dark brown	Alluvium - Puketoka Formation	
0.20		CLAY: silty, very stiff, moderately plastic, yellowish grey brown with orange mottles, moist		
0.80		CLAY: sandy (fine grained), very stiff, moderately plastic, light grey with yellow orange bands, some pumiceous grains, moist		
1.00				
1.60		CLAY: very stiff, moderate to highly plastic, whiteish light grey, pumiceous		
2.00				
2.30		SAND: clayey, (fine grained), 'medium dense', (very stiff), slightly plastic, light to mid grey, moist	Waitemata Group	
		free water at 2.5m, (coarse grained)		
2.80		CLAY: sandy, very stiff, moderately plastic, mid grey with orange mottles		
3.00				
3.15		End of Borehole at 3.15 m		

SAMPLES RECOVERED & TEST RESULTS

CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE
	A1	HA		
	A2			
	A3			
	A4			
	A5			
	A6			

MOISTURE CONTENTS = ●
LIMITS: PLASTIC = × LIQUID = +
20 40 60
IN SITU VANE (kPa) = ✳
50 100 150

OTHER TESTS
Corrected Shear Vane Result **
U = peak / R = remoulded
SPT / Scala Penetrometer

A1	170kPa (U) 95kPa (R)
A2	170kPa (U) 87kPa (R)
A3	148kPa (U) 71kPa (R)
A4	136kPa (U) 73kPa (R)
A5	122kPa (U) 65kPa (R)
A6	103kPa (U) 60kPa (R)

Remarks:

** IN HOUSE METHOD BASED ON BS1377

Babbage CONSULTANTS

SUMMARY OF SOIL PROFILE & TESTING

JOB No.	42608
PROJECT: WEST COAST ROAD	
HOLE No.	HA14

DATE STARTED: 22/05/2006	METHOD: HA	RIG: 50mm dia Auger	SHEET 1 of 1
DATE FINISHED: 22/05/2006	DRILLED BY: Babbage Consultants Ltd	FLUID: None	LOGGED BY: GC/WEC

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

SAMPLES RECOVERED & TEST RESULTS

MOISTURE CONTENTS = ●
LIMITS: PLASTIC = X LIQUID = +
20 40 60
IN SITU VANE (kPa) = ✳
50 100 150

OTHER TESTS
Corrected Shear Vane Result **
U = peak / R = remoulded
SPT / Scala Penetrometer

DEPTH (m)	SOIL SYMBOL		GEOLOGIC UNIT	GROUND WATER	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	OTHER TESTS
0.15		TOPSOIL: SILT, firm, slightly plastic, blackish dark brown, very wet								
		CLAY: silty, very stiff, moderately plastic, mid grey with orange streaks	FILL							
0.60						A1				148kPa (U) 59kPa (R)
		Organic SILT: some clay, stiff, slightly plastic, dark brown, organic stained (Old Topsoil)?								
0.80										
		CLAY: silty, firm to stiff, moderately to highly plastic, brownish light grey with orange streaks.	ALLUVIUM - PUKETOKA FORMATION							
1.00		free water at 1.0m				A2				48kPa (U) 15kPa (R)
		stiff, moderately plastic, brownish light grey.				A3	HA			90kPa (U) 23kPa (R)
1.75										
		CLAY: silty, very stiff, moderately plastic, light to mid grey with orange stains	WAITEMATA GROUP							
2.00						A4				>190kPa (U)
						A5				Unable to Penetrate
3.00										
						A6				Unable to Penetrate
3.15		End of Borehole at 3.15 m								

Remarks:

** IN HOUSE METHOD BASED ON BS1377

Babbage CONSULTANTS

SUMMARY OF SOIL PROFILE & TESTING

JOB No. 42608

PROJECT: WEST COAST ROAD

HOLE No. HA15

DATE STARTED: 22/05/2006	METHOD: HA	RIG: 50mm dia Auger	SHEET 1 of 1
DATE FINISHED: 22/05/2006	DRILLED BY: Babbage Consultants Ltd	FLUID: None	LOGGED BY: SL

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

SAMPLES RECOVERED & TEST RESULTS

MOISTURE CONTENTS = ●
LIMITS: PLASTIC = × LIQUID = +
20 40 60
IN SITU VANE (kPa) = ✳
50 100 150

OTHER TESTS
Corrected Shear Vane Result **
U = peak / R = remoulded
SPT / Scala Penetrometer

DEPTH (m)	SOIL SYMBOL		GEOLOGIC UNIT	GROUND WATER	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	OTHER TESTS
0.10		TOPSOIL: Silt, firm, slightly plastic, brown								
		SILT: minor clay, stiff, non plastic, light brown with grey bands, moist	FILL							
0.40		CLAY: silty, firm to stiff, moderately plastic, brown with orange mottles, moist, rootlets				A1				68kPa (U) 18kPa (R)
		becoming stiff to very stiff, light grey with orange bands								
1.00		very stiff, light to mid grey with orange mottles	ALUUVIUM - Puketoka Formation			A2				148kPa (U) 68kPa (R)
						A3	HA			150kPa (U) 90kPa (R)
		CLAY: some silt, some sand (fine grained), light grey with orange bands, moist								
2.00						A4				122kPa (U) 53kPa (R)
2.50		CLAY: silty, stiff, slightly to moderately plastic, light brown -light grey with coarse silt grains free water	Waitemata Group			A5				92kPa (U) 76kPa (R)
3.00						A6				65kPa (U) 21kPa (R)
3.15		End of Borehole at 3.15 m								

Remarks:

** IN HOUSE METHOD BASED ON BS1377

Babbage CONSULTANTS	SUMMARY OF SOIL PROFILE & TESTING		JOB No.	42608
	PROJECT: WEST COAST ROAD		HOLE No.	HA16
DATE STARTED: 22/05/2006	METHOD: HA	RIG: 50mm dia Auger	SHEET 1 of 1	
DATE FINISHED: 22/05/2006	DRILLED BY: Babbage Consultants Ltd	FLUID: None	LOGGED BY: GC/WEC	

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

SAMPLES RECOVERED & TEST RESULTS

MOISTURE CONTENTS = ●
LIMITS: PLASTIC = × LIQUID = +
20 40 60
IN SITU VANE (kPa) = ✳
50 100 150

OTHER TESTS
Corrected Shear Vane Result **
U = peak / R = remoulded
SPT / Scala Penetrometer

DEPTH (m)	SOIL SYMBOL		GEOLOGIC UNIT	GROUND WATER	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	OTHER TESTS
		TOPSOIL: Silt, firm, slightly plastic, dark brown, saturated free water at 0.2m		←						
0.40		CLAY: silty, very stiff, moderatley plastic, mottled mid grey orange	Alluvium - Puketoka Formation			A1				118kPa (U) 16kPa (R)
		becoming sandy, (fine grained) at 0.75m								
1.00						A2				116kPa (U) 29kPa (R)
		CLAY: silty, fine sandy, very stiff, moderately plastic, light to mid grey with orange banding				A3	HA			184kPa (U) 57kPa (R)
1.90										
2.00		banded CLAY: silty, very stiff, moderately plastic, grey	Waitemata Group			A4				>190kPa (U)
		SAND: clayey, 'medium dense to dense', slightly plastic, grey				A5				>190kPa (U)
3.00						A6				Unable to Penetrate
3.15		End of Borehole at 3.15 m								

Remarks:

** IN HOUSE METHOD BASED ON BS1377

SUMMARY OF SOIL PROFILE & TESTING

Babbage CONSULTANTS

JOB No.	42608		
PROJECT: WEST COAST ROAD		HOLE No.	HA17
DATE STARTED: 22/05/2006	METHOD: HA	RIG: 50mm dia Auger	SHEET 1 of 1
DATE FINISHED: 22/05/2006	DRILLED BY: Babbage Consultants Ltd	FLUID: None	LOGGED BY: WEC

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

DEPTH (m)	SOIL SYMBOL	SOIL/ROCK DESCRIPTION	GEOLOGIC UNIT	GROUND WATER	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	MOISTURE CONTENTS = ● LIMITS: PLASTIC = × LIQUID = + (20 40 60) IN SITU VANE (kPa) = ✳ (50 100 150)	OTHER TESTS: Corrected Shear Vane Result ** U = peak / R = remoulded; SPT / Scala Penetrometer
0.10		TOPSOIL: Silt, firm, slightly plastic, dark brown									
		CLAY: slightly silty, very stiff, moderately plastic, mottled mid grey orange	Alluvium - Puketoka Formation								
					X	A1				● ✳	128kPa (U) 66kPa (R)
1.00		sandy, very stiff, moderately plastic, light grey orange			X	A2				● ✳	173kPa (U) 67kPa (R)
1.20		banded CLAY: silty, very stiff, moderately plastic, light to mid grey and SAND: clayey, 'medium dense to dense', (fine grained), slightly plastic, mid grey	Waitemata Group		X	A3	HA			● ✳	140kPa (U) 42kPa (R)
2.00					X	A4					>190kPa (U)
					X	A5					>190kPa (U)
3.00					X	A6					>190kPa (U)
3.15		End of Borehole at 3.15 m									

Remarks:

** IN HOUSE METHOD BASED ON BS1377

Babbage CONSULTANTS	SUMMARY OF SOIL PROFILE & TESTING	JOB No.	42608
	PROJECT: WEST COAST ROAD	HOLE No.	HA18
DATE STARTED: 22/05/2006	METHOD: HA	RIG: 50mm dia Auger	SHEET 1 of 1
DATE FINISHED: 22/05/2006	DRILLED BY: Babbage Consultants Ltd	FLUID: None	LOGGED BY: SL

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

SAMPLES RECOVERED & TEST RESULTS

MOISTURE CONTENTS = ●
LIMITS: PLASTIC = × LIQUID = +
20 40 60
IN SITU VANE (kPa) = ✳
50 100 150

OTHER TESTS
Corrected Shear Vane Result **
U = peak / R = remoulded
SPT / Scala Penetrometer

DEPTH (m)	SOIL SYMBOL		GEOLOGIC UNIT	GROUND WATER	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	OTHER TESTS
0.00		TOPSOIL: Silt, firm, slightly plastic, dark brown								
0.35		CLAY: silty, fine sandy, very stiff, moderately plastic, light brown grey with orange mottles	Alluvium - Puketoka Formation			A1				>222kPa (U)
		increasing sand, (fine to medium grained), moist				A2				134kPa (U) 50kPa (R)
1.00		pumiceous grains				A3	HA			117kPa (U) 68kPa (R)
		free water at 1.8m								
2.00						A4				192kPa (U) 59kPa (R)
2.55		banded CLAY: silty, very stiff, moderately plastic, light to mid grey and SAND: clayey, 'medium dense to dense', (fine grained), slightly plastic, mid grey	Waitemata Group			A5				Unable to Penetrate
3.00						A6				Unable to Penetrate
3.15		End of Borehole at 3.15 m								

Remarks:

** IN HOUSE METHOD BASED ON BS1377

SUMMARY OF SOIL PROFILE & TESTING

Babbage CONSULTANTS

JOB No.	42608		
PROJECT: WEST COAST ROAD	HOLE No.	HA19	
DATE STARTED: 22/05/2006	METHOD: HA	RIG: 50mm dia Auger	SHEET 1 of 1
DATE FINISHED: 22/05/2006	DRILLED BY: Babbage Consultants Ltd	FLUID: None	LOGGED BY: GC/WEC

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

SAMPLES RECOVERED & TEST RESULTS

MOISTURE CONTENTS = ●
LIMITS: PLASTIC = X LIQUID = +
20 40 60
IN SITU VANE (kPa) = ✳
50 100 150

OTHER TESTS
Corrected Shear Vane Result **
U = peak / R = remoulded
SPT / Scala Penetrometer

DEPTH (m)	SOIL SYMBOL		GEOLOGIC UNIT	GROUND WATER	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	OTHER TESTS
0.00		TOPSOIL: Silt, firm, slightly plastic, dark brown								
0.45		CLAY: slightly sandy, very stiff, moderately plastic, brown orange mottled	Alluvium - Puketoka Formation			A1				106kPa (U) 42kPa (R)
1.00						A2				162kPa (U) 57kPa (R)
1.60		SAND: silty, some clay, (medium dense) slightly to moderately plastic, pumiceous light grey with orange and white grains				A3	HA			137kPa (U) 75kPa (R)
2.00						A4				113kPa (U) 50kPa (R)
2.20		CLAY: fine sandy, very stiff, moderately plastic, light grey with orange mottles	Waitemata Group			A5				109kPa (U) 76kPa (R)
		less sand								
		banded CLAY/SAND, free water at 2.9m								
3.00						A6				185kPa (U) 35kPa (R)
3.15		End of Borehole at 3.15 m								

Remarks:

** IN HOUSE METHOD BASED ON BS1377

SUMMARY OF SOIL PROFILE & TESTING

Babbage CONSULTANTS

PROJECT: WEST COAST ROAD		JOB No.	42608
		HOLE No.	HA20
DATE STARTED: 22/05/2006	METHOD: HA	RIG: 50mm dia Auger	SHEET 1 of 1
DATE FINISHED: 22/05/2006	DRILLED BY: Babbage Consultants Ltd	FLUID: None	LOGGED BY: SL

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

SAMPLES RECOVERED & TEST RESULTS

DEPTH (m)	SOIL SYMBOL	DESCRIPTION	GEOLOGIC UNIT	GROUND WATER	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	MOISTURE CONTENTS = ● LIMITS: PLASTIC = × LIQUID = + (20 40 60) IN SITU VANE (kPa) = ✳ (50 100 150)	OTHER TESTS (Corrected Shear Vane Result ** U = peak / R = remoulded; SPT / Scala Penetrometer)
0.25		TOPSOIL: Silt, firm, slightly plastic, dark brown	Alluvium - Puketoka Formation								
		CLAY: silty, fine sandy, very stiff, moderately plastic, light brown grey with orange mottles				A1	HA			● at 40, ✳ at 100	109kPa (U) 46kPa (R)
1.00		SILTSTONE: [CW-HW] Silt, sandy, some clay, hard, grey with orange staining - unable to auger further	Waitemata Group			A2				✳ at 150	145kPa (U) 65kPa (R)
1.20		End of Borehole at 1.2 m									

Remarks:

** IN HOUSE METHOD BASED ON BS1377

Babbage CONSULTANTS

SUMMARY OF SOIL PROFILE & TESTING

JOB No.	42608		
PROJECT: WEST COAST ROAD		HOLE No.	HA21
DATE STARTED: 22/05/2006	METHOD: HA	RIG: 50mm dia Auger	SHEET 1 of 1
DATE FINISHED: 22/05/2006	DRILLED BY: Babbage Consultants Ltd	FLUID: None	LOGGED BY: GC/WEC

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

SAMPLES RECOVERED & TEST RESULTS

MOISTURE CONTENTS = ●
LIMITS: PLASTIC = × LIQUID = +
20 40 60
IN SITU VANE (kPa) = ✳
50 100 150

OTHER TESTS
Corrected Shear Vane Result **
U = peak / R = remoulded
SPT / Scala Penetrometer

DEPTH (m)	SOIL SYMBOL	GEOLOGIC UNIT	GROUND WATER	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	OTHER TESTS
0.00									
0.15	TOPSOIL: Silt, firm, slightly plastic, dark brown								
	CLAY: silty, fine sandy, very stiff, moderately plastic, light brown grey with orange mottles	Alluvium - Puketoka Formation		X	A1	HA			>190kPa (U)
0.80									
1.00	SANDSTONE: [HW] moderately weak, fine to medium grained, orange brown - unable to auger further	Waitemata Group							
	End of Borehole at 0.8 m								

Remarks:

** IN HOUSE METHOD BASED ON BS1377

Babbage CONSULTANTS

SUMMARY OF SOIL PROFILE & TESTING

JOB No.	42608
PROJECT: WEST COAST ROAD	
HOLE No.	HA22

DATE STARTED: 22/05/2006	METHOD: HA	RIG: 50mm dia Auger	SHEET 1 of 1
DATE FINISHED: 22/05/2006	DRILLED BY: Babbage Consultants Ltd	FLUID: None	LOGGED BY: SL/WEC

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

SAMPLES RECOVERED & TEST RESULTS

MOISTURE CONTENTS = ●
LIMITS: PLASTIC = × LIQUID = +
20 40 60
IN SITU VANE (kPa) = ✳
50 100 150

OTHER TESTS
Corrected Shear Vane Result **
U = peak / R = remoulded
SPT / Scala Penetrometer

DEPTH (m)	SOIL SYMBOL		GEOLOGIC UNIT	GROUND WATER	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	OTHER TESTS
0.30		TOPSOIL: Silt, firm, slightly plastic, dark brown	Alluvium - Puketoka Formation							
		SILT: fine sandy, clayey, stiff to very stiff, moderately plastic, light to mid grey with orange mottles				A1				90kPa (U) 41kPa (R)
0.80		SAND: silty, minor clay, 'medium dense', slightly plastic, grey brown orange streaked					HA			
1.00						A2				150kPa (U) 53kPa (R)
		less clay, slight to non plastic, greenish grey with minor pumice flecks, free water at 1.5m				A3				>222kPa (U)
1.90										Unable to Penetrate
2.00		MUDSTONE: [MW] moderately weak, dark grey - unable to auger further End of Borehole at 1.9 m	Waitemata Group							

Remarks:

** IN HOUSE METHOD BASED ON BS1377

Babbage CONSULTANTS

SUMMARY OF SOIL PROFILE & TESTING

JOB No. 42608

PROJECT: WEST COAST ROAD

HOLE No. HA23

DATE STARTED: 22/05/2006	METHOD: HA	RIG: 50mm dia Auger	SHEET 1 of 1
DATE FINISHED: 22/05/2006	DRILLED BY: Babbage Consultants Ltd	FLUID: None	LOGGED BY: SL/WEC

SOIL/ROCK DESCRIPTION

DATUM: Ground Surface

SURFACE ELEVATION:

For an explanation of the terms & symbols used see attached sheets.

DEPTH (m)	SOIL SYMBOL	SOIL/ROCK DESCRIPTION	GEOLOGIC UNIT	GROUND WATER	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	MOISTURE CONTENTS = ● LIMITS: PLASTIC = × LIQUID = + (20 40 60) IN SITU VANE (kPa) = ✳ (50 100 150)	OTHER TESTS: Corrected Shear Vane Result ** U = peak / R = remoulded; SPT / Scala Penetrometer
0.00		TOPSOIL: Silt, firm, slightly plastic, dark brown									
0.30		CLAY: silty, very stiff, moderately plastic, yellow brown light grey mottles	Alluvium - Puketoka Formation			A1				✳	117kPa (U) 49kPa (R)
0.85		SAND: (fine grained), slightly clayey, 'loose-medium dense', slightly plastic, light grey yellow, moist				A2				✳	101kPa (U) 38kPa (R)
		free water at 1.2m									
1.80						A3	HA			✳	88kPa (U) 24kPa (R)
2.00		banded: CLAY: slightly silty, very stiff to hard, moderately plastic, dark grey	Waitemata Group			A4					Unable to Penetrate
		and SAND: clayey, 'medium dense', (fine to medium grained), dark grey with occasional orange mottles				A5					Unable to Penetrate
3.00						A6					Unable to Penetrate
3.15		End of Borehole at 3.15 m									

Remarks:

** IN HOUSE METHOD BASED ON BS1377

EXPLANATION OF TERMS AND SYMBOLS

These pages present an explanation of the terms and symbols used on the log sheets entitled "Summary of Soil Profile and Testing". The materials, boundaries and conditions have been interpreted at the test hole locations only and could differ elsewhere on the site.

1. DEPTH / ELEVATION

This column refers to the depth below the ground surface existing at the time of drilling. The corresponding elevations are shown with respect to the datum noted where survey information is available.

2. SOIL AND ROCK SYMBOL

This column contains the standard soil and rock symbols used by Babbage for the materials encountered in the boreholes as shown below:

Fill	Clay	Boulders
Asphalt	Silt	Sandstone
Concrete	Sand	Siltstone
Topsoil	Gravel	Volcanic Rock
Peat or Organic Soil	Cobbles	Uncertain Material

3. SOIL AND ROCK DESCRIPTION

The terms used to describe the soils and rocks are generally in accordance with the NZ Geomechanics Society's "***Guidelines for the Field Description of Soils and Rocks in Engineering Use***", Nov. 1988 and the NZ Geotechnical Society's "***Guidelines for the Classification and Field Description of Soils and Rocks for Engineering Purposes***" Feb 2003 (draft for comment).

The **soils** are generally described in the following order:

Major soil type, minor soil type/s, consistency (for cohesive soils) or density (for cohesionless soils), plasticity, structure and/or particle shapes, colour, moisture condition, minor inclusions, other significant aspects (e.g. geological description).

Where rock is encountered, the **rock material** and the **rock mass** are described in the following order:

Major rock type, texture and fabric, strength, weathering, colour, discontinuity type, discontinuity spacing, discontinuity orientation, discontinuity opening, discontinuity roughness, geological description (if this can be determined).

Where no field or laboratory tests are carried out, the soils and rock descriptions are based on handling and visual assessment of the recovered samples. **Any design based on such descriptions should allow for the generic nature of the descriptions.**

4. GEOLOGIC UNIT

This column divides the soil and/or rock encountered in the borehole into units that have been formally described and published by geologists (determined from geological maps), or informal units describing what general categories the materials belong to eg. fill, weathered rock, alluvium, etc.

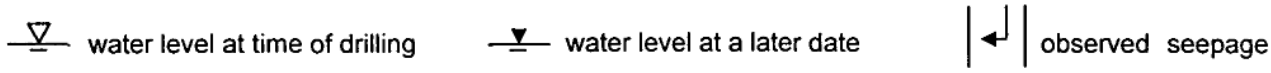
EXPLANATION OF TERMS AND SYMBOLS

5. PIEZOMETER

This column graphically displays what happens to the hole on completion of drilling – ie. whether the hole is backfilled, left open with a plug, or if a piezometer/standpipe is installed. Details of the installation are given in the "Remarks" section at the bottom of the log.

6. GROUNDWATER

The groundwater level, or the depth at which free water was observed in the borehole, or any seepage observed in the borehole, are denoted by the symbols given below.



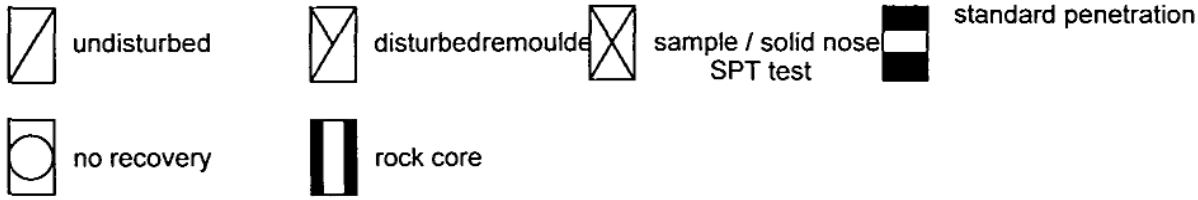
The level is the water level in an open hole unless otherwise indicated.

N in the column indicates the water level could not be recorded due to drilling water/mud, rain or hole caving.
NR in this column indicates that no record of the groundwater level was taken.
D in this column indicates that the hole was dry.
F in this column indicates when free water in the hole was first noticed.

7. SOIL SAMPLES

Condition

This column indicates the depth, length and condition of each sample taken. The following symbols are used to represent the condition of the samples.



Type (and sample number)

The type of sample and its sequential number is indicated in this column as follows:

A	auger sample	**P**	piston tube sample
B	block or bulk sample	**S**	standard penetration test (SPT) sample
D	disturbed sample (eg. open barrel core)	**T**	thin-walled tube sample
J	jar sample	**W**	wash or air return sample
GW	ground water sample	**O**	other (see text)

Disturbed soils samples are transported and stored in plastic bags. Machine borehole disturbed samples are transported and stored in core boxes. Tube samples are sealed with plastic bags in the field and with wax on return to the laboratory.

Method

This refers to the particular drilling/sampling technique:

HA	hand auger	**TU**	push-tube
HD	hand dug	**SSA**	solid stem machine auger
HSA	hollow stem machine auger	**SPT**	standard penetration test
EX	hydraulic excavator	**SP**	scala penetrometer
OB	open barrel	**TT**	triple tube
PP	pneumatic percussion	**WD**	wash drill

EXPLANATION OF TERMS AND SYMBOLS

Recovery

This column gives the sample recovery as a percentage of the sampled length for open barrel and triple tube core runs, and also split spoon SPT tests. If nothing is shown, the sample recovery was not measured.

8. TEST RESULTS

Penetration Resistance

The Penetration Resistance is the number of blows required to drive either a 50mm (outside diameter) open end "spilt spoon" or "Raymond" sampler the final 300mm of a 450mm penetration using a 64kg weight falling 760mm. The number of blows required to drive the sampler the final 300mm is referred to as the **"N" value**. The test is referred to as the **Standard Penetration Test or SPT**. The number of blows for each 150mm penetration of the test, or part-penetration when driving is terminated due to hard ground, are given in the "Other Tests" column, e.g. 15, 36, 46 for 55mm would indicate 15 blows for the first 150mm, 36 blows for the second 150mm and 46 blows for a further 55mm penetration and a N value of greater than 50 would be reported.

In some cases a solid steel 60° cone is used for this test (a **solid nose Standard Penetration Test**). For these cases the penetration resistance is reported as an **"S" value** is reported in this column.

Water Content and Atterberg Limits

The moisture or water content, plastic limit and liquid limit of the recovered soil sample, as determined in the laboratory in accordance with the test procedures set out in NZS4402, is plotted against depth. The abbreviations and graphic symbols are defined as follows:

•	w	natural moisture content
×	w_P	plastic limit
+	w_L	liquid limit

Other Tests

The following abbreviations are used to indicate the type of test undertaken:

COM	Compaction Test	pp	Pocket penetrometer strength
*CON	Consolidation test	*Q	Consolidated undrained triaxial test
G	Specific gravity or solid density of particles	qu	Unconfined compressive strength
k	Permeability coefficient	*SB	Shear box test
LS	Linear shrinkage	SP	Scala penetrometer
OC	Organic content	*ST	Swelling test
*PSD	Particle size distribution	SV	Vane shear strength: (U) – undisturbed (R) – remoulded

*These tests are usually summarised separately.

9. REMARKS

Any additional observations or relevant information such as weather conditions, piezometer design, daily drilling progress, survey co-ordinates of the borehole, problems encountered during drilling, etc.

Appendix C

Laboratory Testing

Babbage Geotechnical Laboratory
109 Fanshawe Street
Freemans Bay
Auckland
Telephone
Fax
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P O Box 2027
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64-9-367 4954
64-9-377 0554
wec@babbage.co.nz

Please reply to: W.E. Campton

Babbage Consultants Limited
P O Box 2027
Auckland, New Zealand

Job Number: 42608/GE/L
File:
Checked by: J.F.
JF
26th May 2006

Attention: **RUSSELL ALLISON**

Dear Sir,

Re: West Coast Road, Henderson
Moisture Content Testing
Report No. 42608/GE/L/MC

The following table presents the results of moisture content testing on hand auger soil samples collected by this laboratory during late May 2006. Test Standards used are as follows:

Moisture Content NZS4402:1986:Test 2.1

Hole No.	Sample No.	Depth (m)	Moisture Content (%)
HA1	A1	0.5	23.5
	A2	1.0	26.0
HA2	A1	0.5	25.2
	A2	1.0	47.6
HA3	A1	0.5	34.6
	A2	1.0	39.8
	A3	1.5	40.0
	A4	2.0	34.0
	A5	2.5	34.7
	A6	3.0	45.8
HA4	A2	1.0	44.5
	A3	1.5	41.3
HA5	A2	1.0	43.9
	A3	1.5	50.5
HA6	A2	1.0	45.2

Hole No.	Sample No.	Depth (m)	Moisture Content (%)
HA7	A1	0.5	31.3
	A2	1.0	44.8
	A3	1.5	38.4
	A4	2.0	75.0
	A5	2.5	76.6
	A6	3.0	74.9
HA8	A1	0.5	39.8
	A2	1.0	47.1
HA9	A2	1.0	31.6
	A3	1.5	30.7
	A4	2.0	47.5
	A5	2.5	53.2
	A6	3.0	70.5
HA10	A2	1.0	15.2
HA11	A2	1.0	37.5
	A3	1.5	80.4
	A4	2.0	73.2

Hole No.	Sample No.	Depth (m)	Moisture Content (%)
HA12	A1	0.5	44.9
	A2	1.0	90.0
	A3	1.5	74.2
	A4	2.0	63.7
	A5	2.5	60.9
	A6	3.0	58.5
HA13	A1	0.5	34.2
	A2	1.0	43.9
	A3	1.5	39.2
	A4	2.0	48.7
	A5	2.5	61.5
	A6	3.0	55.8
HA14	A1	0.5	31.1
	A2	1.0	67.8
	A3	1.5	50.6
	A4	2.0	40.7
	A5	2.5	31.6
	A6	3.0	35.7
HA15	A1	0.5	43.4
HA15	A2	1.0	48.2
	A3	1.5	42.6
	A4	2.0	37.0
	A5	2.5	53.7
	A6	3.0	120
HA16	A1	0.5	35.5
	A2	1.0	33.4
HA17	A1	0.5	31.9
	A2	1.0	27.7
	A3	1.5	52.0
HA18	A2	1.0	29.6
	A3	1.5	26.2
HA19	A2	1.0	33.7
	A3	1.5	35.5
HA20	A1	0.5	34.1
HA21	A1	0.5	44.1

Thank you for the opportunity to carry out this testing. If you have any queries regarding the content of this report please contact the undersigned at your convenience.

Yours faithfully,

Wayne Campton
Signatory (Laboratory Manager)
Babbage Geotechnical Laboratory

new zealand accredited laboratory

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation. This report may not be reproduced except in full.

Appendix 12

Engineering Calculations

SEDIMENT DETENTION POND

(Based on Auckland Regional Council's TP 10 - Stormwater Treatment Devices)

Job No: **42608** *By:* **GW** *Date:* **15/06/2006**
Project: **West Coast Road**

CATCHMENT CHARACTERISTICS

Catchment Area:	**19600** m^2
Imperviousness Percentage:	**0%**
Imperviousness Area (A_{imp}):	**0** m^2
Pervious Percentage:	**100%**
Pervious Area (A_{perv}):	**19600** m^2

POND SIZE

Pond Size:	**588** m^3
Dead Storage:	**176** m^3
Live Storage:	**412** m^3
Average Depth:	**2.2** m
Decant Rate:	**5.9** l/s
Pond Dimension - Width:	**9.4** m
Pond Dimension - Length:	**28.3** m
No. of Decants:	**3**

Job No: 42608
Project :
West Coast Road

Estimated Soil Loss Calculations

23/06/2006

The Universal Soil Loss Equation (USLE) is used to estimate soil loss.

The general form of this equation is **A = R K LS C P** (Goldman et al) where:

A - Soil Loss (tonnes/hectare/year)

R - Rainfall Erosion Index (J/hectare)

Rainfall data has been sourced from ARC TP. 108: Guidelines for Stormwater Runoff Modelling in the Auckland Region, April 1999. As determined from Hirds, the 6hr duration for the 2 year return frequency rainfall event of 49.61. The rainfall erosion index factor for this storm is 75.64

K - Soil Erodibility Factor:

To calculate K, the percentage of sand, silt and clay must be known for each dominant soil type within the site. Based on results done by BCL (June 2006), the soil properties for this site can be taken as 17% sand, 27% silt, 56% clay and the top soil contains approximately 10% organic material.

Therefore,	Triangular Nomograph K Value:	0.21
	Correction factor for 3% organic material in top soil:	-0.10
	Adjusted K Value:	**0.15**

C - Cover factor

The C factor is the ration of soil loss under specified conditions to that of a bare site. When the soil is protected against erosion then the C factor will reduce the soil loss estimate. A C factor of 1.0 is used when the soil surface is bare during construction. A C factor of 0.02 has been assumed for the current situation (pasture -undisturbed).

P - Erosion Control Practice Factor

A P factor of 1.0 is used to reflect compacted and smooth surface conditions for usual cut and fill areas during construction. This factor is reduced to 1.0 during stabilisation works to reflect the top soild surfaces.

Stage of works	R	K	C	P	RKCP
During Construction	75.64	0.15	1	1.3	**14.28**
During Stabilisation	75.64	0.15	0.1	1.0	**1.098**

Job No: 42608
Project :
West Coast Road

Estimated Soil Loss Calculations

23/06/2006

LS - Length Slope Factor

The Length Slope Factor, LS can be calculated from the following:

LS=(((65.41*s^2)/(s^2+10000))+((4.56*s)/sqrt(s^2+10000))+0.065)*(l/72.5)^nn

Where :

LS	Topographic factor	
l	Slope length, ft ((m*0.3048)	
s	Slope steepness	
nn	Exponent dependent on slope steepness:	
	Slope	nn
	<1%	0.2
	>1% but <3%	0.3
	>3% but <5%	0.4
	>5%	0.5

Representative slope lengths are sourced from Drawing No. 42608/C05 and C06.

Based on Drawings 42608/C05 AND C06, the following factors have been used:

Area A	Average slope = 15%
	Average flow distance = 100m
Area B	Average slope = 14%
	Average flow distance = 35m
Area C	Average slope = 14%
	Average flow distance =45m
Area D	Average slope = 12%
	Average flow distance =35m

During Construction

Earthworks Area	Length (m)	l (ft)	Slope (s) (%)	nn	LS
Area A	100	328.08399	15	0.5	4.639101143
Area B	35	114.8294	14	0.5	2.459920402
Area C	45	147.6378	14	0.5	2.789287555
Area D	35	114.8294	12	0.5	1.93412649

During Stabilization

Earthworks Area	Length (m)	l (ft)	Slope (s) (%)	nn	LS
Area A	90	295.27559	6	0.5	1.155852499
Area B	35	114.8294	6	0.5	0.720800674
Area C	45	147.6378	6	0.5	0.81731114
Area D	35	114.8294	6	0.5	0.720800674

Retention of Sediment

The USLE model estimates sediment generation but makes no allowance for any deposition on site prior to run-off. Coarser textured sediments are expected to be deposited as runoff velocities diminish. 50% of the estimated sediment is expected to be retained on site in hollows, wheel runts, etc.prior to runoff. We assumed that a further 95% of sediment generated in Area A will be retained in the silt ponds on the site due to floculation.

SOIL LOSS - DURING CONSTRUCTION

Area	Operation	Time (years)
Area A	Earthworks (cut/fill)	0.25
Area B	Earthworks (cut/fill)	0.167
Area C	Earthworks (cut/fill)	0.167
Area D	Earthworks (cut/fill)	0.1

Earthworks Area	Area	USLE Parameters					Time	Estimate of Sediment Generated	Sediment Delivery Ratio	Sediment Control Efficiency	Sediment Yield
	(ha)	R	K	LS	C	P	(yrs)	(tonnes)		(%)	(tonnes)
Area A	1.97	75.64	0.15	4.6	1.00	1.3	0.25	32.620	0.5	95	0.82
Area B	0.90	75.64	0.15	2.5	1.00	1.3	0.167	5.279	0.5	0	2.64
Area C	0.59	75.64	0.15	2.8	1.00	1.3	0.1	2.350	0.5	0	1.17
Area D	0.62	75.64	0.15	1.9	1.00	1.3	0.1	1.718	0.5	0	0.86
Total:	4.08										5.49

SOIL LOSS - DURING STABILIZATION

Area	Operation	Time (years)
Area A	Top soil	0.08
Area B	Top soil	0.08
Area C	Top soil	0.08
Area D	Top soil	0.08

Earthworks Area	Area	USLE Parameters					Time	Estimate of Sediment Generated	Sediment Delivery Ratio	Sediment Control Efficiency	Sediment Yield
	(ha)	R	K	LS	C	P	(yrs)	(tonnes)		(%)	(tonnes)
Area A	1.97	75.64	0.15	1.2	0.10	1.0	0.08	0.200	0.5	95	0.01
Area B	0.90	75.64	0.15	0.7	0.10	1.0	0.08	0.057	0.5	0	0.03
Area C	0.59	75.64	0.15	0.8	0.10	1.0	0.08	0.042	0.5	0	0.02
Area D	0.62	75.64	0.15	0.7	0.10	1.0	0.08	0.039	0.5	0	0.02
Total:	4.08										0.07

Total Sediment Yield: 5.56 tonnes

TP108 - POND DESIGN GENERAL

Project:	*West Coast Raod*	By: WL	Date: 14/06/06
Job No.:	*42608*	Checked:	Date:

Combination of Stage 1 and 2

Pre-Development

Hardstand/Roof

area (ha)	0

Other (pervious)

area (ha)	4.9323
TOTAL	4.9323

Post-Development

Hardstand/Roof

area (ha)	1.9226

Other (pervious)

area (ha)	2.7407
TOTAL	4.6633

Hydrology

2 year	84 mm
10 year	134 mm
100 year	195 mm

TP108 - POND DESIGN (EXISTING DEVELOPMENT SCENARIO)

Project: *West Coast Raod* By: WL Date: 14/06/06

Location: *42608* Checked: Date:

1. Runoff Curve Number (CN) and Initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (hectares)	Product of CN x Area
	Pervious Areas (List)			
Waitemata clay, Class C	*Bush*	70	0	0
Waitemata clay, Class C	*Pasture*	74	4.9323	365
	Subtotal for Pervious Areas		4.9323	365
	Impervious Areas (List)			
	Roads / paved	98	0.000	0
	Subtotal for Impervious Areas		0	0
* from Table 3.3		Totals	4.9323	365

CN (weighted) : $\frac{\text{total product}}{\text{total area}} = \frac{365}{4.9323} =$ 74

Ia (weighted) : $\frac{\text{5 x pervious area}}{\text{total area}} = \frac{5 \times 4.9323}{4.9323} =$ 5.00 mm

2. Time of Concentration

Channelisation Factor : C = 1 (from Table 4.2)

Catchment Length : L = 0.147 km (along drainage path)

Catchment Slope : Sc = 0.109 m/m (by equal area method)

Runoff Factor R : $\frac{CN}{200 - CN}$ = 0.59

Time of Concentration : $t_c = 0.14\ C\ L^{0.66}\ R^{-0.55}\ Sc^{-0.30}$ = 0.17 hrs

SCS Lag for HEC-HMS : $t_p = 2/3\ t_c$ = 0.11 hrs

3. Soil Storage Parameter : S = ((1000/CN)-10)*25.4

Total = 89.2 mm

Pervious = 89.2 mm

Impervious = 5.2 mm

		Storm #1	Storm #2	Storm #3
4. Average Recurrence Interval, ARI (yr) :		2	10	100
5. 24 hour Rainfall Depth, P_{24} (mm), (from Appendix A)		84	134	195
6. Runoff Index, c* : $= \frac{P_{24} - 2Ia}{P_{24} - 2Ia + 2S}$		0.29	0.41	0.51
7. Specific Peak Flow Rate, q*, (from Figure 5.1)		0.082	0.108	0.126
8. Peak Flow Rate, q_p : $= q^* A P_{24}$ (m^3/s)		0.340	0.714	1.212
9. Runoff Depth, Q_{24} : $= \frac{(P_{24} - Ia)2}{(P_{24} - Ia) + S}$ (mm)	Pervious	37.1	76.2	129.3
	Impervious	79.1	129.0	190.0
10. Runoff Volume, V_{24} : $= 1000 \times Q_{24} A$ (m^3)	Pervious	1,830	3,761	6,376
	Impervious	000	000	000
	Total	1,830	3,761	6,376

TP108 - POND DESIGN (POST-DEVELOPMENT SCENARIO)

Project: *West Coast Raod* By: WL Date: 14/06/06

Location: ## Checked: 0 Date:

1. Runoff Curve Number (CN) and Initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area	Product of CN x Area
	Pervious Areas (List)			
Waitemata clay, Class C	*Bush*	70	0	0
Waitemata clay, Class C	*Cut faces*	74	2.7407	203
	Subtotal for Pervious Areas		2.7407	203
	Impervious Areas (List)			
	Roads / paved	98	1.923	188
	Subtotal for Pervious Areas		1.9226	188
* from Table 3.3		Totals	4.6633	391

CN (weighted) : $\frac{\text{total product}}{\text{total area}} = \frac{391}{4.6633} = 84$

Ia (weighted) : $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 2.7407}{4.6633} = 2.9$ mm

2. Time of Concentration

Channelisation Factor : C = 0.6 (from Table 4.2)

Catchment Length : L = 0.147 km (along drainage path)

Catchment Slope : Sc = 0.109 m/m (by equal area method)

Runoff Factor R : $\frac{CN}{200 - CN} = 0.72$

Time of Concentration : $t_c = 0.14\ C\ L^{0.66}\ R^{-0.55}\ Sc^{-0.30} = 0.17$ hrs

SCS Lag for HEC-HMS : $t_p = 2/3\ t_c = 0.11$ hrs

3. Soil Storage Parameter : S = ((1000/CN)-10)*25.4

Total = 49 mm

Pervious = 89 mm

Impervious = 5 mm

		Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
4. Average Recurrence Interval, ARI (yr) :		Erosion	1/3 *2	2	10	100
5. 24 hour Rainfall Depth, P_{24} (mm), (from Appendix A)		34.5	28.0	84	134	195
6. Runoff Index, c* : $= \frac{P_{24} - 2Ia}{P_{24} - 2Ia + 2S}$		0.23	0.18	0.44	0.57	0.66
7. Specific Peak Flow Rate, q*, (from Figure 5.1)		0.066	0.052	0.112	0.133	0.145
8. Peak Flow Rate, q_p : $= q^* A P_{24}$ (m^3/s)		0.11	0.07	0.44	0.83	1.32
9. Runoff Depth, Q_{24} : $= \frac{(P_{24} - Ia)2}{(P_{24} - Ia) + S}$ (mm)	Pervious	7.3	4.7	37.1	76.2	129.3
	Impervious	30.0	23.6	79.1	129.0	190.0
10. Runoff Volume, V_{24} : $= 1000 \times Q_{24} A$ (m^3)	Pervious	201	129	1,017	2,090	3,543
	Impervious	577	454	1,521	2,480	3,652
	Total	778	583	2,538	4,570	7,195

TP10 - WATER QUALITY POND DESIGN (Low Flow Orifice)

Project: *West Coast Raod* By: WL Date: 14/06/06

Location: *42608* Checked: 0 Date: 0

Assume Shape

Permanent Water Surface RL			16.95	mRL
Base Width		na		m
Base Length		na		m
Assumed side slope		na		m(hor):m(ver)

1. Water Quality Treatment Pond Dimensions :

Assumed Depth of WQV	d	=	0.5	m		
Top Elevation of Water Quality Volume :	H	=	16.95	mRL		
Water Quality Volume :	V_d	=	583	m^3		
Permanent Water Quality Volume :	$V_{d(perm)}$	=	292	m^3		
Total Forebay Volume Requirement :	$V_{forebay}$	=	88	m^3		

2. Extended Detention Outlet Design :

Extended Detention Volume :	V_{ex}	=	778	m^3		
Average Discharge Release Rate :	Q_{avg}	=	0.0090	m^3/sec		
Top Elevation of Extended Detention Volume :	Hex	=	18.56	m		
Height of Extended Detention Volume	hex	=	1.61	m		
Maximum Discharge Release Rate :	Q_{max}	=	0.0180	m^3/sec		
Selected Orifice Diameter :	$d_{orifice}$	=	0.08	m		
Orifice Discharge Rate	Q_i	=	0.0173	m^3/sec	< Q_{max}	OK

3. 100 Year Storm Flood Routing

100 year Post Development Max Flow :	Q100	=	1.319	m^3/sec
Depth over weir:	h100	=	0.150	m
Width of Emergency Spillway	h100	=	12.61	m
			13.35	

	Orifice	Notch	Weir	Spillway
Diameter	0.08	0.2	1.05	12.61
Elevation	16.95	18.56	18.65	18.75
Coefficient	0.62	1.8	1.8	1.8

0.1 Depth	Outflow (m^3/s) Orifice	Notch	Weir	Combined
16.75	0	0	0	0
16.80	0	0	0	0
16.90	0	0	0	0
17.00	0.003087	0	0	0.003087
17.10	0.005346	0	0	0.005346
17.20	0.006902	0	0	0.006902
17.30	0.008167	0	0	0.008167
17.40	0.00926	0	0	0.00926
17.50	0.010237	0	0	0.010237
17.60	0.011129	0	0	0.011129
17.70	0.011955	0	0	0.011955
17.80	0.012727	0	0	0.012727
17.90	0.013455	0	0	0.013455
18.00	0.014145	0	0	0.014145
18.10	0.014803	0	0	0.014803
18.20	0.015434	0	0	0.015434
18.30	0.016039	0	0	0.016039
18.40	0.016622	0	0	0.016622
18.50	0.017186	0	0	0.017186
18.60	0.017732	0.00288	0.044620881	0.065233
18.65	0.017998	0.00972	0.150595473	0.178314
18.70	0.018261	0.018858	0.292173085	0.329292
18.75	0.01852	0.029815	0.461932538	0.510268
18.80	0.018776	0.042327	0.655790341	0.716893
18.90	0.019277	0.071371	1.105774393	1.196422
19.00	0.019765	0.105071	1.627897918	1.752733
19.10	0.020241	0.142854	2.2132924	2.376388
19.20	0.020706	0.18432	2.855736379	3.060763
19.25	0.020935	0.206337	3.19684654	3.424118

Copy data to HEC-HMS

Depth m	Vol 1000m3	Outflow (m3/s)	
16.75	0.00	0	0.0
16.80	0.00	0	4.0
16.90	0.02	0	15.5
17.00	0.03	0.003087	32.1
17.10	0.05	0.005346	52.8
17.20	0.08	0.006902	76.4
17.30	0.10	0.008167	102.9
17.40	0.13	0.00926	132.3
17.50	0.16	0.010237	164.7
17.60	0.20	0.011129	200.3
17.70	0.24	0.011955	239.0
17.80	0.28	0.012727	280.9
17.90	0.33	0.013455	326.1
18.00	0.37	0.014145	374.6
18.10	0.43	0.014803	426.4
18.20	0.48	0.015434	481.8
18.30	0.54	0.016039	540.7
18.40	0.60	0.016622	603.1
18.50	0.67	0.017186	669.1
18.60	0.74	0.065233	738.8
18.65	0.78	0.178314	775.5
18.70	0.81	0.329292	812.2
18.75	0.85	0.510268	850.0
18.80	0.89	0.716893	889.4
18.90	0.97	1.196422	970.4
19.00	1.05	1.752733	1050.0
19.10	1.13	2.376388	1130.0
19.20	1.22	3.060763	1220.0
19.25	1.31	3.424118	1310.0

HMS * Summary of Results for Reservoir-1

Project : West Coast Rd Run Name : Run 8

Start of Run : 01Jan03 0000 Basin Model : Pakuranga

End of Run : 02Jan03 0000 Met. Model : 10-year event

Execution Time : 22Jun06 1814 Control Specs : Control CHicago

Computed Results

Peak Inflow : 0.77856 (cms) Date/Time of Peak Inflow : 01 Jan 03 1212

Peak Outflow : 0.72795 (cms) Date/Time of Peak Outflow : 01 Jan 03 1215

Total Inflow : 92.3 (mm) Peak Storage : 0.89185(K cu m)

Total Outflow : 78.3 (mm) Peak Elevation : 18.802(m)

HMS * Summary of Results for Reservoir-1

Project : West Coast Rd Run Name : Run 7

Start of Run : 01Jan03 0000 Basin Model : Pakuranga

End of Run : 02Jan03 0000 Met. Model : 2 year event

Execution Time : 19Jun06 1438 Control Specs : Control CHicago

Computed Results

Peak Inflow : 0.41444 (cms) Date/Time of Peak Inflow : 01 Jan 03 1213

Peak Outflow : 0.21202 (cms) Date/Time of Peak Outflow : 01 Jan 03 1223

Total Inflow : 49.3 (mm) Peak Storage : 0.78670(K cu m)

Total Outflow : 36.8 (mm) Peak Elevation : 18.661(m)

Babbage CONSULTANTS
BABBAGE CONSULTANTS LIMITED
109 FARNHAM STREET, AUCKLAND
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STORMWATER CALCULATIONS

Job No. 42608
Project West Coast Rd
Date
By WL
k_s = 1.5 (>1m) & 0.6 (<1m)
10% AEP

MH to MH	Catchment Description	Catchment Area (ha)	C	CA	Σ CA	Σ t	I mm/hr	Required Q (l/s)	Adopted Pipe					
									Size	Grade	Length	Q	V	δ t
Outfall from pond		1.9226	0.9	1.7303	1.7303		105	505						
		2.4191	0.3	0.7257	2.4561		105	717						
								1222	750	1%		1236		

TP108 - POND DESIGN GENERAL

Project:	*West Coast Raod*	By: WL	Date: 14/06/06
Job No.:	*42608*	Checked:	Date:

Stage 1

Pre-Development

Hardstand/Roof

area (ha)	0

Other (pervious)

area (ha)	3.3948
TOTAL	3.3948

Post-Development

Hardstand/Roof

area (ha)	1.2378

Other (pervious)

area (ha)	1.7112
TOTAL	2.9490

Hydrology

2 year	84 mm
10 year	134 mm
100 year	195 mm

TP108 - POND DESIGN (EXISTING DEVELOPMENT SCENARIO)

Project: *West Coast Raod* By: WL Date: 14/06/06

Location: *42608* Checked: Date:

1. Runoff Curve Number (CN) and Initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (hectares)	Product of CN x Area
	Pervious Areas (List)			
Waitemata clay, Class C	*Bush*	70	0	0
Waitemata clay, Class C	*Pasture*	74	3.3948	251
	Subtotal for Pervious Areas		3.3948	251
	Impervious Areas (List)			
	Roads / paved	98	0.000	0
	Subtotal for Impervious Areas		0	0
* from Table 3.3		Totals	3.3948	251

CN (weighted) : $\frac{\text{total product}}{\text{total area}} = \frac{251}{3.3948} = 74$

Ia (weighted) : $\frac{\text{5 x pervious area}}{\text{total area}} = \frac{5 \times 3.3948}{3.3948} = 5.00$ mm

2. Time of Concentration

Channelisation Factor : C = 1 (from Table 4.2)

Catchment Length : L = 0.147 km (along drainage path)

Catchment Slope : Sc = 0.109 m/m (by equal area method)

Runoff Factor R : $\frac{CN}{200 - CN}$ = 0.59

Time of Concentration : $t_c = 0.14\ C\ L^{0.66}\ R^{-0.55}\ Sc^{-0.30}$ = 0.17 hrs

SCS Lag for HEC-HMS : $t_p = 2/3\ t_c$ = 0.11 hrs

3. Soil Storage Parameter : S = ((1000/CN)-10)*25.4

Total = 89.2 mm

Pervious = 89.2 mm

Impervious = 5.2 mm

		Storm #1	Storm #2	Storm #3
4. Average Recurrence Interval, ARI (yr) :		2	10	100
5. 24 hour Rainfall Depth, P_{24} (mm), (from Appendix A)		84	134	195
6. Runoff Index, c* : $= \frac{P_{24} - 2Ia}{P_{24} - 2Ia + 2S}$		0.29	0.41	0.51
7. Specific Peak Flow Rate, q*, (from Figure 5.1)		0.082	0.109	0.125
8. Peak Flow Rate, q_p : $= q^* A P_{24}$ (m^3/s)		0.234	0.496	0.827
9. Runoff Depth, Q_{24} : $= \frac{(P_{24} - Ia)2}{(P_{24} - Ia) + S}$ (mm)	Pervious	37.1	76.2	129.3
	Impervious	79.1	129.0	190.0
10. Runoff Volume, V_{24} : $= 1000 \times Q_{24} A$ (m^3)	Pervious	1,259	2,589	4,389
	Impervious	000	000	000
	Total	1,259	2,589	4,389

TP108 - POND DESIGN (POST-DEVELOPMENT SCENARIO)

Project: *West Coast Raod* By: WL Date: 14/06/06

Location: ## Checked: 0 Date:

1. Runoff Curve Number (CN) and Initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area	Product of CN x Area
	Pervious Areas (List)			
Waitemata clay, Class C	*Bush*	70	0	0
Waitemata clay, Class C	*Cut faces*	74	1.7112	127
	Subtotal for Pervious Areas		1.7112	127
	Impervious Areas (List)			
	Roads / paved	98	1.238	121
	Subtotal for Pervious Areas		1.2378	121
* from Table 3.3		Totals	2.949	248

CN (weighted) : $\frac{\text{total product}}{\text{total area}} = \frac{248}{2.949} = 84$

Ia (weighted) : $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 1.7112}{2.949} = 2.9$ mm

2. Time of Concentration

Channelisation Factor : C = 0.6 (from Table 4.2)

Catchment Length : L = 0.147 km (along drainage path)

Catchment Slope : Sc = 0.109 m/m (by equal area method)

Runoff Factor R : $\frac{CN}{200 - CN}$ = 0.73

Time of Concentration : $t_c = 0.14\ C\ L^{0.66}\ R^{-0.55}\ Sc^{-0.30}$ = 0.17 hrs

SCS Lag for HEC-HMS : $t_p = 2/3\ t_c$ = 0.11 hrs

3. Soil Storage Parameter : S = ((1000/CN)-10)*25.4

Total = 48 mm

Pervious = 89 mm

Impervious = 5 mm

		Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
4. Average Recurrence Interval, ARI (yr) :		Erosion	1/3 *2	2	10	100
5. 24 hour Rainfall Depth, P_{24} (mm), (from Appendix A)		34.5	28.0	84	134	195
6. Runoff Index, c* : $= \frac{P_{24} - 2Ia}{P_{24} - 2Ia + 2S}$		0.23	0.19	0.45	0.57	0.66
7. Specific Peak Flow Rate, q*, (from Figure 5.1)		0.070	0.057	0.116	0.135	0.146
8. Peak Flow Rate, q_p : $= q^* A P_{24}$ (m^3/s)		0.07	0.05	0.29	0.53	0.84
9. Runoff Depth, Q_{24} : $= \frac{(P_{24} - Ia)2}{(P_{24} - Ia) + S}$ (mm)	Pervious	7.3	4.7	37.1	76.2	129.3
	Impervious	30.0	23.6	79.1	129.0	190.0
10. Runoff Volume, V_{24} : $= 1000 \times Q_{24} A$ (m^3)	Pervious	125	081	635	1,305	2,212
	Impervious	371	292	979	1,597	2,351
	Total	497	373	1,614	2,902	4,563

TP108 - POND DESIGN GENERAL

Project:	*West Coast Road*	By: WL	Date: 19/05/06
Job No.:	*42608*	Checked:	Date:

Stage 2

Pre-Development

Hardstand/Roof

area (ha)	0

Other (pervious)

area (ha)	1.5375
TOTAL	1.5375

Post-Development

Hardstand/Roof

area (ha)	0.6848

Other (pervious)

area (ha)	0.8527
TOTAL	1.5375

Hydrology

2 year	84 mm
10 year	134 mm
100 year	195 mm

TP108 - POND DESIGN (EXISTING DEVELOPMENT SCENARIO)

Project: *West Coast Road* By: WL Date: 19/05/06

Location: *42608* Checked: Date:

1. Runoff Curve Number (CN) and Initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (hectares)	Product of CN x Area
	Pervious Areas (List)			
Waitemata clay, Class C	*Bush*	70	0	0
Waitemata clay, Class C	*Pasture*	74	1.5375	114
	Subtotal for Pervious Areas		1.5375	114
	Impervious Areas (List)			
	Roads / paved	98	0.000	0
	Subtotal for Impervious Areas		0	0
* from Table 3.3		Totals	1.5375	114

CN (weighted) : $\frac{\text{total product}}{\text{total area}} = \frac{114}{1.5375} =$ 74

Ia (weighted) : $\frac{\text{5 x pervious area}}{\text{total area}} = \frac{5 \times 1.5375}{1.5375} =$ 5.00 mm

2. Time of Concentration

Channelisation Factor : C = 1 (from Table 4.2)

Catchment Length : L = 0.046 km (along drainage path)

Catchment Slope : Sc = 0.204 m/m (by equal area method)

Runoff Factor R : $\frac{CN}{200 - CN}$ = 0.59

Time of Concentration : $t_c = 0.14\ C\ L^{0.66}\ R^{-0.55}\ Sc^{-0.30}$ = 0.17 hrs

SCS Lag for HEC-HMS : $t_p = 2/3\ t_c$ = 0.11 hrs

3. Soil Storage Parameter : S = ((1000/CN)-10)*25.4

Total = 89.2 mm

Pervious = 89.2 mm

Impervious = 5.2 mm

				Storm #1	Storm #2	Storm #3
4. Average Recurrence Interval, ARI (yr) :				2	10	100
5. 24 hour Rainfall Depth, P_{24} (mm), (from Appendix A)				84	134	195
6. Runoff Index, c* :	$= \frac{P_{24} - 2Ia}{P_{24} - 2Ia + 2S}$			0.29	0.41	0.51
7. Specific Peak Flow Rate, q*, (from Figure 5.1)				0.109	0.135	0.147
8. Peak Flow Rate, q_p :	$= q^* A P_{24}$	(m^3/s)		0.141	0.278	0.441
9. Runoff Depth, Q_{24} :	$= \frac{(P_{24} - Ia)2}{(P_{24} - Ia) + S}$	(mm)	Pervious	37.1	76.2	129.3
			Impervious	79.1	129.0	190.0
10. Runoff Volume, V_{24} :	$= 1000 \times Q_{24} A$	(m^3)	Pervious	570	1,172	1,988
			Impervious	000	000	000
			Total	570	1,172	1,988

TP108 - POND DESIGN (POST-DEVELOPMENT SCENARIO)

Project: *West Coast Road* By: WL Date: 19/05/06

Location: ## Checked: 0 Date:

1. Runoff Curve Number (CN) and Initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area	Product of CN x Area
	Pervious Areas (List)			
Waitemata clay, Class C	*Bush*	70	0	0
Waitemata clay, Class C	*Cut faces*	74	0.8527	63
	Subtotal for Pervious Areas		0.8527	63
	Impervious Areas (List)			
	Roads / paved	98	0.685	67
	Subtotal for Pervious Areas		0.6848	67
* from Table 3.3		Totals	1.5375	130

CN (weighted) : $\frac{\text{total product}}{\text{total area}} = \frac{130}{1.5375} = 85$

Ia (weighted) : $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 0.8527}{1.5375} = 2.8$ mm

2. Time of Concentration

Channelisation Factor : C = 0.6 (from Table 4.2)

Catchment Length : L = 0.046 km (along drainage path)

Catchment Slope : Sc = 0.204 m/m (by equal area method)

Runoff Factor R : $\frac{CN}{200 - CN}$ = 0.73

Time of Concentration : $t_c = 0.14\ C\ L^{0.66}\ R^{-0.55}\ Sc^{-0.30}$ = 0.17 hrs

SCS Lag for HEC-HMS : $t_p = 2/3\ t_c$ = 0.11 hrs

3. Soil Storage Parameter : S = ((1000/CN)-10)*25.4

Total = 46 mm

Pervious = 89 mm

Impervious = 5 mm

		Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
4. Average Recurrence Interval, ARI (yr) :		Erosion	1/3 *2	2	10	100
5. 24 hour Rainfall Depth, P_{24} (mm), (from Appendix A)		34.5	28.0	84	134	195
6. Runoff Index, c* : $= \frac{P_{24} - 2Ia}{P_{24} - 2Ia + 2S}$		0.24	0.20	0.46	0.58	0.67
7. Specific Peak Flow Rate, q*, (from Figure 5.1)		0.066	0.048	0.109	0.130	0.145
8. Peak Flow Rate, q_p : $= q^* A P_{24}$ (m^3/s)		0.04	0.02	0.14	0.27	0.43
9. Runoff Depth, Q_{24} : $= \frac{(P_{24} - Ia)2}{(P_{24} - Ia) + S}$ (mm)	Pervious	7.3	4.7	37.1	76.2	129.3
	Impervious	30.0	23.6	79.1	129.0	190.0
10. Runoff Volume, V_{24} : $= 1000 \times Q_{24} A$ (m^3)	Pervious	062	040	316	650	1,102
	Impervious	205	162	542	883	1,301
	Total	268	202	858	1,534	2,403

TP108 - POND DESIGN GENERAL

Project:	*West Coast Raod*	By: WL	Date: 19/05/06
Job No.:	*42608*	Checked:	Date:

Stage 3

Pre-Development

Hardstand/Roof

area (ha)	0

Other (pervious)

area (ha)	0.4581
TOTAL	0.4581

Post-Development

Hardstand/Roof

area (ha)	0.2939

Other (pervious)

area (ha)	0.1642
TOTAL	0.4581

Hydrology

2 year	84 mm
10 year	134 mm
100 year	195 mm

TP108 - POND DESIGN (EXISTING DEVELOPMENT SCENARIO)

Project: *West Coast Raod* By: WL Date: 19/05/06

Location: *42608* Checked: Date:

1. Runoff Curve Number (CN) and Initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (hectares)	Product of CN x Area
	Pervious Areas (List)			
Waitemata clay, Class C	*Bush*	70	0	0
Waitemata clay, Class C	*Pasture*	74	0.4581	34
	Subtotal for Pervious Areas		0.4581	34
	Impervious Areas (List)			
	Roads / paved	98	0.000	0
	Subtotal for Impervious Areas		0	0
* from Table 3.3		Totals	0.4581	34

CN (weighted) : $\frac{\text{total product}}{\text{total area}} = \frac{34}{0.4581} = 74$

Ia (weighted) : $\frac{\text{5 x pervious area}}{\text{total area}} = \frac{5 \times 0.4581}{0.4581} = 5.00$ mm

2. Time of Concentration

Channelisation Factor : C = 1 (from Table 4.2)

Catchment Length : L = 0.044 km (along drainage path)

Catchment Slope : Sc = 0.158 m/m (by equal area method)

Runoff Factor R : $\frac{CN}{200 - CN} = 0.59$

Time of Concentration : $t_c = 0.14\ C\ L^{0.66}\ R^{-0.55}\ Sc^{-0.30} = 0.17$ hrs

SCS Lag for HEC-HMS : $t_p = 2/3\ t_c = 0.11$ hrs

3. Soil Storage Parameter : S = ((1000/CN)-10)*25.4

Total = 89.2 mm

Pervious = 89.2 mm

Impervious = 5.2 mm

		Storm #1	Storm #2	Storm #3
4. Average Recurrence Interval, ARI (yr) :		2	10	100
5. 24 hour Rainfall Depth, P_{24} (mm), (from Appendix A)		84	134	195
6. Runoff Index, c* : $= \frac{P_{24} - 2Ia}{P_{24} - 2Ia + 2S}$		0.29	0.41	0.51
7. Specific Peak Flow Rate, q*, (from Figure 5.1)		0.082	0.108	0.126
8. Peak Flow Rate, q_p : $= q^* A P_{24}$ (m^3/s)		0.032	0.066	0.113
9. Runoff Depth, Q_{24} : $= \frac{(P_{24} - Ia)2}{(P_{24} - Ia) + S}$ (mm)	Pervious	37.1	76.2	129.3
	Impervious	79.1	129.0	190.0
10. Runoff Volume, V_{24} : $= 1000 \times Q_{24} A$ (m^3)	Pervious	170	349	592
	Impervious	000	000	000
	Total	170	349	592

TP108 - POND DESIGN (POST-DEVELOPMENT SCENARIO)

Project: *West Coast Raod* By: WL Date: 19/05/06

Location: ## Checked: 0 Date:

1. Runoff Curve Number (CN) and Initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area	Product of CN x Area
	Pervious Areas (List)			
Waitemata clay, Class C	*Bush*	70	0	0
Waitemata clay, Class C	*Cut faces*	74	0.1642	12
	Subtotal for Pervious Areas		0.1642	12
	Impervious Areas (List)			
	Roads / paved	98	0.294	29
	Subtotal for Pervious Areas		0.2939	29
* from Table 3.3		Totals	0.4581	41

CN (weighted) : $\frac{\text{total product}}{\text{total area}} = \frac{41}{0.4581} = 89$

Ia (weighted) : $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 0.1642}{0.4581} = 1.8$ mm

2. Time of Concentration

Channelisation Factor : C = 0.6 (from Table 4.2)

Catchment Length : L = 0.044 km (along drainage path)

Catchment Slope : Sc = 0.158 m/m (by equal area method)

Runoff Factor R : $\frac{CN}{200 - CN}$ = 0.81

Time of Concentration : $t_c = 0.14\ C\ L^{0.66}\ R^{-0.55}\ Sc^{-0.30}$ = 0.17 hrs

SCS Lag for HEC-HMS : $t_p = 2/3\ t_c$ = 0.11 hrs

3. Soil Storage Parameter : S = ((1000/CN)-10)*25.4

Total = 30 mm

Pervious = 89 mm

Impervious = 5 mm

		Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
4. Average Recurrence Interval, ARI (yr) :		Erosion	1/3 *2	2	10	100
5. 24 hour Rainfall Depth, P_{24} (mm), (from Appendix A)		34.5	28.0	84	134	195
6. Runoff Index, c* : $= \frac{P_{24} - 2Ia}{P_{24} - 2Ia + 2S}$		0.34	0.29	0.57	0.68	0.76
7. Specific Peak Flow Rate, q*, (from Figure 5.1)		0.066	0.048	0.109	0.130	0.145
8. Peak Flow Rate, q_p : $= q^* A P_{24}$ (m^3/s)		0.01	0.01	0.04	0.08	0.13
9. Runoff Depth, Q_{24} : $= \frac{(P_{24} - Ia)2}{(P_{24} - Ia) + S}$ (mm)	Pervious	7.3	4.7	37.1	76.2	129.3
	Impervious	30.0	23.6	79.1	129.0	190.0
10. Runoff Volume, V_{24} : $= 1000 \times Q_{24} A$ (m^3)	Pervious	012	008	061	125	212
	Impervious	088	069	233	379	558
	Total	100	077	293	504	771

C A L C U L A T I O N S H E E T

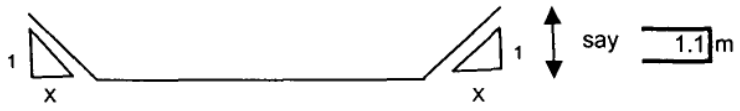
Job No: 42608 *By:* WL *Checked:* *Date:* 19/05/2006

Project: West Coast Road *Page:* 1 *of:* 1

Subject: Stormwater Pond Sizing for Pond (Stage 3)

Water Quality Volume (WQV) = 180 m^3

180 m^3

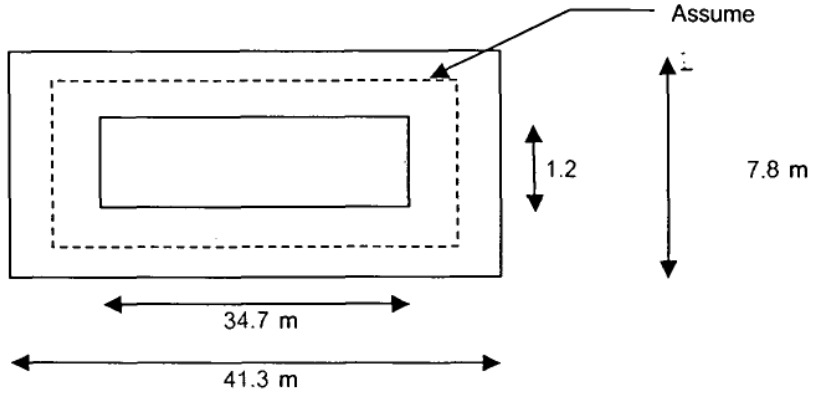


Area required = 164 m^2

Side slope: 1 : 3
(1 : X)

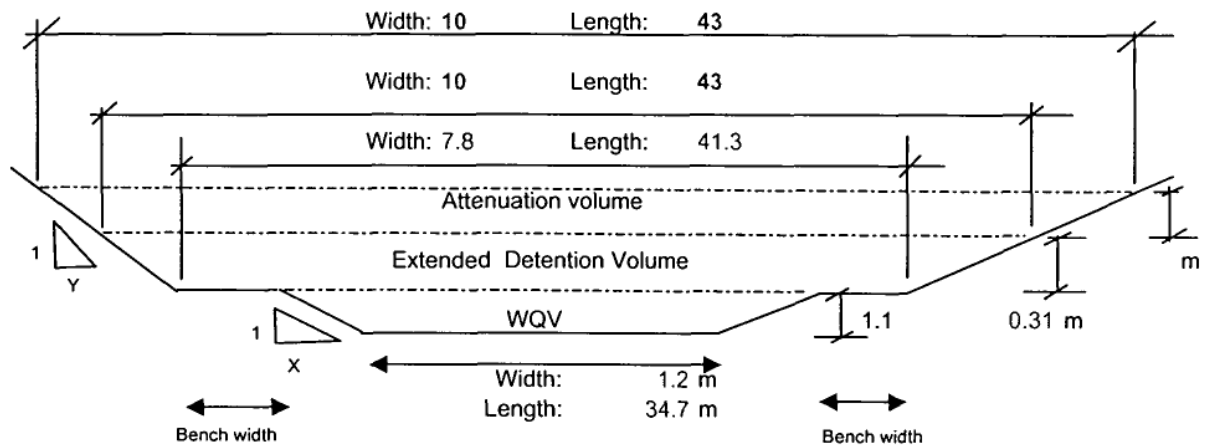
Ratio:

Width 4.5 m
Length 38 m
Area = 171 m^2 OK



	Top	Bottom
Width	7.8	1.2
Length	41.3	34.7

Extended Dentention storage = 100 m^3



Bench Width: 0 m
Side slope(1:Y): 1 : 3

Depth required: 0.31 m

CATCHMENT SCHEDULE

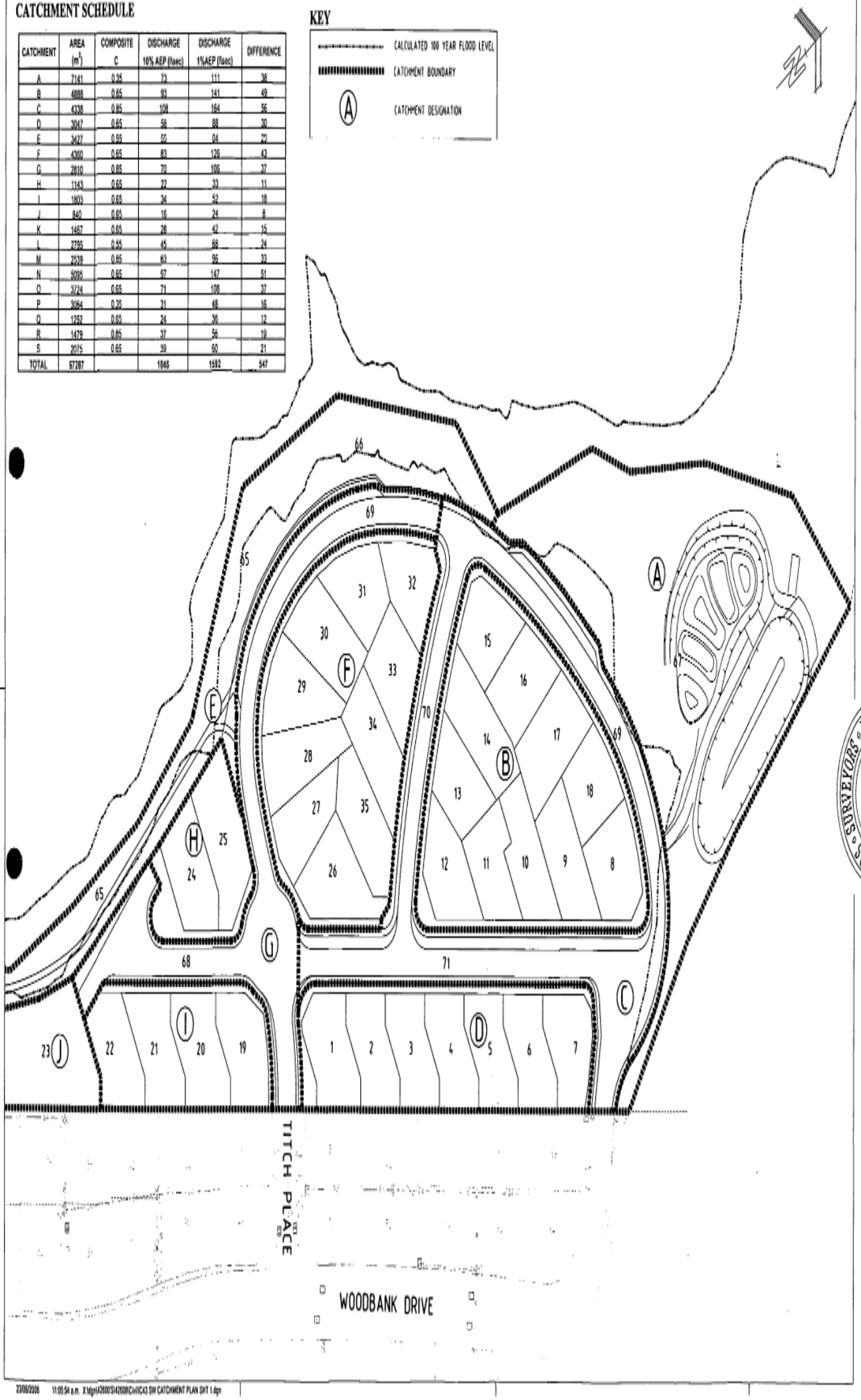
CATCHMENT	AREA (m^2)	COMPOSITE C	DISCHARGE 10% AEP (l/sec)	DISCHARGE 1%AEP (l/sec)	DIFFERENCE
A	7141	0.35	73	111	38
B	4888	0.65	93	141	49
C	4338	0.65	108	164	56
D	3047	0.65	58	88	30
E	3427	0.55	50	04	22
F	4360	0.65	83	126	43
G	2810	0.85	70	106	37
H	1143	0.65	22	33	11
I	1803	0.65	34	52	18
J	840	0.65	16	24	8
K	1467	0.65	28	42	15
L	2795	0.55	45	68	24
M	2539	0.85	63	96	33
N	5095	0.65	97	147	51
O	3724	0.65	71	108	37
P	3064	0.35	31	48	16
Q	1252	0.65	24	36	12
R	1479	0.65	37	56	19
S	2075	0.65	39	60	21
TOTAL	67287		1045	1592	547

KEY

CALCULATED 100 YEAR FLOOD LEVEL

CATCHMENT BOUNDARY

(A) CATCHMENT DESIGNATION



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DRAWING NOTES

REV	DATE	DESCRIPTION	DRAWN	CHKD

DRAWING REVISIONS

SURVEYORS • ENGINEERS • ARCHITECTS
Babbage CONSULTANTS
100 FANSHAWE STREET
PO BOX 2027
AUCKLAND 1 - NEW ZEALAND
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admin@babbage.co.nz

CLIENT / PROJECT

WEST COAST ROAD HOUSING DEVELOPMENT

FOR

NZ HOUSING FOUNDATION

DRAWING TITLE

STORMWATER CATCHMENT PLAN (SHEET 1)

	DATE	INITIAL
DESIGNED	JUNE 2006	FK
DRAWN	JUNE 2006	CW
CHECKED		
APPROVED	23/06/06	TP

SCALE (A1)

1:500

JOB NUMBER	DRAWING NUMBER	REVISION
42608	C43	-

23/06/2006 11:05:54 a.m. X:\dgn\42600\42608\C\civil\C43 SW CATCHMENT PLAN SHT 1.dgn

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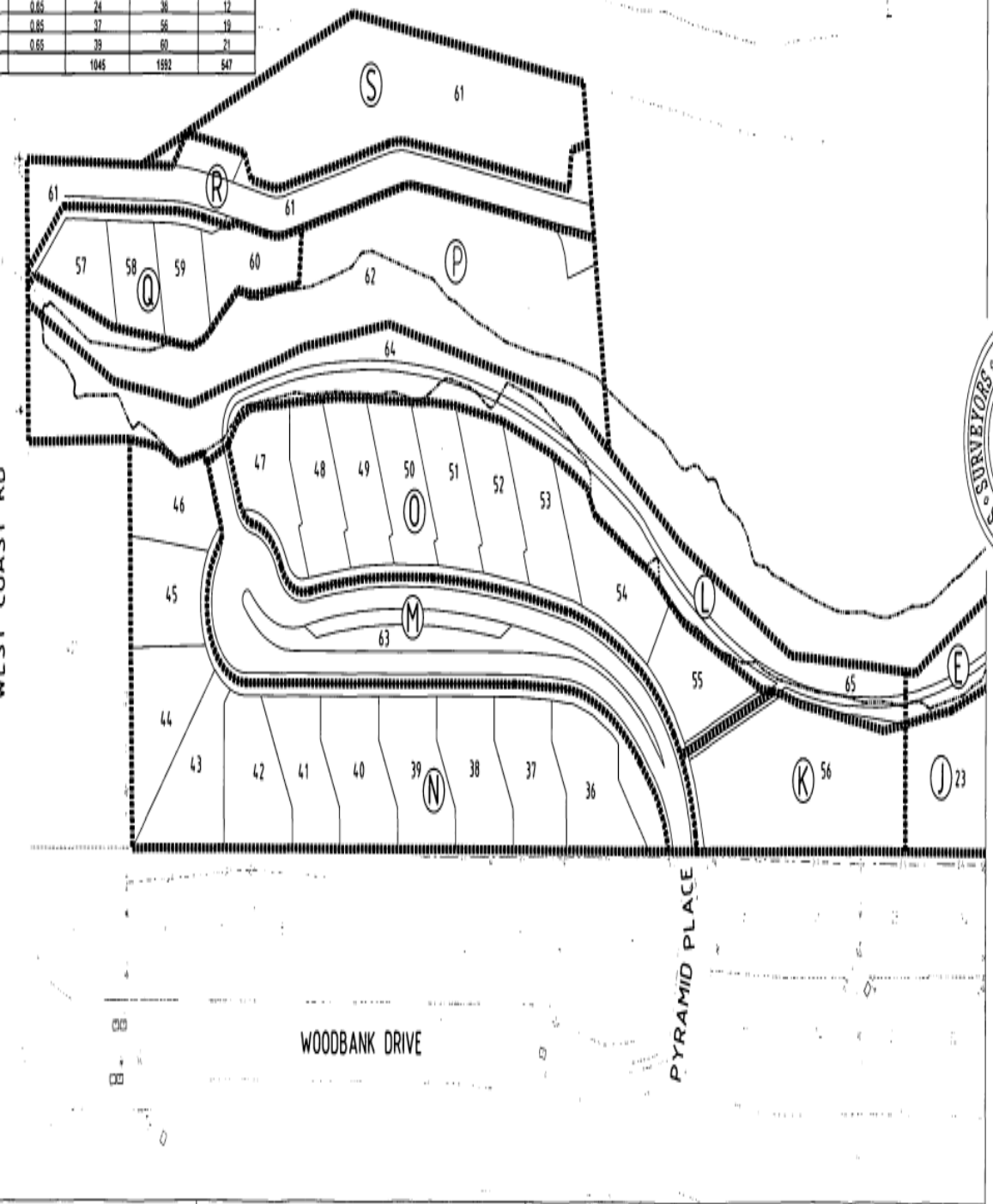
DRAWING NOTES

KEY

- CALCULATED 100 YEAR FLOOD LEVEL
- CATCHMENT BOUNDARY
- (A) CATCHMENT DESIGNATION

CATCHMENT SCHEDULE

CATCHMENT	AREA (m^2)	COMPOSITE C	DISCHARGE 10% AEP (l/sec)	DISCHARGE 1%AEP (l/sec)	DIFFERENCE
A	7141	0.35	73	111	38
B	4888	0.65	93	141	49
C	4338	0.85	108	164	56
D	3047	0.65	58	88	30
E	3427	0.55	55	84	29
F	4360	0.65	83	126	43
G	2810	0.85	70	106	37
H	1143	0.65	22	33	11
I	1803	0.65	34	52	18
J	840	0.65	16	24	8
K	1467	0.65	28	42	15
L	2795	0.55	45	68	24
M	2539	0.85	63	96	33
N	5095	0.65	97	147	51
O	3724	0.65	71	108	37
P	3064	0.35	31	48	16
Q	1252	0.65	24	36	12
R	1479	0.85	37	56	19
S	2075	0.65	39	60	21
TOTAL	57287		1045	1592	547



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WEST COAST ROAD HOUSING DEVELOPMENT

FOR

NZ HOUSING FOUNDATION

DRAWING TITLE

STORMWATER CATCHMENT PLAN (SHEET 2)

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Appendix 11

ARC Comprehensive Discharge Consent

Comprehensive Discharge Consent Application

Parrs Stream
Stormwater Management Plan

Waitakere City Council

Opus: an accomplished work, a creation, an achievement

Comprehensive Discharge Consent Application

Parrs Stream
Stormwater Management Plan

Waitakere City Council

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1 Introduction

Opus International Consultants Ltd were commissioned to carry out a catchment analysis and stormwater study of the Parrs Stream catchment. The study had the following specific requirements:

- To define the catchment and principal sub-catchments
- To determine likely flood flows
- To investigate potential flooding problems
- To analyse and report on flood mitigation options
- To prepare a report and drawings identifying the flood hazard areas.

It is anticipated that this report may be used as the principal resource for:

- Obtaining a discharge consent for the catchment
- Determining the appropriate mode and level of catchment development
- Identifying flood hazards and ensuring appropriate development controls are implemented in flood hazard areas.
- Identifying necessary (or recommended) system upgrading requirements
- Identifying existing flood prone properties and proposing appropriate flood protection measures.

1.1 Background

This report concerns the Parrs Stream catchment, a 1.1 km^2 urban tributary of the Waikumete Stream in Glen Eden. At least one house in the catchment suffers flooding at present, and significant development is occurring which could worsen the existing situation. Ecowater have requested Opus to undertake a catchment study to identify potential problems, propose solutions and develop a long-term management plan for the catchment.

Waitakere City Council has a statutory duty to manage stormwater under the Local Government Act, 1974, the Building Act, 1991, and the Resource Management Act, 1991. Responsibilities include minimising the adverse effects of flooding from both land development and building activities. Ecowater is the local authority business unit that manages stormwater activities on behalf of Waitakere City Council.

1.2 Previous Reports

The catchment has been partially investigated in two previous stormwater reports, the first by Hugh Fendall Consultants Ltd in September 1989, *"PHP Trust Subdivision, West Coast Rd, Oratia Stream Flow Calculations"*, and the second a more recent investigation by N S Chandler, Consulting Engineer, for a proposed 13 lot subdivision in Selak Place for Linx Developments Ltd. As the titles suggest the two studies were principally related to managing stormwater from proposed subdivisions.

A further report was prepared by Worley Consultants Ltd in March 1993 titled *"Henderson Creek South Catchment – Simple Hydrological Catchment Study"* The report assessed flood flows and pipe/channel capacities throughout the Henderson Creek South catchment, which includes the Parrs Stream catchment.

1.3 Planning Framework

The Waitakere City Council Proposed District Plan was proposed in October 1995 and re-issued in December 1998, updated to include the results of Council decisions to date and cross-referenced to indicate outstanding appeals.

The catchment is predominantly zoned 'Living', which permits medium-density residential development. 89 Ha (82%) of the catchment has this zoning, of which approximately three-quarters is presently developed. Other significant land-uses are 'Reserve' (14.4 Ha or 13%), with 11 Ha of Parrs Park being the most significant component; and 'Special' (5.2 Ha or 5%) which covers the marae.

The Proposed District Plan requires the preservation of a riparian margin (7 m each side) for the full length of Parrs Stream from 70 m below Solar Rd to its confluence with the Waikumete Stream.

2 Catchment Area

2.1 Catchment Description

The Parrs Stream catchment is illustrated on figure 1. The catchment comprises two tributaries: the main creek which rises in the head of the gully, above Solar Rd, and a subsidiary catchment which collects stormwater from the Glengarry Rd/Nicholas Ave area. The two tributaries merge below West Coast Rd for the final 260 m to their confluence with the Waikumete Stream.

The main Parrs Stream flows as a natural stream for 1.3 km from 120 m below Solar Rd to the Waikumete confluence. Two road crossings are culverted, Milan Drive with two 1600 mm pipes and West Coast Rd with twin 1800 mm pipes. The urban areas around the sides and head of the valley are fully reticulated with pipes discharging to the stream.

The subsidiary catchment comprises a mixture of piped and open channel sections.

2.2 Historical Flooding

Regular complaints of flooding have been received from the owners of 426 West Coast Rd. Mr and Mrs Bree were interviewed during the preparation of this report. They report that the Parrs Stream (which runs along the side boundary of their property) overflows into their back yard about six times per year. They have lived on the property for more than 30 years but noted that flooding has become significantly worse in recent years due, they believe, to the additional subdivisional development upstream. Typical flood events spill into and contaminate an in-ground swimming pool, and more serious events flood into a basement shower/toilet and garaging. There are no habitable areas at this level, with all living accommodation on the floor above.

2.3 Stormwater Issues Identified through Public Questionnaire

A number of other stormwater and flooding problems were identified by means of a questionnaire, which was circulated to residents in the catchment (refer sample appended). Quite a few respondents drew attention to relatively minor nuisances, which have been forwarded to Waitakere City for appropriate attention. A small number were more significant and deserve attention here.

The owner of 24 Milan Drive noted that the stream that used to run along his back boundary appears to have been diverted a few years ago by a neighbour. The diversion encroaches onto his property and some erosion is occurring. The stream reportedly floods beyond its banks with every significant rainfall (approximately three times per month), with the stream rising to peak levels in about 10 minutes.

The owner of 83 Brunner Road reported an increased amount of debris within the stream and higher flooding levels since the completion of the Milan Drive subdivision. Observations at the property showed an area has been filled on the Milan Drive side of the stream to level the sections adjacent to the stream. In places there is uncovered soil which could be prone to erosion during the flooding of the stream. Monitoring of the neighbourhood and control of building activities within the flood plain are recommended.

75A Brunner Road is also adjacent to the stream, and reports similar problems. This section is an example of a subdivided section placing houses immediately adjacent to the stream and associated floodplain. The ground around the property is continuously wet due to rising of the stream and overland flow from the houses above. Since the house is piled, the floor is clear of any immediate risk of flooding.

The property owner at 158 Solar Road reported stormwater problems occurring every time it rains. The property is situated in the bottom of the gully and there is no adequate drainage to capture the amount of runoff to the area. On inspection the ground around this house was found to be extremely wet, with water sitting on the ground surface. Once again the house is on piles and has no immediate risk of flooding.

The walkway between Maywood Cres and Solar Rd and adjacent properties suffer ponding due to the existing ground profile which effectively 'dams' the overland flow path. When the overland flow path operates water will pond to approximately 1m depth before flowing clear. No dwellings are at risk of flooding. This nuisance effect could be mitigated if necessary by localised earth filling.

2.4 Future Development

It is anticipated that most remaining vacant 'Living'-zoned areas will be developed over the next 10-15 years. A site in the lower catchment has been proposed for a future Wananga (university), which may result in perviousness equivalent to a medium-density residential area. Future development of Parrs Park is not expected to significantly affect the level of perviousness of that site.

The nature of the existing stormwater reticulation is expected to change little as a result of future development (i.e. new development areas will be fully reticulated but the main stream will remain open).

3.1.3 Results

Table 1: PEAK FLOWS IN THE PARRS STREAM CATCHMENT				
Location	Full Development Peak flow[2] (m³/sec)		Capacity of Existing Culvert (m³/sec)	Pipe Diameter (mm)
	1% AEP (100 year ARI)	20% AEP (5 year ARI)		
Outflow subcatchment A (Solar Rd)	7.2	3.6	4.0	2 x 825 dia
Outflow subcatchment A -B (Milan Dr)	12.2	6.3	14[3]	2 x 1600 dia
Outflow subcatchment A - C (West Coast Rd)	16.2	8.2	14[3]	2 x 1800 dia
Outflow subcatchment E (West Coast Rd)	3.3	1.7	1.2	525 dia
Outflow subcatchment E + F (confluence Parrs Stream)	6.6	3.0		Open channel
Outflow subcatchments A – F (confluence Waikumete Stream)	24.2[4]	11.0		Open channel

[2] Based on full development to existing District Plan limits with no significant alteration to the stream channel.

[3] Assumes culverts headed up to the point where flooding of buildings is imminent. Assumes no blockage of culverts occurs.

[4] This figure may be compared with 26.0 m³/s for the 1% AEP storm with cleared channel conditions for full development (ref *Oratia Stream Flood Modelling Review* (draft), Opus International Consultants, Sept 1999). Refer also discussion in Section 3.3. Principal differences arise from the following:

- The Flood Modelling Review used the new TP108 methodology whereas this study has been based on the older TP19 methodology. TP108 was not available at the time of commencement of this study.
- This report assumes a catchment imperviousness of 35% for the fully developed residential areas and 30% for the overall catchment. By comparison the Flood Modelling Review assumes an overall imperviousness of 46%.
- Much of the land below West Coast Rd is zoned for reserve, which is expected to remain roughly 10% impervious. The remaining land is now zoned 'living'. An overall imperviousness of 22% has therefore been assumed in this study for the land below West Coast Rd compared to 19% assumed in the Flood Modelling Review.
- The Parrs Stream catchment modelled in the Review is 44% larger than that considered in this study, and includes significant areas draining direct to the Waikumete Stream from both sides. This reflects the differing focus of the two studies – this study considering the catchment that physically drains to Parrs Stream, while the Review considers all flows entering between nodes in the Waikumete Stream.
- While the Flood Modelling Review assumed a larger catchment area, it also assumed a cleared channel condition, whereas this study assumes the present level of riparian vegetation will continue. The effects of area and channel condition have tended to cancel out, yielding a similar 1% AEP flow to this study.

3.2 Calculation of water levels

3.2.1 Methodology

Hydraulic modelling carried out for this study was limited to an assessment of pipe and culvert capacities, and limited 'HecRAS' analysis of surveyed open channel sections adjacent to the Bree property. HecRAS is a non-dynamic river analysis programme developed by the US Army Corps of Engineers and predicts top water levels for nominated flow rates.

Flood hazards identified in this report have been principally based on reported flood problems, together with the results of the analyses above. Flood hazard areas have been derived by extending the potential flood or overflow levels using contour plans and field observations, and making some allowance for backwater effects.

3.2.2 Flood Hazard Maps

The inferred flood hazard areas are illustrated on the flood hazard map appended as figure 2. The maps principally cover the main channel and do not purport to identify every isolated case where flooding may occur due to blockage, lack of primary system capacity, etc.

The flood hazard map appended identifies areas where a potential flood hazard exists. Further detailed analysis will be required to determine the precise flood level and footprint of flooding at any given spot.

3.3 Flooding in the Waikumete/Oratia Stream Catchment

This report does not deal in detail with flooding in the Waikumete/Oratia Stream system downstream. Flooding in that system has been studied in a number of reports, including the *Oratia Stream Catchment Management Plan* (Opus, 1995).

This present report is based on the philosophy that peak flow detention in the upper Oratia will be beneficial for management of the Waikumete/Oratia system and that detention in the lower Oratia will be detrimental. Parrs Stream is located in the mid-Oratia, where detention can be either beneficial or detrimental, depending on the device configuration and storm characteristics. This was borne out by a specific study carried out in a neighbouring catchment, the Tangatu Stream (Opus, 1999), which joins the Waikumete approximately 600m upstream of Parrs Stream. That study found that peak flows actually *increased* slightly downstream if detention was installed in the tributary. The study found that detention was only likely to be an appropriate management option in the mid-catchment if *all* tributaries were so fitted. In the case of Parrs Stream and several other tributaries in the vicinity there are few sites easily amenable to detention. Since the modelling indicated that detention needs to be on an 'all or nothing' basis, we concluded that detention in the middle catchment is not appropriate.

Notwithstanding these comments it is appropriate to install where feasible detention to restrict post-development peak flows in small storms (say up to the 50% AEP storm) to their pre-development levels. Such measures will be beneficial by reducing stream erosion, but will not significantly alter flooding in larger storms.

4 Assessment of Existing System

4.1 Pipe Reticulation

The catchment drainage generally comprises piped drains serving most lots (most are less than 30 years old), and discharging to the main drain which is piped upstream of Solar Rd and open stream downstream. The pipe systems are generally relatively steep.

Pipe capacities for the catchment have been assessed previously by others (ref. Worley Consultants Ltd, *'Henderson South Catchment – Simple Hydrological Catchment Study'*, 1993). Worley's work has not been re-calculated, however spot checks were made of their spreadsheet analysis, which was found to be generally satisfactory. 'Possible flood hazard' areas identified by Worleys were visited and inspected, and have been reproduced where appropriate on the flood hazard maps appended.

The Worley report found that most of the piped reticulation was of sufficient capacity, however some links are inadequate for the 20% AEP (5 year ARI) flows. Works recommended by Worleys that remain outstanding are as follows:

Table 2: Upgrading Works Recommended in Henderson Creek South Catchment Study

Stormwater line	Location	Section between manholes	Diameter 1995	Required diameter	Cost (1995 value)
Line WX	Subcatchment E drain below orchard	5-10	< 700	1050	$71,424[5]
Line WXB	West Coast Rd/Parrs Cross Rd intersection	5-10	225	375	$16,450
Line WQ	Tributary adj Brunner Rd	30-35	225	375	25,380
Line WH	Tributary above Solar Rd	15-20, 30-35, 35-WW60	225	450-600	63,850
				Total:	$179,099

The main drain at Solar Rd is conveyed by an 825mm dia pipe. At a gradient of 5.8% the pipe has a capacity of 4 m^3/sec, which meets the 20% AEP design standard. Below Solar Rd the gradient reduces to 2.2%. Here the pipe has been duplicated recently to provide additional capacity.

4.2 Open Channel above Milan Drive

Between the pipe outlet 120 m below Solar Rd and Milan Dr the 310 m of open channel has an average slope of 1.4%. The gully floor is relatively wide but the channel becomes more incised near Milan Drive. In places urban landscaping approaches the bank-tops, while in other places

[5] Upgrading of line WX is considered further in section 6.6.

the flood plain is clothed in bush or scrub. Above the Milan Dr Reserve the channel is less incised, and floodwaters regularly spill onto private property, even beyond the 10 m wide drainage easement. In this reach some small-scale reclamation has occurred, which causes increased depth and frequency of flooding together with minor erosion.

A sample cross section was surveyed above Milan Drive where the stream is relatively incised. Whilst it is erroneous to assume that the cross-section is representative of the entire reach, a simple Mannings analysis indicates that the channel at that point can convey the 1% AEP flow at a depth of approximately 1.7 m. At this depth damaging flooding is unlikely to occur.

4.3 Milan Drive Culverts

Parrs Stream crosses Milan Drive in twin 1600 mm dia culverts. No habitable floors of upstream houses were identified as being below road level, however one garage/basement was noted 0.7 m below road level.

The culverts have a capacity of 14 m^3/sec assuming no blockage and heading up no higher than the garage floor level noted. This is sufficient to pass the 1% AEP flood. Assuming 50% blockage occurs the culverts have a capacity of 7 m^3/sec, which is equivalent to the 10% AEP storm flow.

There is therefore no appreciable risk of flooding to any building adjacent to the Milan Dr culverts provided the culverts remain unblocked. If blockage occurs one non-habitable floor may be put at risk.

4.4 Open Channel Between Milan Drive and West Coast Rd

Several sample cross-sections were surveyed between Milan Drive and West Coast Rd. The channels at these points were evaluated by Mannings' analysis, which indicates the channel is capable of transmitting the 1% AEP flood flow at depths of up to 2.0 m and surface widths of up to 16 m.

The Bree property at 426 West Coast Rd represents a significant constriction to stream flow. Here the existing open channel runs down the side boundary. The back yard is only approximately 900 mm above streambed level at the upstream boundary, and sand-bags have been installed along the fenceline to exclude floodwater. The sand-bagged stream has an assessed capacity of only about 25% of the 5 year ARI (20% AEP) storm event, which explains the frequent inundation of the back yard and occasionally the basement area of the house.

4.5 West Coast Rd Culverts

Parrs Stream passes under West Coast Rd in two 1.8 m diameter culverts.

Two houses immediately upstream of the culverts (numbers 424 and 426 West Coast Rd) have upper (habitable) floor levels of 380 and 480 mm respectively above the road centre-line. While this represents a less than desirable level of freeboard, any potential over-land flow over the road

will be broad and shallow, and the upper floors should remain free of flooding in any reasonably foreseeable event.

The basement/garage areas of the two houses have floor levels approximately 0.5 and 1.7 m respectively below the road centre-line, which for No 426 is only 2.6 m above culvert invert level. The culverts have a capacity of approximately 14 m^3/sec at a head-water level of 2.6 m (i.e. where flooding of No 426's garage/basement is imminent), *provided they remain unblocked.* This is approximately equivalent to a 2% AEP storm flow.

With bush areas and urban back yards along the stream banks it is not possible to eliminate the debris blockage threat altogether. The large diameter (1800 mm) culverts are however less prone to blockage than smaller sized pipes. Assuming 50% loss of inlet capacity due to blockage the culverts can still convey approximately 9 m^3/sec (i.e. better than the 20% AEP flood flow) without garage/basement flooding.

It can therefore be concluded that the garage/basement of 426 West Coast Rd is flood-prone in a 1% flood event without culvert blockage, and smaller events if blockage occurs.

4.6 Open Channel Below West Coast Rd

Below West Coast Rd the channel slope decreases to 0.5 – 1.0%. The open channel becomes wider and slower, meandering through farmland. After traversing a pond section it narrows again between the confluence of subcatchments E & F and the Waikumete Stream. The channel is weedy in parts, and the banks contain significant brushwood.

One sample cross section was surveyed below West Coast Rd. This should not be considered representative of the entire reach, which varies as described above. The channel at the sample section had a slope of 0.5%, and was capable of transmitting the 1% AEP flow at a depth of approximately 2.6 m and a surface width of approximately 18 m.

4.7 Subcatchment E

Between Glengarry Rd and West Coast Rd the previously open drain has been piped (or possibly only filled with shells to create a subsoil drain) through an orchard. No manholes are evident, leading to the conclusion that any piping has been carried out informally. The pipe system below the orchard has an assessed capacity of 0.6 m^3/sec compared to the 20% AEP (5-year) flow of 1.7 m^3/sec. Upgrading is recommended.

Excess flows will follow a defined gully through the orchard, and then flow across numbers 452-458 West Coast Rd. The crest level of West Coast Rd is higher than the ground level at number 452 so that nuisance ponding is likely in larger storms (typically less than 200 mm depth). Once stormwater heads up sufficiently it will flow across West Coast Rd and return to the open channel. No dwellings appear to be at risk of flooding. One solution would be to construct an overland flowpath across number 456b and down the concrete driveway to West Coast Rd, together with upgrading the stormwater pipe. Alternatively a pipe capable of conveying the 1% AEP flow can

be installed including an adequate, non-blocking inlet structure. A pipe of approximately 1050 mm dia will convey the 1% AEP flow.

The culvert inlet at Glengarry Rd is substandard, and a short reach between the culvert outlet and the (assumed) pipe inlet in the orchard was badly blocked at the time of inspection. Channel clearing is urgently required. It is recommended that a fully piped linkage should be constructed with manholes as appropriate.

Below West Coast Rd subcatchment E returns to open channel flow, passing through three culverts adjacent to a Maori school (Wharekura). The upper two of these carry paved driveways serving the school site, which form substantial dams to flow. Excess flows will pond deeply and spill over the upper driveway without significant effect but the overflow level of the second driveway is higher than three adjacent buildings, which may flood. The situation is made worse by an orifice plate that has been installed on the second culvert to create an extended detention pond upstream, for which ARC consent number 15975 was issued in 1997. The 720 mm dia orifice plate/1200 mm pipe system will convey flows up to approximately the 20% AEP flow. We understand that this device was installed (in the absence of catchment management plans for the tributary) to ensure pre-development flows were maintained after development of the Wharekura. Options for modifying this culvert/driveway are presented in section 6.6 below.

The third (downstream) culvert is also inadequately sized but has a lower overflow level. Excess flows will overtop the embankment and return to the open channel downstream without causing further flooding.

It is recommended that prior to further significant development of subcatchment E the existing pipe drainage system above West Coast Rd is located, its size and capacity checked, and any necessary upgrading carried out.

5 Stormwater Quality Issues/Opportunities

5.1 Water Quality

From a water quality point of view Parrs Stream has a number of factors in its favour. The main stream is largely natural and open, with remnants of native riparian vegetation. While the Parrs Stream catchment is completely urbanised, it is fortunate in that it contains no industry. The residential development that makes up most of the catchment will have a relatively smaller impact on water quality, apart from the initial construction phase. West Coast Rd is highly trafficked, and represents perhaps the greatest pollutant source. The opportunity should be taken in conjunction with development of land to the north to divert as much road runoff as possible into suitable treatment devices.

The main stream channel below West Coast Rd has the potential to be developed as a riparian reserve (say 30m from each stream bank), which will serve an ecological, and amenity function. Among the benefits provided by such a reserve is the additional shading of the stream, which will help maintain water temperatures and will benefit in-stream biota. Recent international research has identified the riparian reserve as a critically important stormwater management practice, as shown by the following extract:

> Retention of a relatively wide, continuous riparian zone in forest cover or wetlands was shown to be the BMP of greatest potential and versatility among those investigated here. This practice may also be the easiest to accomplish logistically, the least costly and, accordingly, the most cost-effective. In newly developing areas riparian zones can be isolated from development, along with their associated streams, which are not going to be built over in any event. In already developed landscapes riparian zones are often the most free of development and could more easily be bought and put into protective status than upland areas. Riparian retention fits nicely with other objectives, like flood protection and provision of wildlife corridors and open space. Land and water management agencies should give top priority to securing and protecting existing high quality riparian buffers, enhancing or restoring degraded but not developed ones, and getting into protective status developed ones and then removing development and upgrading.[^]

No sampling or analysis of stream water quality was undertaken in the present study. During Opus' walkover assessment water clarity was observed to be fair, although some discolouration can be expected after heavy rainfall. There is a significant debris and litter problem (eg. prunings, furniture, etc.), which is mainly attributable to storage and dumping of materials on the stream bank. Like many urban New Zealanders, residents along the riparian margins of Parrs Stream are not particularly good stewards of their stream, choosing to use it for refuse disposal rather than understanding it as an asset. Public education is needed in this area.

[^] Horner, Richard, R and Christopher W May, *Regional Study Supports Natural Land Cover Protection as Leading Best Practice for Maintaining Stream Ecological Integrity* in Proceedings of First South Pacific Conference, Comprehensive Stormwater and Aquatic Ecosystem Management, 1999; pp. 233-247.

Some relatively minor erosion is occurring in the stream bed and banks, particularly in the steeper sections above West Coast Rd. Stream velocities are sufficiently high to indicate that erosion will be a continuing problem. The corridor should be monitored and localised protection works implemented as necessary.

5.2 Ecological Assessment

At the time of writing no formal ecological assessments have been undertaken in Parrs Stream, however inferences can be made from surveys carried out in the Waikumete Stream nearby[7].

Native Fish surveys have been undertaken in the Waikumete Stream above and below Parrs Stream in March 1998 (Bioresearches) and January 1999 (Field Studies). Notable in these studies (and from surveys of the Oratia Stream also) is the presence of the rare native freshwater crab Halicarcinus lacustris. This crab seems to be quite common in the Oratia and Waikumete subcatchments, particularly in any areas where there is rocky substrate, yet has not been found anywhere else in the Auckland region. The crab, while tolerant of high levels of settled sediment, is likely to be adversely affected by increased suspended sediment levels and increased water temperatures.

In addition to these crabs, Crans Bully, Redfinned Bully, common bullies, shortfinned eels and longfinned eels were found in the Waikumete Stream. Snails and damselflies were also found in the stream.

It is likely that some or all of these species can also be found in the Parrs Stream.

Notable in their absence from all areas surveyed in the Waikumete Stream are the banded kokopu, a species that is frequently found in Waitakere streams. It is likely that the lack of shading of the stream is the major cause of their absence, and being a fish which migrates up and down streams, could recolonise the area should suitable shade be re-established.

The two culverts on the main stream may create a significant barrier to fish passage. Consideration should be given to installing fish passes in the culverts to assist migration.

5.3 Stormwater Treatment

The main stream catchment above West Coast Rd is largely developed and offers few easy opportunities for stormwater treatment. In this area options such as regular cesspit cleaning, cesspit liners, and/or end of pipe solutions such as gross pollutant traps, CDS units or small forebays may be appropriate. The natural stream channel and riparian planting should be retained and enhanced where possible.

[7] Acknowledgment is made to L Easton, WCC, for information in this section.

Below West Coast Rd the land is presently undeveloped and the options are wider. On-line ponds are not appropriate in the main stream channel because they will destroy ecological features, however there is space to construct TP10-standard devices off-line. There is no obvious single, ideal site so the optimum treatment device, layout and location will be best determined in conjunction with the developers of the land concerned. The devices should be configured to treat as much runoff from West Coast Rd as possible.

The large tributary (Subcatchments E & F) is heavily modified and should provide a suitable location for an on-line pond. A pond (or other treatment device) should be constructed in the gully behind 456 West Coast Rd when the remaining vacant land is developed. (Site constraints will probably limit the pond size to about 50% removal efficiency at best, or excavation and dam height will become excessive.)

A pond has already been partly formed by the driveway serving the wharekura below West Coast Rd, but the floor levels of the adjacent buildings limit the available storage. A small in-line treatment pond capable of achieving an efficiency approaching 50% may be feasible in this location. Such a pond may not be altogether appropriate immediately adjacent to a school.

6 Flood Management Options

6.1 Level of Flood Protection

For all new buildings in the catchment WCC policy prohibits construction of any new habitable or ancillary building within the 1% AEP (ie 100 year) flood plain. Although the 1% flood plain has not been defined by this study, the main channel of the Parrs Stream is well defined, and the areal extent of flooding does not vary greatly with different sized flood events.

The minimum standard of flood protection for works requiring a Building Consent is laid down by the Building Act as the 2% AEP flood level. This will apply to all new buildings and alterations, and also to flood protection works which may require a building consent (eg house raising).

The following options are available to control flooding or mitigate the effects of flooding in the Parrs Stream catchment:

6.2 Controlling New Development in Flood Prone Areas

WCC's current policy of prohibiting development within the 1% AEP flood plain should continue. This plan provides some guidance into the likely extent of the 1% AEP flood plain. In cases of doubt the applicant should be required to commission his own flood study to investigate the specific local issues.

6.3 Flood Protection for No 426 West Coast Rd

Options for mitigating the nuisance flooding at 426 West Coast Rd include the following:

- Do nothing
- Increasing channel capacity
- Concrete lining the drain
- Gabion lining the drain
- Piping the drain
- Floodwalling of at-risk property with or without channel widening
- House raising or modification

One major advantage of open channel solutions over piped drains is that they are not limited by entry capacity. Flow can join the stream anywhere along its length, and also rejoin the stream immediately downstream of any blockage or constriction.

6.3.1 Do Nothing

This is the option against which all other management options must be compared. To do nothing will result in continued flooding of the back yard and pool area on a regular basis, causing considerable nuisance but little monetary loss. The basement/garage will flood periodically in major storms, causing minor losses. There will also be occasional major erosion episodes that will require reconstruction of the yard area and fences at considerable cost.

The house is currently listed on Council's flood hazard register, which will potentially reduce its market value.

6.3.2 Increasing channel capacity

For an unlined channel a trapezoidal cross section of approximately 20 m total width will be required (ie a base width of 1.0m, side slopes of 1:4 max and a depth of 1.2m). Such a channel would require substantial earthworks (approximately 600 m^3) and encroach markedly on neighbouring properties to the extent that at least one property would have to be purchased outright.

Construction costs are detailed below.

6.3.3 Piping of Stream

Two piping options are available:

- Piping to accommodate the 5% AEP flows with an overland flow path for the remainder, or
- Piping to accommodate the 1% AEP design flow.

For the 5% option a 1600 dia pipe will suffice, together with a trapezoidal overland flow channel 8m wide and 0.9 m deep. Since the open channel will normally remain dry it is felt that land purchase may not be necessary however a suitable easement would be prudent. Since the overland flow channel will remain generally along the line of the existing stream, the pipe will need to be constructed alongside the swimming pool in the rear of No 426, with the attendant expense and risk of damage to the pool.

The other option is to convey the entire 1% AEP flow within the pipe system. For this option two 1500 mm dia pipes will be required, with appropriate attention to the inlet structure to minimise the risk of blockage. The pipes could be laid generally within the existing stream corridor and no additional land is expected to be required. In fact there would be a net gain of usable land for the adjoining owners.

Costs associated with the two pipe options are detailed in the table below.

6.3.4 Concrete Lining of Stream Channel

A concrete channel of 2.1 m base width, 1.2 m depth and 4:1 side slopes is sufficient to convey the 1% AEP storm flow. Such a channel could be located within the existing stream corridor with minimal impact on the adjoining properties. Channel velocities will be high and fencing is considered essential. Concrete lining is not an 'eco-friendly' solution and is not therefore a preferred option

Costs associated with the channel lining option are tabled below.

6.3.5 Gabion Lining of Stream Channel

A gabion-lined channel approximately 8m wide by 1.5 m deep is capable of conveying the 1% AEP flow. This width of channel will encroach on existing properties by up to 6m, requiring land to be purchased or easements to be taken. Gabion costs are tabled below

6.3.6 Flood Walling

426 West Coast Rd has been given some interim flood protection in the form of sand bags placed along the rear and side boundaries. While these may be effective in minor storms their effectiveness will be limited because:

- they are too low adjacent to the upstream boundary, and
- the channel capacity is inadequate causing even relatively small floods to back up and overtop the sand bags.

It is feasible to install flood walling along the side and rear boundaries of a sufficient height to keep floodwaters out. Flood walls are effectively retaining walls designed to retain water rather than earth. They must be designed to withstand the likely hydraulic loadings and their foundations must be secure against scour or undermining.

The height of flood wall required depends on the extent of flood protection which is required (1%, 10%, etc.) and the distance the wall is set back from the stream edge. A wall which is set back 3.0 m from the top of banks will provide a greater flow area than one which is erected along the existing fence-line.

Two principal structural options are available:

- A concrete or masonry retaining wall can be constructed. If the wall is close to the stream or if it is intended to enlarge the stream by excavation then the wall will have to be founded below stream bed level. If the wall is more distant from the stream then a shallow wall footing may be feasible in conjunction with piling. Flood events will be of short duration and the ground is unlikely to become fully saturated, however velocities may be high and there is potential for undermining of the wall by scour or erosion.

- Alternatively a close-boarded timber retaining wall could be installed, utilising cantilevered poles, with the same provisos relating to distance from the stream as above.

The available set-back of the flood-wall is limited by the location of the existing in-ground swimming pool. In discussion with the owners it was determined that a walkway of at least 1m is necessary around the pool inside any flood wall. This will limit the available set-back to between 0.5-1.0 m inside the existing fenceline at this point as shown on the plan appended. On this alignment the wall will require a crest level of RL 29.06m (approximately 1.75 m above yard level) adjacent to the back boundary, reducing to RL 28.0m (0.7m above yard level) adjacent to the carport. A wall of these dimensions should exclude the 1% flood from the rear yard (inclusive of 500mm freeboard) but will cause a rise in flood levels of approximately 210 mm in the 5 year ARI flood event, and 540 mm in the 100-year event, outside the cordon (particularly above the property in the Wheaton Pl subdivision). This level of effect is not expected to cause flooding to any adjacent dwelling, although landscaped areas will be inundated more regularly.

Waitakere City have nominated minimum floor levels for future houses in Wheaton Pl as follows:

Lot 5, DP190863	29.30m
Lot 6	29.45m
Lot 7	29.60m
Lot 8	29.75m
Lot 9	29.90m

These restrictions are appropriate and should remain.

In order to protect the basement/garage area of 426 West Coast Rd in the 1% AEP event the RL28.0 m crest level must be carried through as a wall or bund to link up with the West Coast Rd embankment. Special provisions for draining the area inside the flood-wall cordon will be required.

Land acquisition and access for construction will be subject to negotiation with the owners.

6.3.7 Flood Walling and Enlargement of Channel

Another flood-walling option which was investigated comprised building a flood wall behind the stream bank and enlarging the channel by excavating the material on the stream side of the wall down to bed level. Since the stream channel is increased the amount of set-back can be reduced. For example a wall set-back 1.5 m from the top of bank will bring about a flood level *reduction* of approximately 200 mm for the 5 year and 10 year ARI storms. Even the 100 year ARI flood level will increase by less than 150 mm.

The flood walling required under this option will be correspondingly lower (1.3 m above yard level), but since the wall must be founded at or below stream bed level, construction costs will in fact be greater. Once again flood walls can be constructed from either timber, or reinforced concrete. A wall or earth bund will still be required through the front of the property with a top level of RL 28.0 m to protect the garage/basement from the 1% AEP flood event.

The disadvantage of this option is the resultant modification of the stream channel, which is undesirable from an ecological point of view. The existing palm and totara trees near the upstream boundary of No 426 will also require removal.

Land acquisition and access for construction will be subject to negotiation with the owners.

6.3.8 House-Raising

Since the type of flooding experienced at 426 West Coast Rd is generally nuisance-type flooding to yards and non-habitable areas which causes only minor damage, house raising is not considered an appropriate flood mitigation option. A completely new suspended lower floor would need to be constructed beneath the raised upper floor, at considerable expense. These works would provide no relief to the regular nuisance flooding of the yard and pool area.

6.3.9 Purchase and Removal

Purchase and removal of the house at 426 West Coast Rd is only considered appropriate in conjunction with stream works and this option is therefore considered under 'Increasing channel capacity' above.

6.3.10 Purchase/Alteration/Sale

It may be feasible to purchase No 426 West Coast Rd, alter the house by removing the swimming pool and basement area, and then on-sell it (with appropriate hazard notes on the title). A valuer's appraisal would be required to determine the likely cost of this exercise. Nuisance flooding of the property will remain even after the works were completed.

6.3.11 Compensation

One option available is to compensate the owners for future flooding which will occur as a result of urban growth in the upper catchment. This option is not recommended because

- Such compensation may have to be significant
- The existing regular flooding will continue and worsen, and eventually try the patience of the owners, not withstanding any compensation that has been made.

6.3.12 Summary of Costs

Table 3: Flood Mitigation Options for 426 West Coast Rd							
($1000)	Stream Widening	Concrete Lining	Gabion Lining	Piping for 5% storm	Piping for 1% storm event	Flood walling (to contain 1% storm)	Flood walling and channel widening (1% storm)
Negotiation/ land acquisition	236.5	2	45	10	4	16	14
Construction	47.5	113	85	110	143	81	96
Sub-total	284	115	130	120	147	97	110
Contingency (25%)	71	29	33	30	37	24	28
Total cost	**355**	**144**	**163**	**150**	**184**	**121**	**138**

6.4 Protection of Culvert Entries

It has been shown above that the existing culverts are generously sized provided they remain unblocked. Potential flood debris sources in the catchment include stream bank vegetation, and floatable material stored in the flood plain (e.g. timber, garden furniture, garden sheds, etc.). One non-habitable floor space will be put at risk through significant blockage of either the Milan Dr culverts or the West Coast Rd culverts. This risk can be reduced by constructing generous debris racks over the culvert inlets. Since the two culvert systems can still handle the 20% and 10% AEP flows respectively even with 50% blockage, such debris racks can be considered a lower priority.

6.5 Channel Clearing

Stream-bank vegetation clearance is an acknowledged means of controlling flood levels. Below West Coast Rd, for example, maintaining well-mowed channel banks will reduce the 1% AEP flood levels by approximately 200 mm. While hydraulically efficient, this is not consistent with water quality objectives as embodied in current ARC and WCC policies, which seek to promote integrated management of both stormwater quality and quantity. Channel clearing is contrary to WCC's preference for promoting native planting and ecological corridors along stream channels. Future development should be based on an assumption of native bush stream margins. Because of access difficulties above West Coast Rd it is not realistic to assume that a mown channel maintenance regime can be effected in any case.

The stream channel below West Coast Rd should be retained as an open channel after development. A planted riparian reserve of at least 60 m total width should be created along the stream margins.

6.6 Subcatchments E and F

Above West Coast Rd no dwellings are at risk from flooding but overland flows could be a nuisance and will need to be controlled. This could be done by either:

(i) upgrading the piped system to convey the 20% AEP flow and forming an overland flow path, or

(ii) constructing a pipe system capable of carrying the 1% AEP storm flow without overland flow, or

(iii) providing peak flow detention upstream.

Detention does not appear feasible above West Coast Rd since the gully shape would dictate a long, and relatively high dam, which would be visually unattractive and expensive. Option (i) will require a 750 mm dia pipe and a formed overland flow path across 456b West Coast Rd and down a shared concrete driveway. Option (ii) avoids the surface flow path but requires a 1050 mm dia pipe and a carefully designed inlet structure to ensure that all flow is captured into the pipe system. Options (i) and (ii) have been provisionally costed at $174,500 and $192,500 respectively.

Below West Coast Rd up to three school buildings may be at risk of flooding caused by backing up of floodwaters upstream of a driveway culvert. Ideally the driveway should be lowered by approximately 2.0 metres to provide permanent protection to the buildings, however this will necessitate long ramps, which will intrude into access roads and carparks at either end. A simplified pond-routing analysis was carried out to determine the culvert sizes necessary to eliminate flooding. Results of this analysis were as follows:

Culvert Configuration	Storm that can be conveyed without buildings flooding
Existing 1200 dia culvert with 720 mm orifice plate	20% AEP (ie 5 year ARI)
Existing 1200 dia culvert with orifice plate removed	2% AEP (ie 50 year ARI)
Existing 1200 dia culvert replaced with new 1350 mm dia	1% AEP (ie 100 year ARI)
Existing 1200 dia culvert with orifice plate removed, plus additional 450 dia	1% AEP (ie 100 year ARI)
Improved hydraulic conditions at pipe entry (e.g. 1500 pipe with gradual transition to 1200 mm pipe)	1% AEP (ie 100 year ARI)
Existing 1200 dia culvert with orifice plate removed, with contributing catchment reduced by diverting approximately 10 Ha of park drainage to discharge below driveway	1% AEP (ie 100 year ARI)

Among the above options that of improving the culvert inlet hydraulics is probably the most simple and cost-effective. If the existing culvert is extended upstream by one 1500 dia pipe length, a new head-wall installed and a gradual 1500 – 1200 taper created, the culvert should be capable of conveying 1% AEP flood flows. The pipe extension can be largely hidden from sight by re-grading the upstream batter. The above sizes will need to be confirmed by detailed design.

Note that measures to prevent pipe blockage by debris will also be required.

6.7 Seakens Way

Seakens Way is a relatively short, steep cul-de-sac off Sunvue Rd. Stormwater flows down the street channel to be picked up by two single cesspits in the cul-de-sac head. In heavy rainfall, and particularly when debris blocks the cesspit grates, water will pond and then run away over adjoining properties. Constructing additional cesspits or catchpit manholes to provide extra inlet capacity at the bottom of the cul-de-sac can eliminate this nuisance flooding relatively simply. If necessary overland flow can be diverted down the walkway to Brunner Rd by creating a small earth bund in the berm at the end of the cul-de-sac, a hotmix 'judder bar' across a private driveway, and a small nib wall down the walkway. Providing additional catchpit capacity will cost approximately $3,000, while overland flow diversion will cost a further $2,000.

7 Conclusions

Parrs Stream is generally capable of conveying present and future flood flows. The two major culvert structures at Milan Drive and West Coast Rd have sufficient capacity for the 1% AEP storm flow providing they remain unblocked, and fair capacity in the partially blocked condition[8]. Velocities are in the range where erosion is likely to become a problem and future channel stabilisation is likely to be necessary.

The stream channel has insufficient capacity where it passes alongside 424-426 West Coast Rd, and causes regular minor flooding. It is recommended that flood protection is provided to number 426 by constructing a flood wall around the rear and side of the property. A plan showing a possible arrangement is appended. The flood protection needs to be carried right through to link with the West Coast Rd embankment if the basement/garage is to be protected from the 1% AEP flood event.

This study has not defined a precise 1% AEP flood plain but provides guidance on the likely extent of flooding based on local knowledge, previous studies, field inspection and simple calculations.

This study did not address the issue of flood detention in the Oratia/Waikumete catchment at large, or the contribution of the Parrs Stream catchment to flooding in the larger system. The range of flows considered in this study are broadly consistent with those considered in the Oratia/Waikumete study (but note the discussion in section 3.1.3).

[8] Better than 20% AEP in the 50% blocked condition

8 Recommendations

1. That no new buildings shall be constructed in the 1% AEP (ie 100 year) flood plain unless they have been the subject of a specific flood investigation.

2. That new development in the catchment should, where practicable, incorporate 'low impact design' principles as per ARC technical publication TP124.

3. That new developments should incorporate stormwater management measures to restrict their post-development 50% AEP flows to their pre-development levels.

4. That all new buildings must be constructed at least 500 mm above the 1% AEP flood plain or the level of any downstream hydraulic control (eg 500 mm above the crest of any road embankment), whichever is higher.

5. In the absence of a detailed determination of 1% AEP flood levels, potential flood risk to new buildings should be minimised by ensuring they are constructed with floors as follows.

   Above West Coast Rd, at least:
   - 12 m removed from the centreline of the stream channel, and
   - 3.5 m above bed level

   Below West Coast Rd, at least:
   - 20 m removed from the centreline of the stream channel, and
   - 4.5 m above stream bed level.

6. That the house and property at number 426 West Coast Rd be protected from flooding by construction of a flood wall of up to 1.8 m high as illustrated in the plan appended.

7. That open channels in the catchment be monitored for channel erosion, and appropriate mitigation works implemented as and when necessary.

8. That prior to any further development in subcatchment E the capacity and condition of reticulation through the orchard upstream of West Coast Rd be investigated and upgraded as appropriate. As a minimum, additional manholes will need to be installed.

9. That piped stormwater reticulation be installed in Subcatchment E above West Coast Rd in conjunction with development of the remaining lots.

10. That the existing stormwater reticulation between 456b West Coast Rd and the existing pipe outlet below West Coast Rd be upgraded to convey the 1% AEP flow. This is expected to involve laying a new 1050 mm dia pipe together with an adequate inlet chamber.

11. That the second culvert below West Coast Rd adjacent to the wharekura be upgraded by installing a more hydraulically efficient pipe inlet structure and removing the existing orifice plate.

12. That pipe reticulation upgrading identified in the Henderson Creek South Catchment Study be implemented.

13. That the main stream channel below West Coast Rd be protected as a riparian reserve for an average width of 20 m each side. Existing ponds and wetland communities should be preserved and enhanced and additional riparian planting carried out.

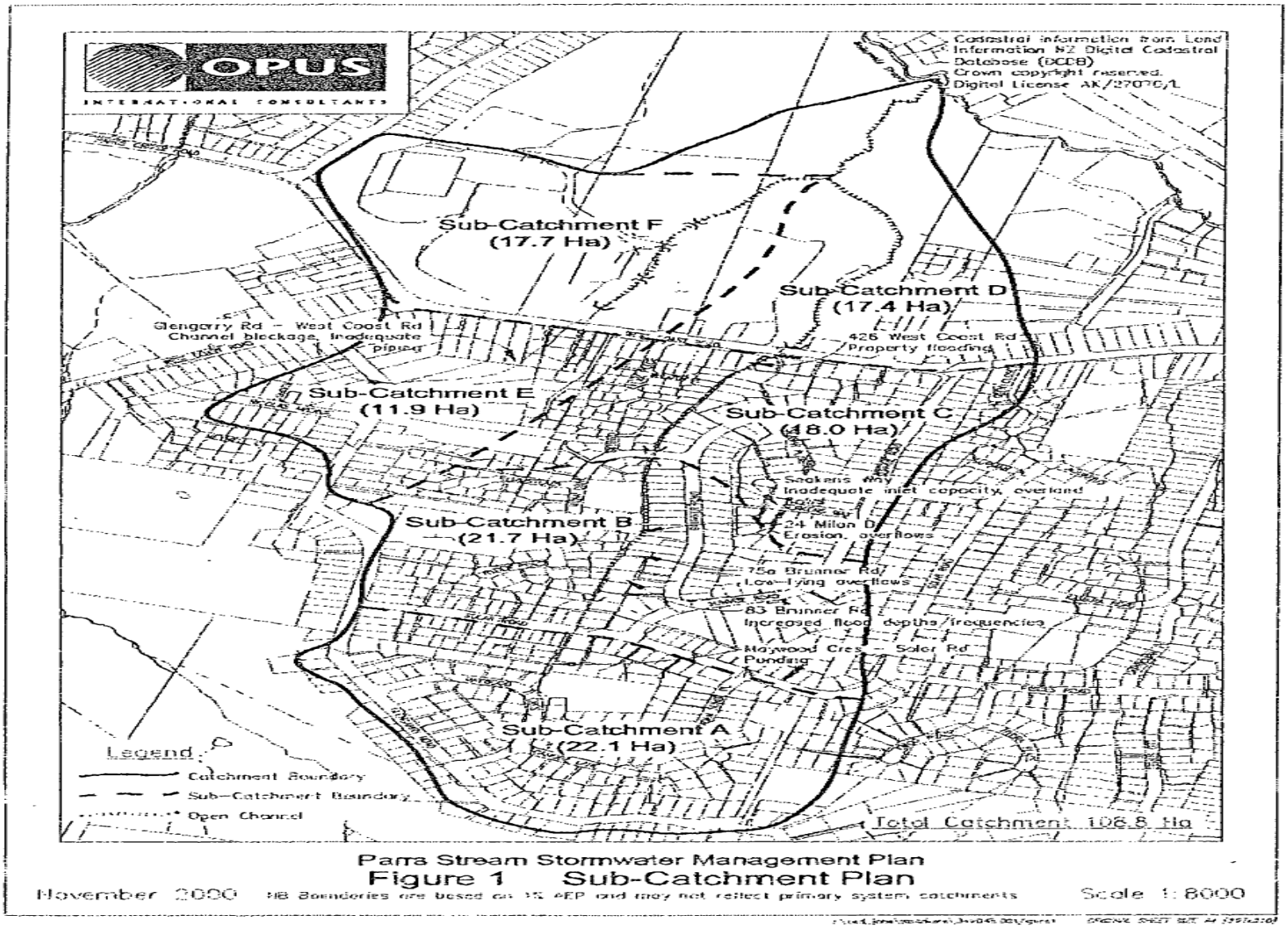
14. That stormwater treatment facilities be provided throughout the catchment according to the best practicable option. This will generally involve all new developments over 1.0 Ha incorporating a stormwater treatment device capable of 75% sediment removal (as per ARC Technical Publication No 10). In subcatchments E/F this is expected to include the construction of a treatment pond upstream of 456b West Coast Rd (and possibly also a further small pond adjacent to the wharekura). Undeveloped land draining to the main stream below West Coast Rd should be provided with suitable treatment devices at the time of development, and these should be configured to treat the maximum possible length of West Coast Rd. Source control and low-impact design techniques may be appropriate for smaller sites.

15. That prior to removal of accumulated solids from stormwater treatment devices the captured material should be analysed for the presence of a range of heavy metals (including arsenic), hydrocarbons (PAH and TPH), and organochlorines. The material should then be handled and disposed of appropriately according to the findings. This requirement arises due to the urban use of the catchment and the possibility of soil contamination from former land uses.

16. That Waitakere City Council investigate, and if appropriate implement, a financial contributions policy for the funding of stormwater upgrading in the catchment.

17. That additional pipe entry capacity be provided at the end of Seakens Way together with localised bunding and nib walls to divert any overland flow down the adjacent walkway.

Appendices



Parrs Stream Stormwater Management Plan

Figure 1 Sub-Catchment Plan

November 2000 NB Boundaries are based on 1% AEP and may not reflect primary system catchments Scale 1: 8000

Parrs Stream Catchment

TP 19 WORKSHEET

(Whenuapai +outlier) x 1.

CATCHMENT A (above Solar Rd)

% Impermeable	35.0%

Storm	Impervious		Pervious		Impervious		Pervious		Total A (ha)=	22.1
	Flow (cm/s)	Tc	Flow (cm/s)	Tc	"C"	"F"	"C"	"F"	Imp. Area=	7.735
20%	3.36	8.00	3.59	21.00	1.00	0.40	0.46	0.80	Perv. Area=	14.365
10%	4.03	8.00	4.43	20.00	1.00	0.40	0.48	0.80	Lc=	0.6
1%	6.29	8.00	7.21	17.00	1.00	0.45	0.50	0.80	Sc=	0.045

CATCHMENT A+B (above Milan Drive)

% Impermeable	35.0%

Storm	Impervious		Pervious		Impervious		Pervious		Total A (ha)=	43.8
	Flow (cm/s)	Tc	Flow (cm/s)	Tc	"C"	"F"	"C"	"F"	Imp. Area=	15.33
20%	6.25	12.00	6.05	33.00	1.00	0.40	0.46	0.80	Perv. Area=	28.47
10%	7.59	11.00	7.57	31.00	1.00	0.40	0.48	0.80	Lc=	1.05
1%	11.71	12.00	12.41	27.00	1.00	0.45	0.50	0.80	Sc=	0.032

CATCHMENT A+B+C (above West Coast Rd)

% Impermeable	35.0%

Storm	Impervious		Pervious		Impervious		Pervious		Total A (ha)=	61.8
	Flow (cm/s)	Tc	Flow (cm/s)	Tc	"C"	"F"	"C"	"F"	Imp. Area=	21.63
20%	8.19	15.00	7.89	42.00	1.00	0.40	0.46	0.80	Perv. Area=	40.17
10%	10.09	14.00	10.02	39.00	1.00	0.40	0.48	0.80	Lc=	1.35
1%	15.51	14.00	16.54	33.00	1.00	0.45	0.50	0.80	Sc=	0.025

CATCHMENT E

% Impermeable	35.0%

Storm	Impervious		Pervious		Impervious		Pervious		Total A (ha)=	11.9
	Flow (cm/s)	Tc	Flow (cm/s)	Tc	"C"	"F"	"C"	"F"	Imp. Area=	4.165
20%	1.69	12.00	1.63	34.00	1.00	0.40	0.46	0.80	Perv. Area=	7.735
10%	2.03	12.00	2.04	32.00	1.00	0.40	0.48	0.80	Lc=	0.65
1%	3.15	12.00	3.33	28.00	1.00	0.45	0.50	0.80	Sc=	0.025

CATCHMENT E + F

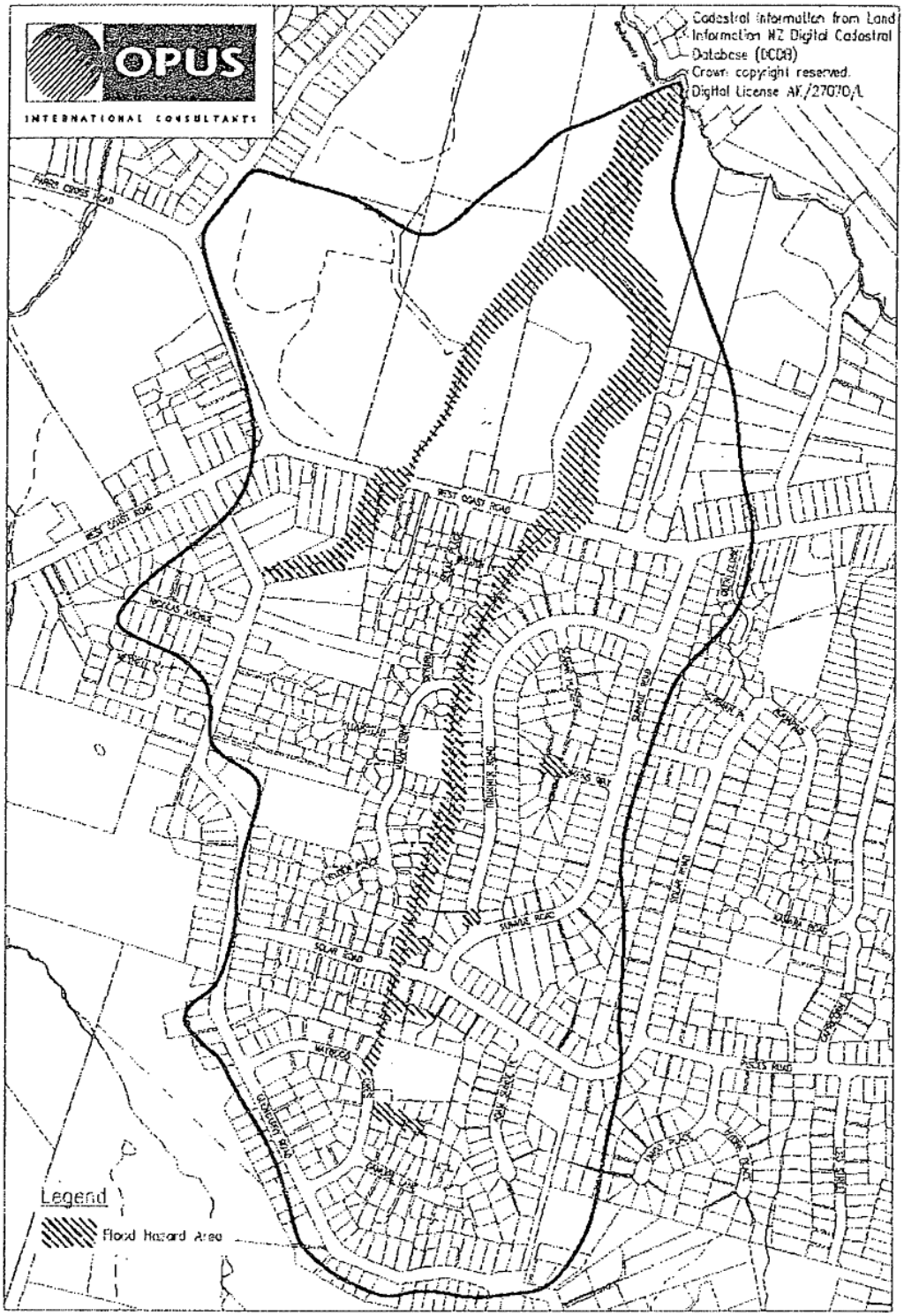
% Impermeable	15.0%

Storm	Impervious		Pervious		Impervious		Pervious		Total A (ha)=	29.6
	Flow (cm/s)	Tc	Flow (cm/s)	Tc	"C"	"F"	"C"	"F"	Imp. Area=	4.44
20%	2.47	16.00	3.12	43.00	1.00	0.40	0.46	0.80	Perv. Area=	25.16
10%	3.07	15.00	4.01	40.00	1.00	0.40	0.48	0.80	Lc=	1.1
1%	5.02	15.00	6.70	34.00	1.00	0.45	0.50	0.80	Sc=	0.025

CATCHMENT TO WAIKUMETE STREAM (A THRU F)

% Impermeable	30.0%

Storm	Impervious		Pervious		Impervious		Pervious		Total A (ha)=	108.8
	Flow (cm/s)	Tc	Flow (cm/s)	Tc	"C"	"F"	"C"	"F"	Imp. Area=	32.64
20%	11.12	22.00	10.99	62.00	1.00	0.40	0.46	0.80	Perv. Area=	76.16
10%	13.77	21.00	14.42	57.00	1.00	0.40	0.48	0.80	Lc=	2.2
1%	22.15	21.00	25.11	48.00	1.00	0.45	0.50	0.80	Sc=	0.02



Parrs Stream Stormwater Management Plan

Figure 2 Flood Hazard Map

November 2000

Scale 1:8000

Parrs Stream Catchment Stormwater and Flooding Questionnaire

June 1999

Please read this questionnaire carefully then answer the questions and post it back to us before 21 June 1999 in the freepost envelope provided.
NO POSTAGE STAMP IS REQUIRED

Ecowater* together with Opus International Consultants Ltd are presently studying flooding issues in the Parrs Stream catchment. We would like to hear about flooding problems affecting you, so that we can investigate them more fully, and look at ways of resolving them. You will be advised of progress and any proposals which eventuate.

Please answer the questions below as fully as possible, adding additional notes if necessary. Please include your name and address in your reply so that we can contact you for any additional information which may be necessary.

1. Please supply your name and contact details.
   (This will be used if we need to contact you for more information).

   Name: .....
   Address: .....
   .....
   Daytime Phone No: .....

2. Have you experienced any stormwater problems on or adjacent to your property? Yes/No

   If your answer to 2 was YES, please indicate (with an X) the location of the observed stormwater problems on the attached map, then proceed to 3.

   If your answer to 2 was NO, your response is ***still important to us***. Please proceed to question 6, complete the questionnaire and return it to us.

Definitions used in this questionnaire

Flooding	stormwater from a drain or stream which has overflowed its banks	**Groundwater**	water which seeps from the ground
Ponding	accumulation of stormwater and/or groundwater into major puddles	**Wastewater**	used water (sewage)
		Stormwater	water which has accumulated during a period of heavy rain

* Ecowater is the water and wastewater business unit of Waitakere City Council

3. What was the nature of the problem? Please tick (✓) the appropriate box.

		Up to 1 cm deep	Up to 5 cm deep	Greater than 5 cm deep
(a)	Overland flow across the property	☐	☐	☐
(b)	Ponding on the property	☐	☐	☐
(c)	Water has passed under dwelling	☐	☐	☐
(d)	Water has entered garages/sheds	☐	☐	☐
(e)	Water has entered the dwelling	☐	☐	☐

4. What frequency has the problem occurred? Please tick (✓) the appropriate box.

		More than once per year	Once per year	Once every 2-5 years	Less than once every 5 years
(a)	Overland flow	☐	☐	☐	☐
(b)	Ponding on the property	☐	☐	☐	☐
(c)	Water under dwelling	☐	☐	☐	☐
(d)	Water in garages/sheds	☐	☐	☐	☐
(e)	Water in dwelling	☐	☐	☐	☐

5. Do you have any photographs of stormwater flooding on your property that we can look at? Yes/No

6. Do you have any further comments regarding stormwater?

.....
.....
.....
.....
.....
.....
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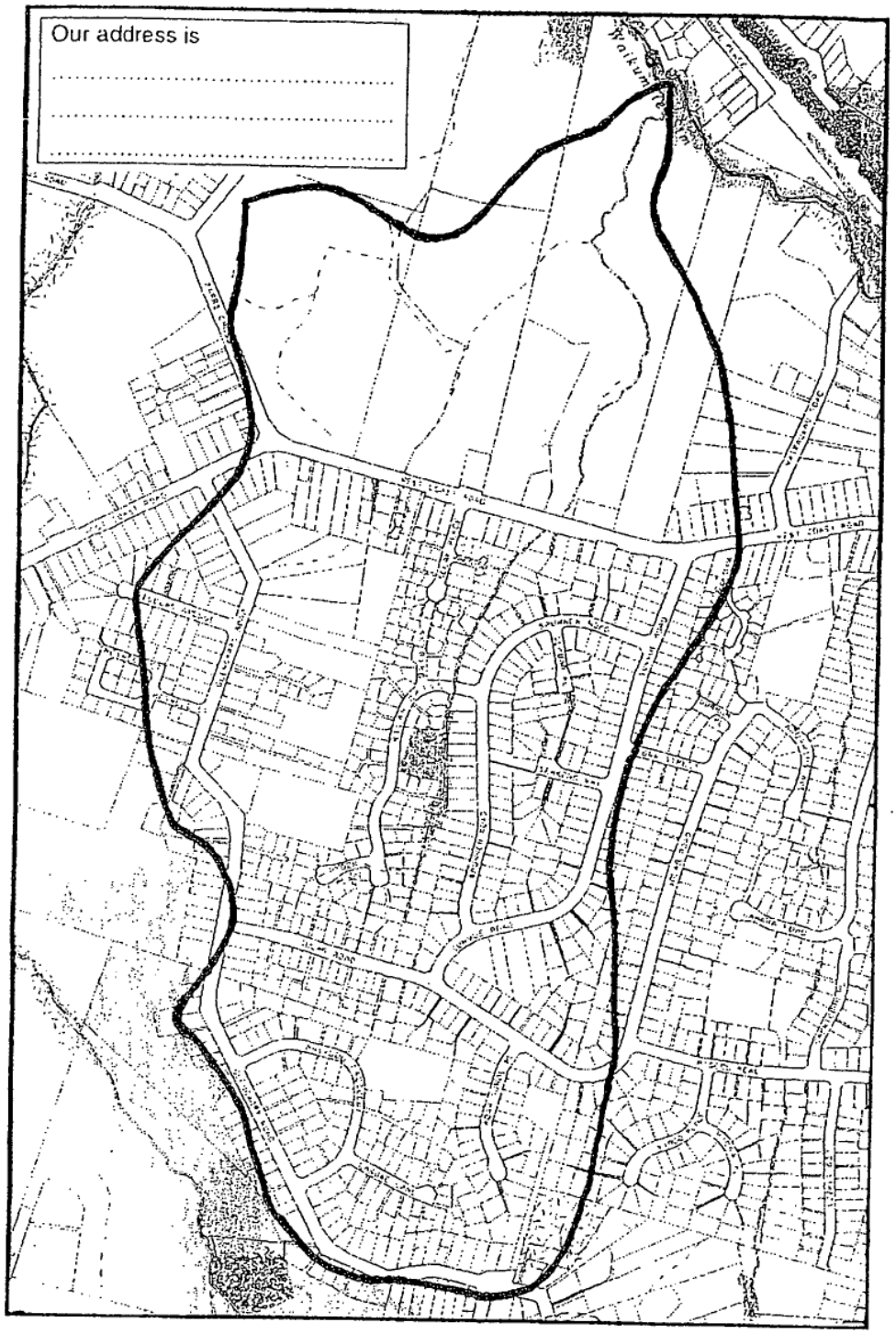
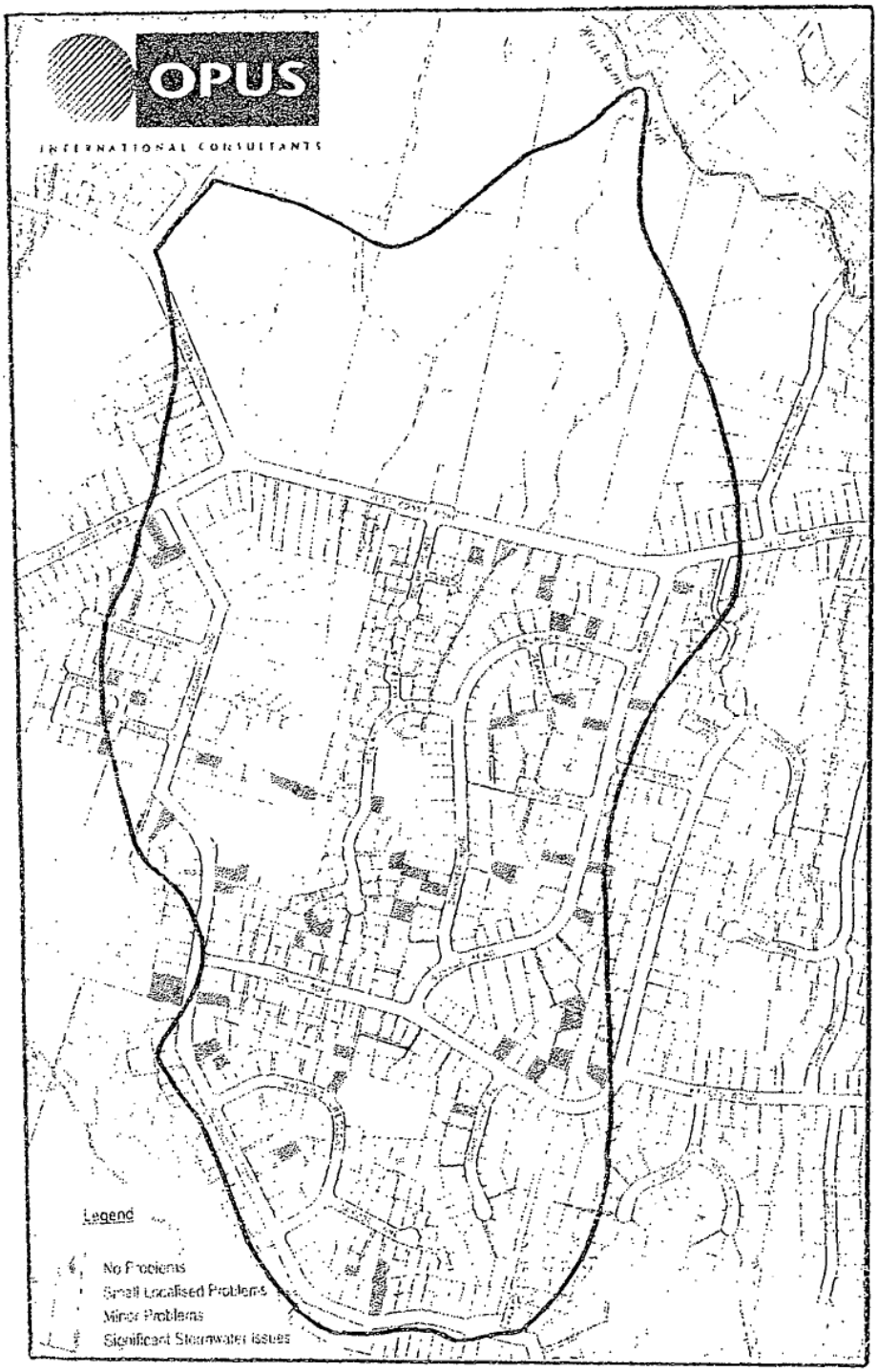
Thank you for taking the time to complete this questionnaire. The project team will use this information to identify stormwater problems and possible solutions. Please return it in the reply-paid envelope before 21 June 1999.

If you require any further information, please contact Annise Brumby at Opus International Consultants (phone 355 9578), and she will arrange for the appropriate person to contact you.

OPUS



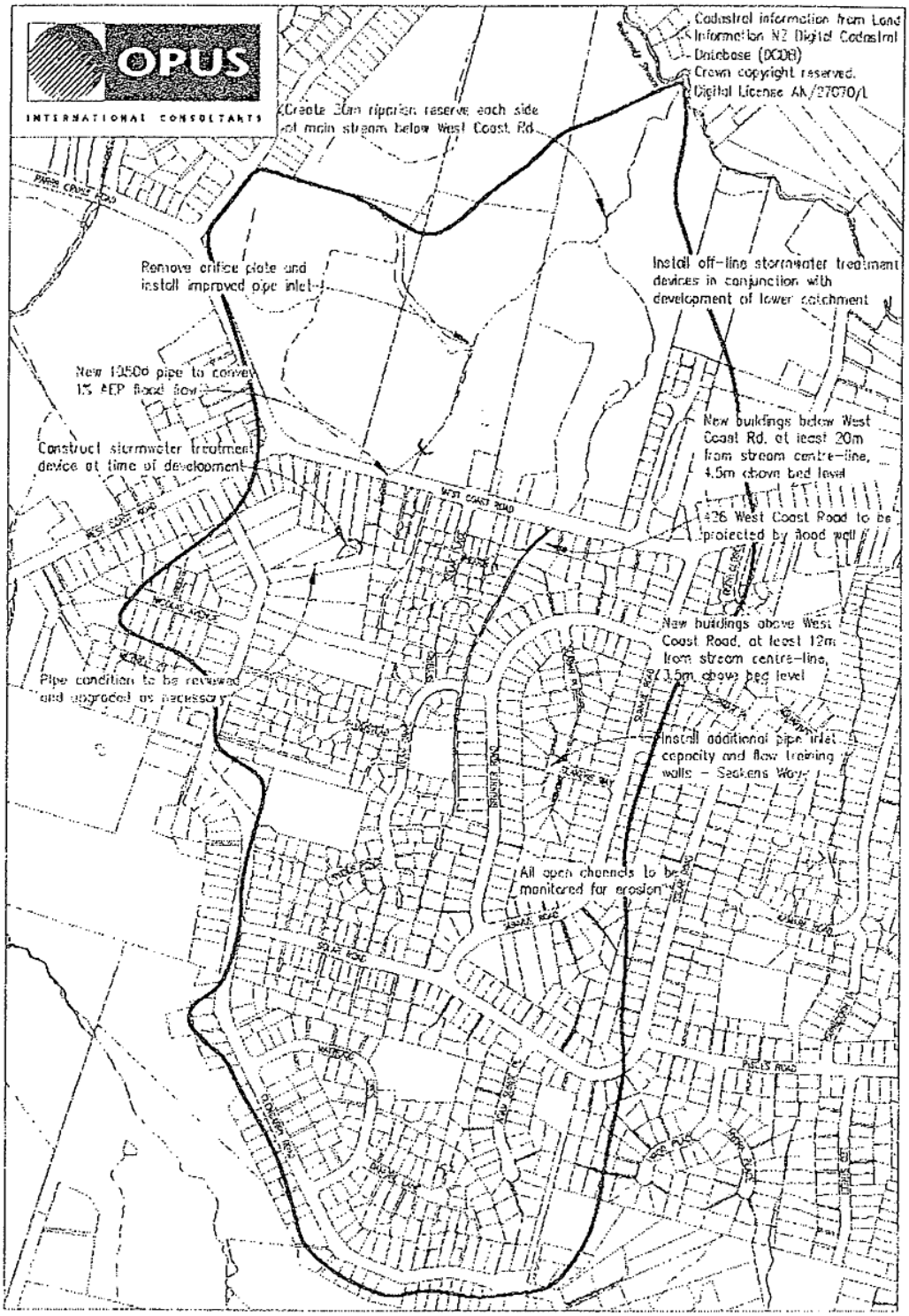
Parrs Stream Catchment



Parrs Stream Stormwater Management Plan

Figure 3 Stormwater Issues arising from Public Consultation

July 1999 Scale 1:8000



Parrs Stream Stormwater Management Plan

Figure 4 Summary of Proposed Upgrading Works

November 2000

Scale 1 8000

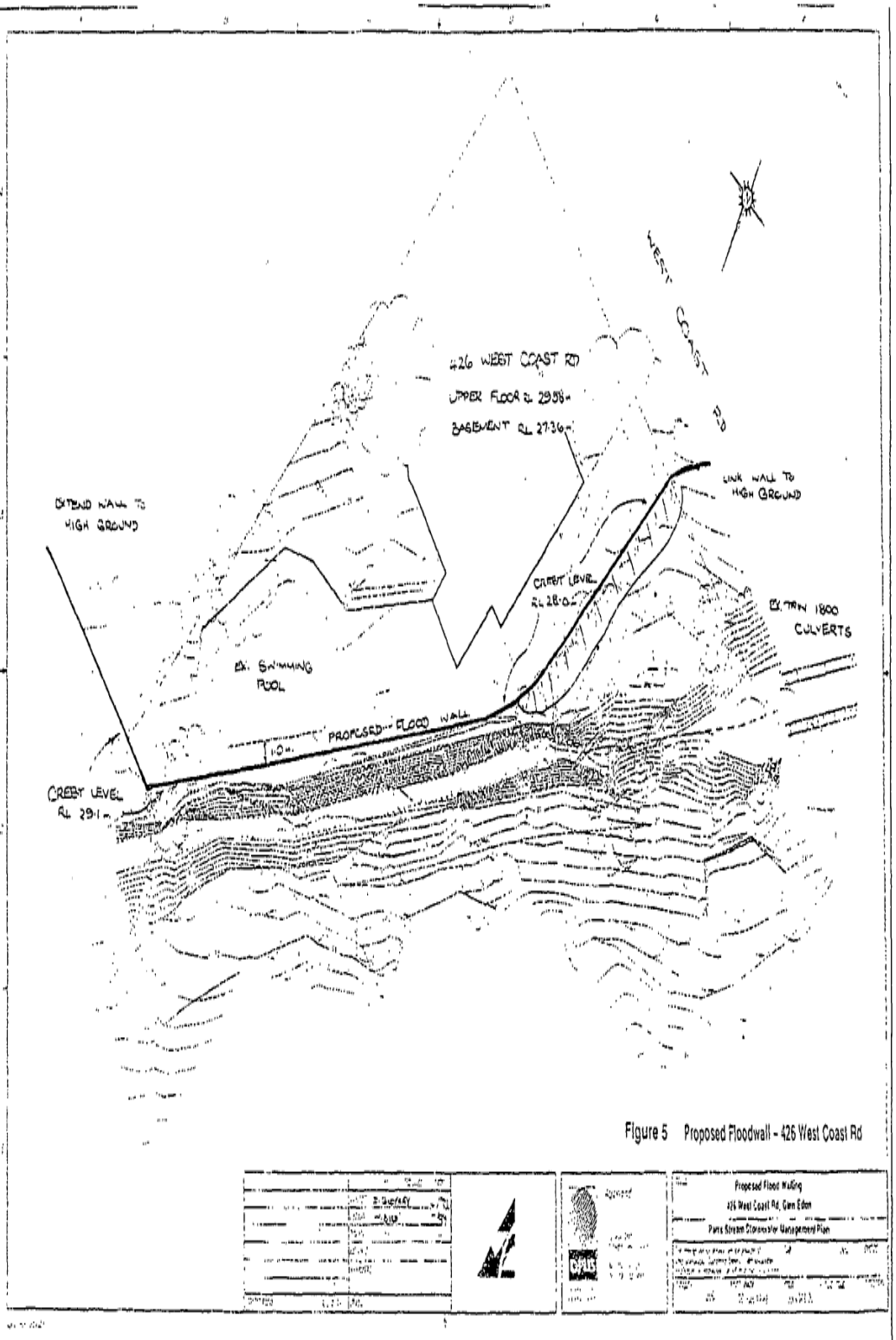


Figure 5 Proposed Floodwall - 426 West Coast Rd

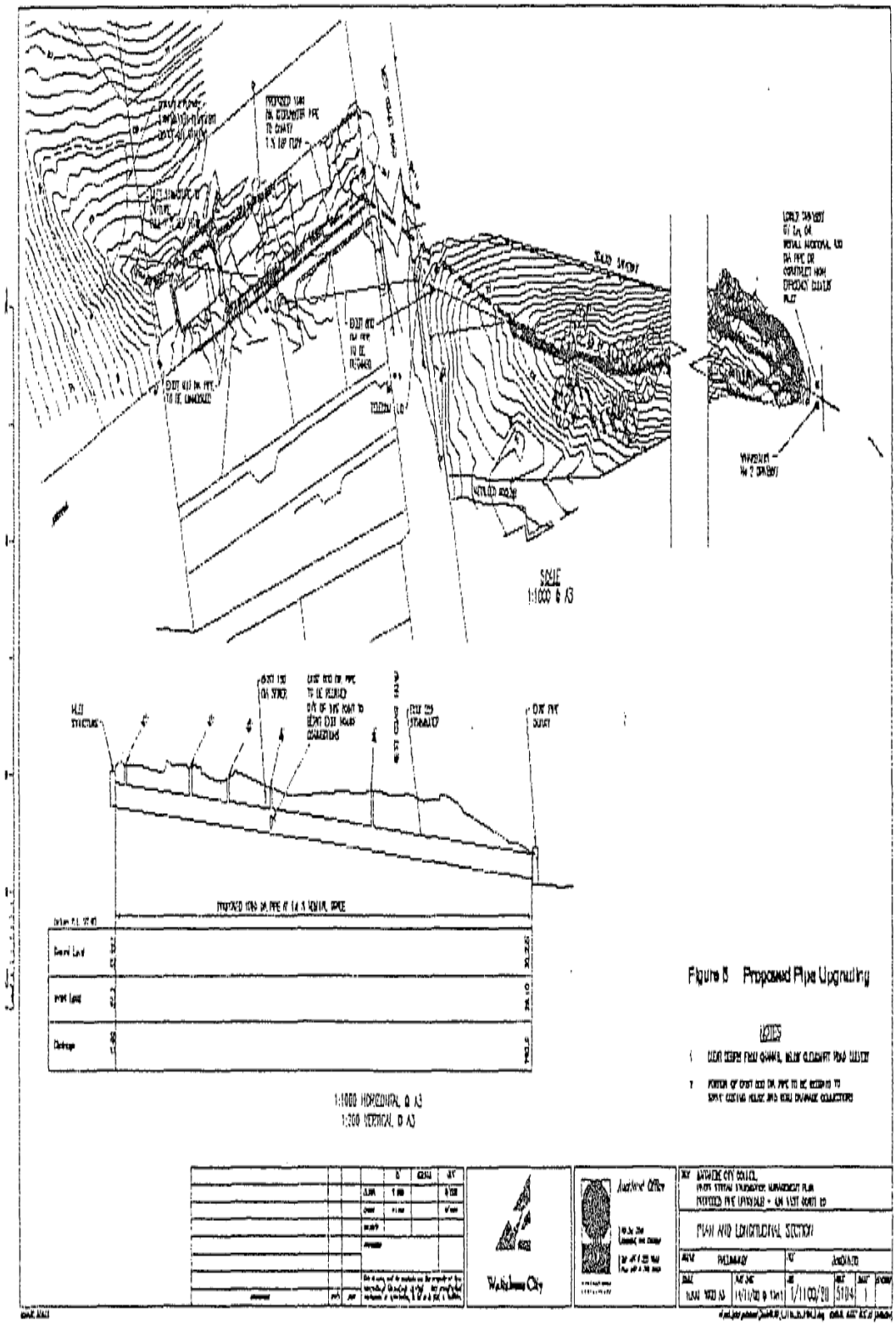


Figure 8 Proposed Pipe Upgrading

Appendix 10

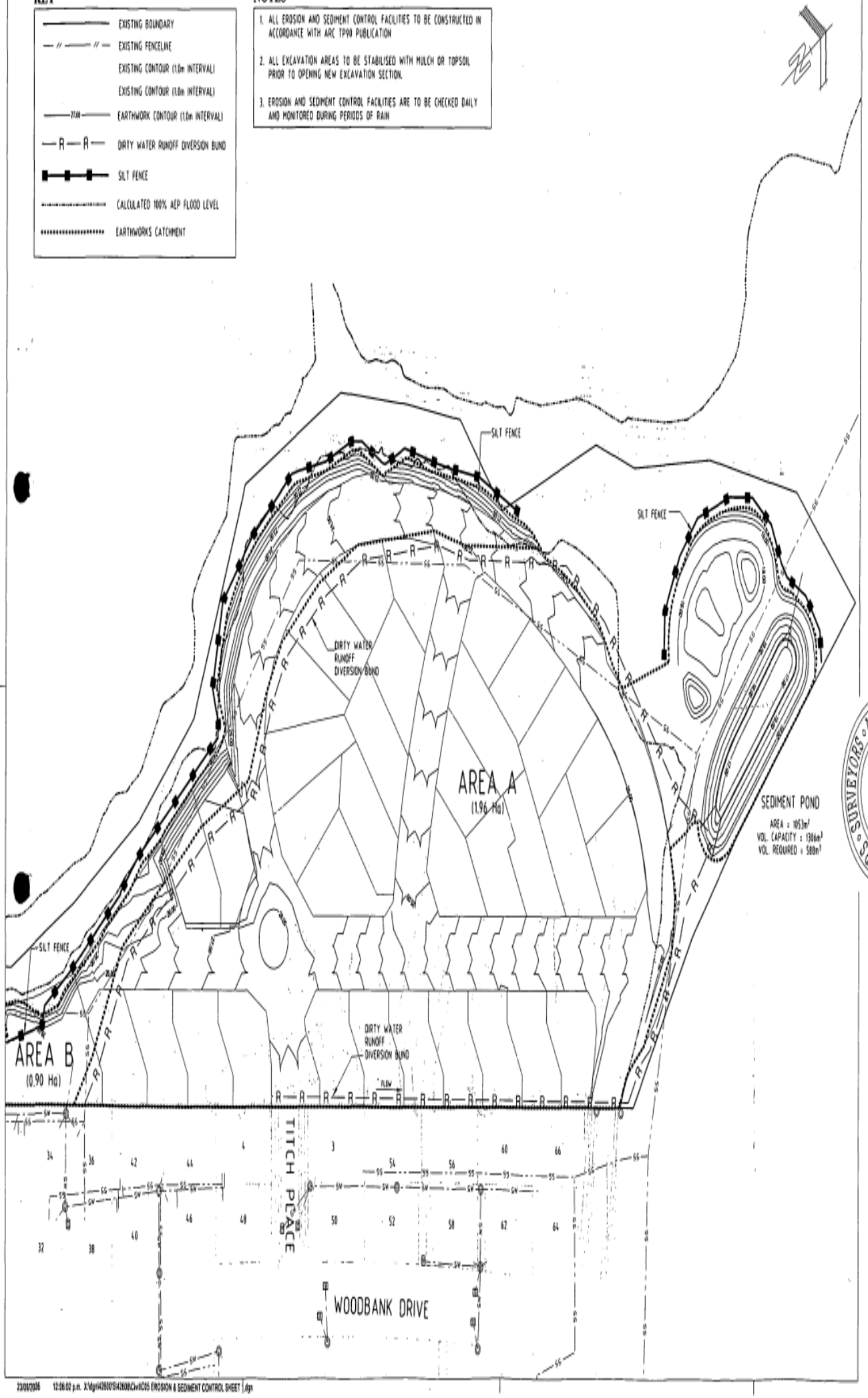
Erosion and Sediment Control

KEY

- EXISTING BOUNDARY
- EXISTING FENCELINE
- EXISTING CONTOUR (1.0m INTERVAL)
- EXISTING CONTOUR (1.0m INTERVAL)
- EARTHWORK CONTOUR (1.0m INTERVAL)
- DIRTY WATER RUNOFF DIVERSION BUND
- SILT FENCE
- CALCULATED 100% AEP FLOOD LEVEL
- EARTHWORKS CATCHMENT

NOTES

1. ALL EROSION AND SEDIMENT CONTROL FACILITIES TO BE CONSTRUCTED IN ACCORDANCE WITH ARC TP90 PUBLICATION
2. ALL EXCAVATION AREAS TO BE STABILISED WITH MULCH OR TOPSOIL PRIOR TO OPENING NEW EXCAVATION SECTION.
3. EROSION AND SEDIMENT CONTROL FACILITIES ARE TO BE CHECKED DAILY AND MONITORED DURING PERIODS OF RAIN



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DRAWING NOTES

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CLIENT / PROJECT

WEST COAST ROAD HOUSING DEVELOPMENT

FOR

NZ HOUSING FOUNDATION

DRAWING TITLE

EROSION & SEDIMENT CONTROL PLAN (SHEET 1)

	DATE	INITIAL
DESIGNED	JUNE 2006	GW
DRAWN	JUNE 2006	GW
CHECKED		
APPROVED	23/06/06	

SCALE (A1)

1:500

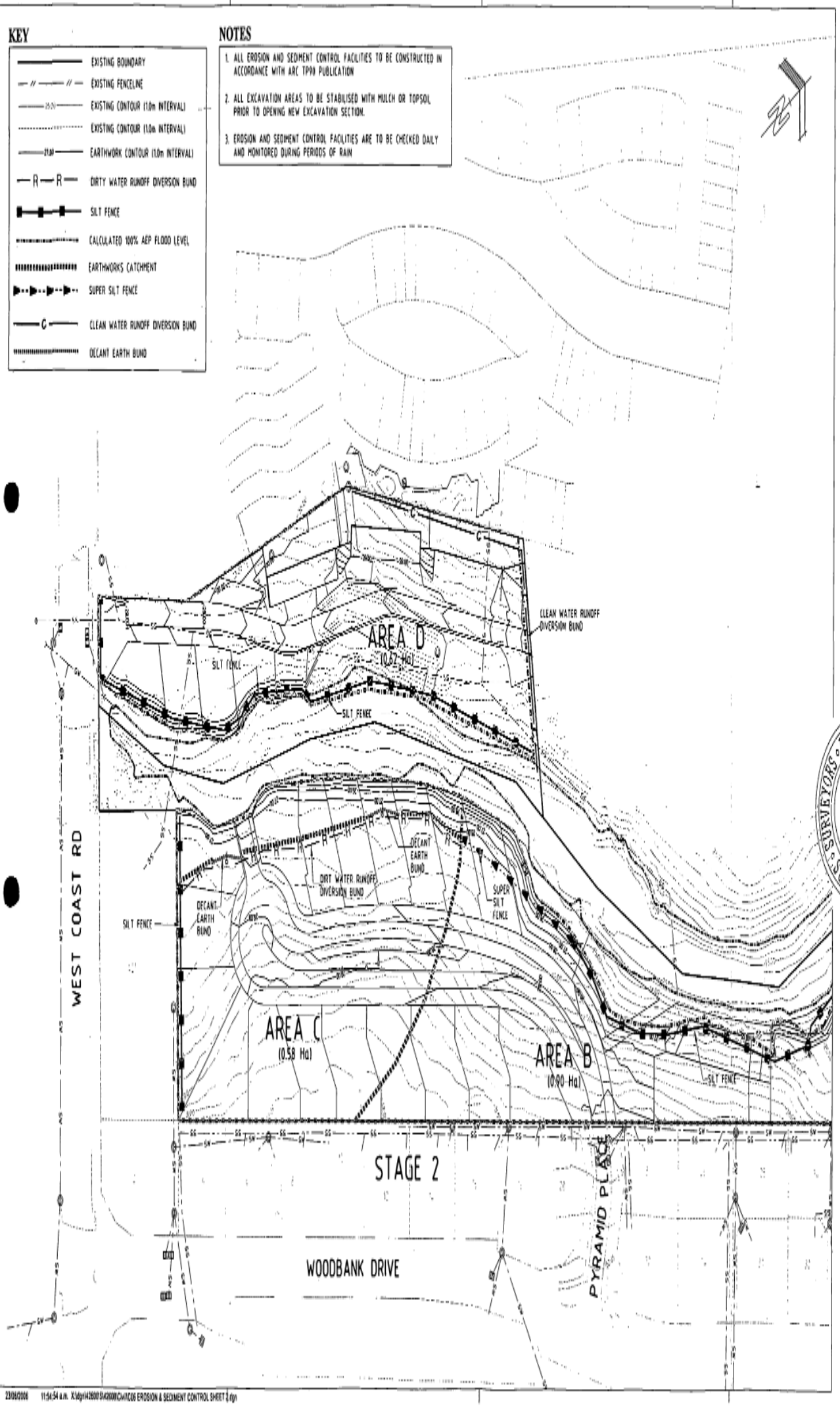
JOB NUMBER	DRAWING NUMBER	REVISION
42608	C05	-

KEY

- EXISTING BOUNDARY
- EXISTING FENCELINE
- EXISTING CONTOUR (1.0m INTERVAL)
- EXISTING CONTOUR (1.0m INTERVAL)
- EARTHWORK CONTOUR (1.0m INTERVAL)
- DIRTY WATER RUNOFF DIVERSION BUND
- SILT FENCE
- CALCULATED 100% AEP FLOOD LEVEL
- EARTHWORKS CATCHMENT
- SUPER SILT FENCE
- CLEAN WATER RUNOFF DIVERSION BUND
- DECANT EARTH BUND

NOTES

1. ALL EROSION AND SEDIMENT CONTROL FACILITIES TO BE CONSTRUCTED IN ACCORDANCE WITH ARC TP90 PUBLICATION
2. ALL EXCAVATION AREAS TO BE STABILISED WITH MULCH OR TOPSOIL PRIOR TO OPENING NEW EXCAVATION SECTION.
3. EROSION AND SEDIMENT CONTROL FACILITIES ARE TO BE CHECKED DAILY AND MONITORED DURING PERIODS OF RAIN



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CLIENT / PROJECT

WEST COAST ROAD HOUSING DEVELOPMENT

FOR

NZ HOUSING FOUNDATION

DRAWING TITLE

EROSION & SEDIMENT CONTROL PLAN (SHEET 2)

	DATE	INITIAL
DESIGNED		
DRAWN	JUNE 2006	GW
CHECKED	JUNE 2006	GW
APPROVED	23/06/06	TP

SCALE (A1)

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42608	C06	-

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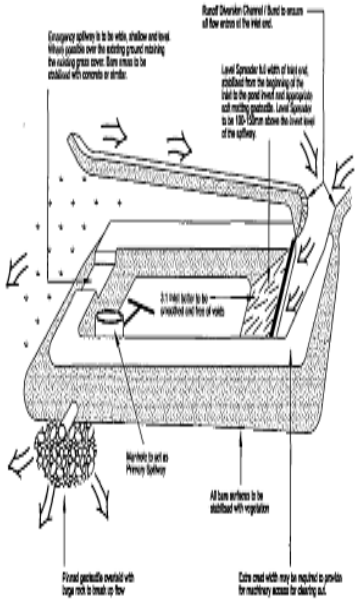
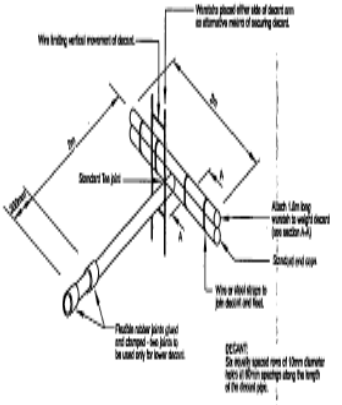
DRAWING NOTES

NOTES:

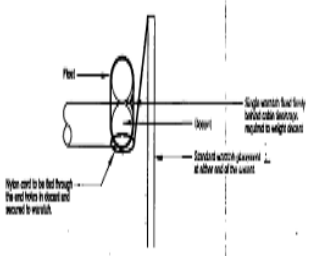
1. ALL EROSION AND SEDIMENT CONTROL MEASURES MUST BE OPERATIONAL PRIOR TO ANY OTHER WORKS COMMENCING ON SITE. THE CONTRACTOR SHALL ARRANGE AND ATTEND A PRELIMINARY SEDIMENT CONTROL MEETING WITH THE ENGINEER AND COUNCIL.
2. A COPY OF THE EROSION AND SEDIMENT CONTROL PLAN SHALL BE AVAILABLE ON SITE DURING WORK HOURS AND ALL PERSONNEL INVOLVED IN THE EARTHWORKS ACTIVITIES ON SITE INCLUSIVE OF SUB-CONTRACTORS) SHALL BE FAMILIAR WITH THE CONSENT AND PLAN REQUIREMENTS AS THE RELATE TO EROSION AND SEDIMENT CONTROL.
3. ALL "CLEAN WATER" RUNOFF FROM THE STABILISED SURFACES, INCLUDING CATCHMENT AREAS ABOVE THE SITE, SHALL BE DIVERTED AWAY FROM THE EARTHWORKS AREAS VIA A STABILISED SYSTEM, SO AS TO PREVENT EROSION.
4. ALL EROSION AND SEDIMENT CONTROL SHALL COMPLY WITH "EROSION AND SEDIMENT GUIDELINES FOR LAND DISTURBING ACTIVITIES: ARC TECHNICAL PUBLICATION No.88. UPDATED MARCH 1999 AND ANY AMENDMENTS TO THIS DOCUMENT. DIVERSION OF "CLEAN WATER" FROM THE UPSTREAM CATCHMENTS AROUND THE EARTHWORKS AREA SHALL BE BY MEANS OF DIVERSION DRAINS AND / OR OTHER APPROVED METHODS.
5. FURTHER SEDIMENT CONTROL WORKS MAY BE REQUIRED BY THE ENGINEER AS THE PROJECT ADVANCES. THESE WILL BE INSTALLED AS AND WHERE REQUIRED BY THE ENGINEER. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR ENSURING THAT THE SITE HAS EFFECTIVE SILT DETENTION FACILITIES OPERATING AT ALL TIMES.



SEDIMENT RETENTION POND



PERSPECTIVE VIEW



SECTION A - A
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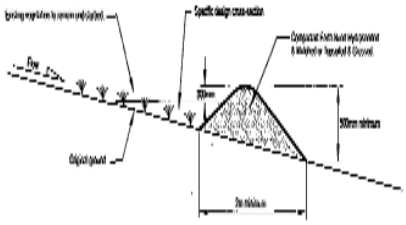
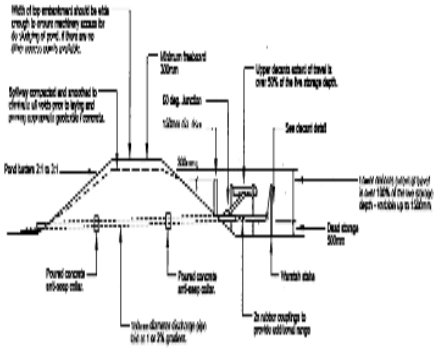


CLEANWATER RUNOFF DIVERSION BUND CROSS-SECTION



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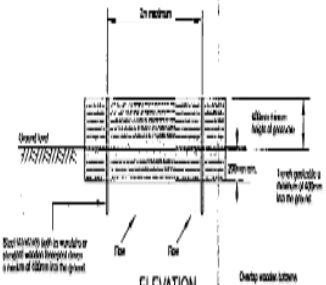
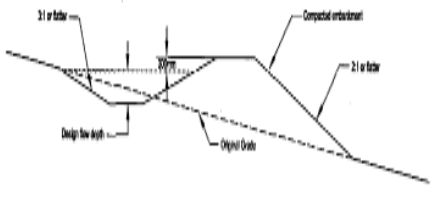


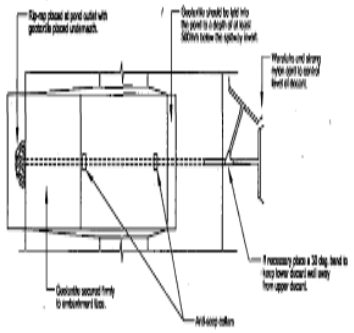
ELEVATION

CROSS SECTION

STANDARD FABRIC JOINT

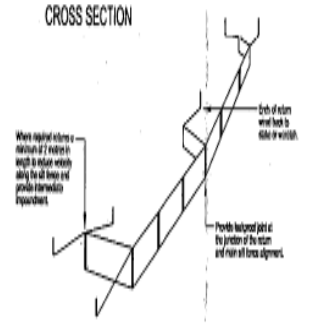


RUNOFF DIVERSION CHANNEL CROSS-SECTION



PLAN

SEDIMENT RETENTION POND
FOR CATCHMENTS BETWEEN 1.5 AND 3 ha



PERSPECTIVE VIEW

SILT FENCE DETAIL

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CLIENT / PROJECT

WEST COAST ROAD
HOUSING DEVELOPMENT

FOR

NZ HOUSING FOUNDATION

DRAWING TITLE

SEDIMENT CONTROL DETAILS

	DATE	INITIAL
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DRAWN	JUNE 2006	FK
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APPROVED	23/06/06	

SCALE (A1)

NTS

JOB NUMBER	DRAWING NUMBER	REVISION
42608	C07	-

Appendix 9

Traffic Assessment

Residential Development

423 – 429 West Coast Road, Henderson

TRANSPORTATION ASSESSMENT

June 2006

Traffic Design Group
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Phone : +64 9 302 0901
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8509ta

TRAFFIC DESIGN GROUP

Residential Development
423 – 429 West Coast Road,
Henderson

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Senior Traffic Engineer

Reviewed by:

Gary Vlieg
Associate

Approved for Issue by:

Gary Vlieg
Associate

Status: **Draft Report**

Date: **21 June 2006**

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RESIDENTIAL DEVELOPMENT
423 – 429 West Coast Road, Henderson

Transportation Assessment Report

1. INTRODUCTION

Traffic Design Group has been appointed by Babbage Consultants Limited to undertake a transportation assessment for a proposed residential development at 423 - 429 West Coast Road, Henderson.

The transportation planning issues relating to the application include:

- the level of vehicular traffic likely to be generated by the development;
- the adequacy and efficiency of the access and internal circulation provisions that are intended to serve the generated vehicular and pedestrian traffic;
- the ability of the proposed parking supply to meet the actual demand expected to be generated; and
- the ability to integrate the proposed development into the existing traffic environment without significant adverse effects.

These and other matters will be addressed in the following detail of this report.

By way of summary however, it has been found that the residential development can be established with less than minor impact on the surrounding road network in terms of function, capacity and safety.

2. EXISTING TRANSPORT NETWORK

2.1 Road Network

Figure 1 shows the location of the site within the road network hierarchy as defined in the Waitakere City Council Proposed District Plan, 2002.

As shown in the Figure the site is located north of West Coast Road between Albionvale Road and Woodbank Drive. In the vicinity of the site West Coast Road is classified as a District Arterial Road (changing to a Collector Road west of its intersection with Parrs Cross Road). The surrounding streets, Albionvale Road, Woodbank Road, Pyramid Place, and Titch Place are all classified as Local Roads.

2.2 Road Layout

Figure 2 is an aerial photograph showing the subject site and also the layouts of surrounding roads and intersections.

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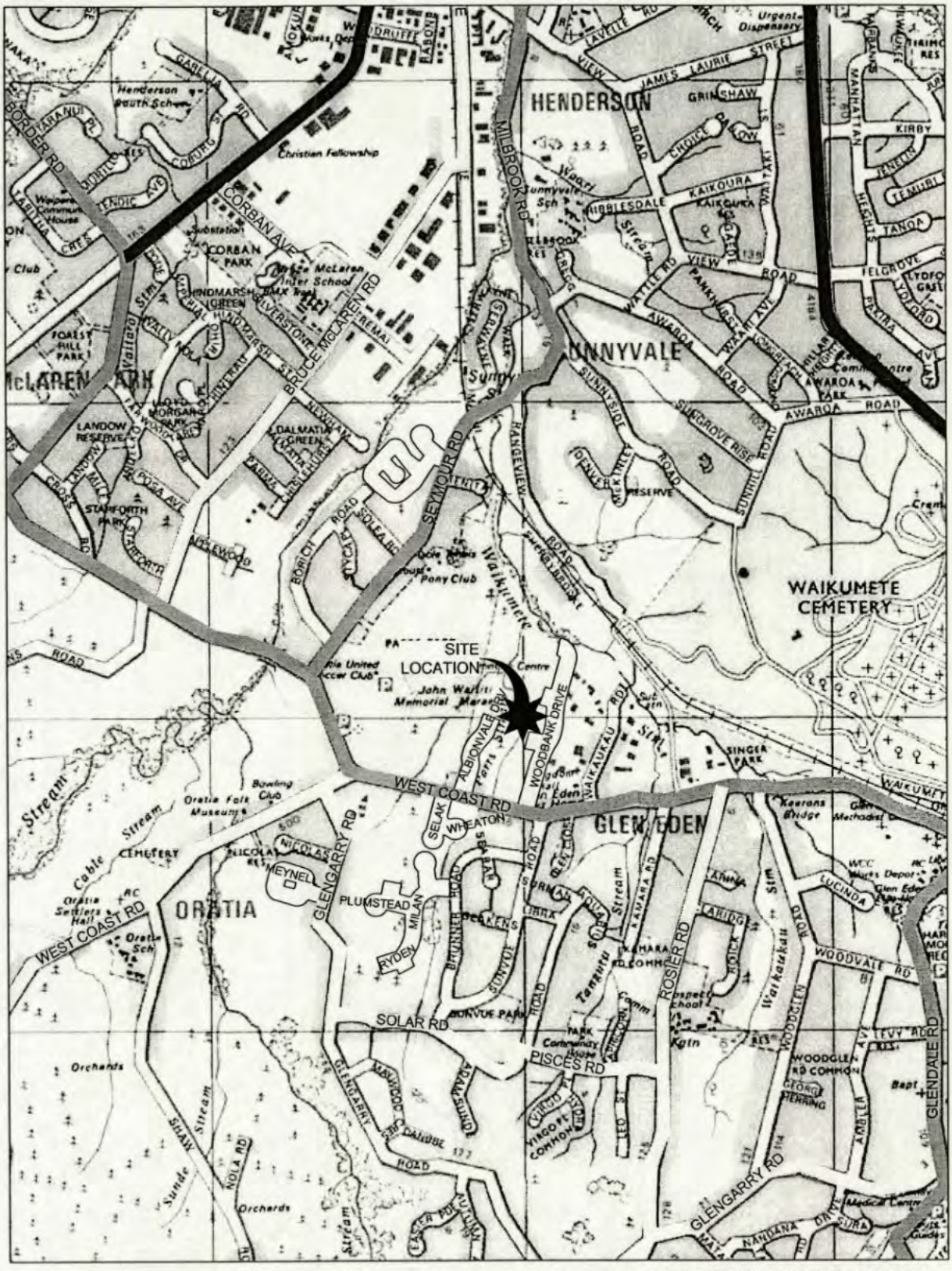


ROAD NETWORK

1

ISSUE.	DATE.	CHK.	REVISION.

PROJECT.

423-429 WEST COAST ROAD

RESIDENTIAL DEVELOPMENT

DRAWING.

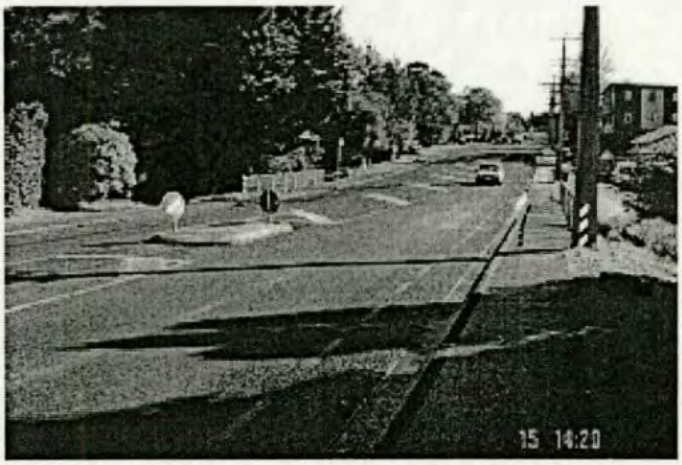
EXISTING LAYOUT

TRAFFIC DESIGN GROUP

2

DRN. ~	APP. ~	DATE. 13/9/18	DRAWING NO:
TDG. CTW	. Patrick Symth	ORIGINAL SIZE. A1	8509A2A-SHT3
CHK. ~	. Ref 30e-111-TDG	SCALE. 1:1000	

In the vicinity of the site, West Coast Road has a carriageway, measuring 12.6 metres in width, with a single traffic lane in both directions and a flush median which allows traffic to turn into side roads and driveways without affecting the main flow of traffic, as illustrated in Photograph 1. The carriageway is protected by a 'no stopping at all times' restriction on both sides of the road which ensures visibility is not restricted by parked vehicles. There is a raised central island with 'keep left' signs located some 13 metres east of the site frontage's eastern boundary. West Coast Road forms a three-arm roundabout intersection with Parrs Cross Road some 550 m to the west of the subject site, with two traffic lanes provided on each approach arm.



Photograph 1 : West Coast Road in the vicinity of the subject site

Woodbank Drive is a typical, cul-de-sac suburban street serving a number of residential properties. It has a carriageway width of 7.6 metres and parking is permitted on both sides. Pyramid Place and Titch Place each form short cul-de-sacs leading off Woodbank Drive serving a small number of residential properties.

Woodbank Drive forms a 'give way' priority intersection with West Coast Road, with a right turn lane provided within the flush median on West Coast Road and a pedestrian refuge provided on the Woodbank Drive approach. The Road and Traffic Standards (RTS) 6 document "Guidelines for Visibility at Driveways" provides minimum sight distance requirements for intersections. The document states a minimum sight distance requirement of 115 m for a high volume driveway onto an arterial with an operating speed of 60 km/hr. Operating speeds can be taken as the speed limit (50 km/hr) plus 15% if no speed survey data is available. Sight distances at the Woodbank Drive/West Coast Road intersection have been measured as 95m to the east and 150m to the west. These are illustrated in Photographs 2 and 3. Whilst visibility to the left is slightly below the requirements, it is considered adequate as westbound vehicle speeds on the frontage road are naturally reduced by a sharp bend in the road to the east of Woodbank Drive. The speed limit on all the roads in the vicinity of the site is 50km/h.

Photograph 2 : Sight distance looking west along West Coast Road

Photograph 3 : Sight distance looking east along West Coast Road

Sight distances were measured at the location of the proposed private access road off West Coast Road and were found to be in excess of 200m to the east and 167m to the west. These sight distances exceed the minimum requirements.

2.3 Traffic Flows

Traffic Design Group surveyed traffic volumes at the intersections of West Coast Road/Woodbank Drive and West Coast Road/Parrs Cross Road on Tuesday 16 May 2006. Volumes were recorded between the hours of 7.00 am to 9.00 am, 11.00am to 1.00 pm and 3.00 to 6.00 pm.

Based on the survey results it was determined that the morning peak hour occurred between 7.45 and 8.45 am and the evening peak hour occurred between 4.45 and 5.45 pm. The recorded peak hour volume for the two intersections are illustrated in Figure 3. Along West Coast Road the volume is highest eastbound in the morning peak, the reverse being true in the evening peak. The approximate two-way peak hour flows are given in Table 1 below.

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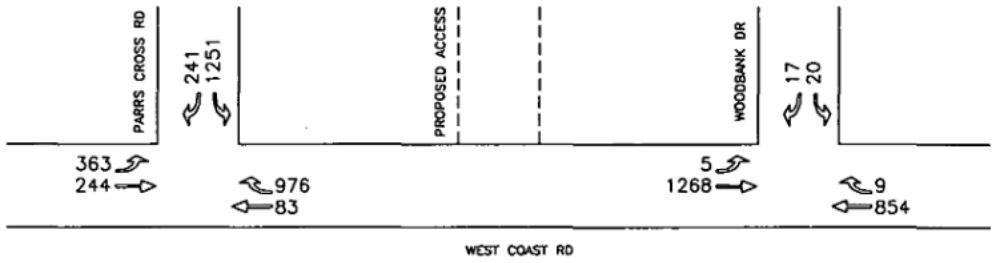
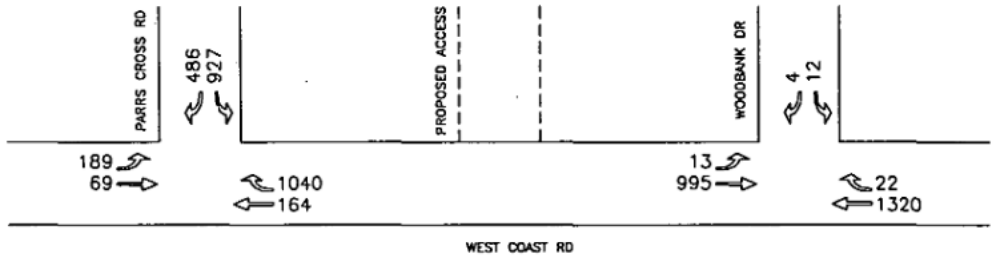


MORNING PEAK HOUR



EVENING PEAK HOUR

EXISTING TRAFFIC VOLUMES

	AM Peak Hour	PM Peak hour
Woodbank Drive	50	50
West Coast Road (west of Woodbank Drive)	2,150	2,300
Parrs Cross Road	2,850	2,650

Table 1 : Observed two-way traffic volumes (vehicles per hour)

Traffic volumes during the midday peak hour were found to be some 50% of the peak hour volumes.

No more than two vehicles at a time and generally no more than one vehicle at a time was observed queuing either to turn right into Woodbank Drive or to turn out of Woodbank Drive in either peak hour.

2.4 Road Safety

A search of the Land Transport New Zealand (LTNZ) Crash Analysis System (CAS) was carried out for all crashes occurring during the five-year period to December 2005 at the West Coast Road/Parrs Cross Road and West Coast Road/Woodbank Drive intersections, as well as along West Coast Road between these two intersections.

The search revealed the following:

- A total of 5 crashes occurred within 50m of the West Coast Road/Woodbank Drive intersection, all causing minor injuries
- A total of 22 crashes occurred within 50m of the West Coast Road/Parrs Cross Road roundabout, only 7 of which caused injury (6 minor and 1 serious)
- A total of 14 crashes occurred along West Coast Road, between Parrs Cross Road and Woodbank Drive, though just one caused injury (serious)

Whilst the number of crashes that occurred initially appears higher than would be expected, on closer inspection it is revealed that the majority of the crashes did not involve injury and of those that did the majority caused only minor injuries. Based on the above crash history, and several site visits, it is concluded there are no readily evident inherent road safety deficiencies in the area surrounding the subject site.

As will be detailed later in this report, the proposed development-generated traffic can be integrated into the existing traffic environment without compromising this road safety record.

2.5 Pedestrian and Cycle

In terms of pedestrian provision footpaths of adequate width are provided on both sides of all the surrounding roads. Additionally there is a pedestrian refuge on Woodbank Drive, at the intersection with West Coast Road, and dropped kerbs are provided on all arms of the Parrs Cross Road roundabout.

West Coast Road's wide carriageway and on-street parking prohibition is of benefit to cyclists.

2.6 Public Transport Provision

The development site lies adjacent to West Coast Road, an arterial route that is well served by public transport. Frequent services run along West Coast Road between Henderson and Downtown Auckland, including the 15F flyer service, with two services an hour throughout the day (with additional services in the peak hours). Bus stops are located on West Coast Road, directly adjacent to the development site, with the city centre-bound bus stop being provided with a bus shelter and seating.

The Auckland Regional Transport Authority (ARTA) document 'Draft Passenger Network Plan' (April 2006) states "at least 70% of all residents and employees should be within 800m of a Rapid Transit Network or Quality Transit Network". A proposed footbridge connection between the development and the residential development under construction on Albionvale Road will put Sunnyvale railway station about a one kilometre walk from the site, via Parrs Park. Further, both Sunnyvale and Glen Eden stations are within an easy cycle ride of the site.

3. PROPOSED DEVELOPMENT

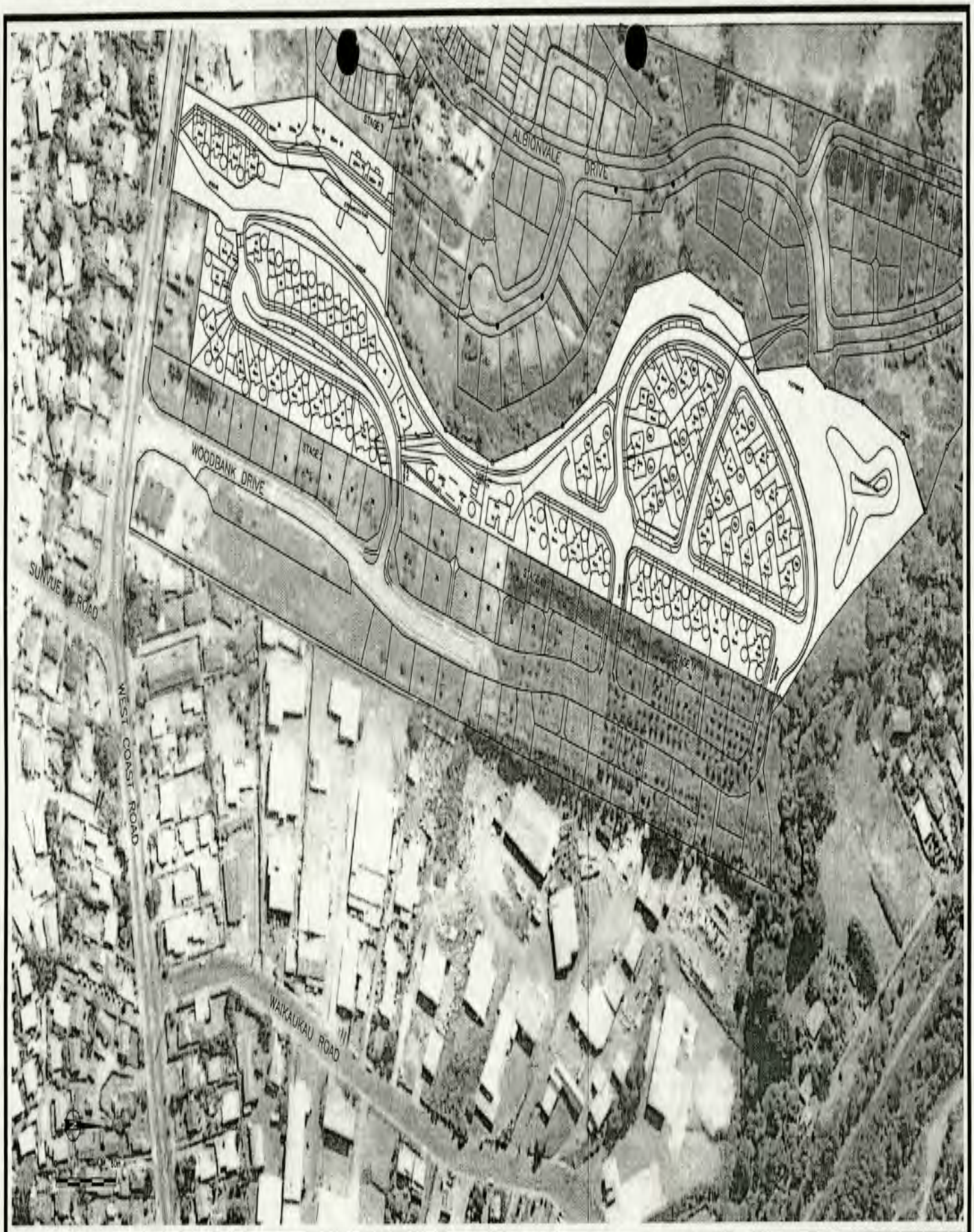
New Zealand Housing Foundation is proposing a medium density residential development consisting of 77 dwellings with associated roading and ranging in size from 2 to 5 bedrooms to be constructed on undeveloped land. Table 2 below summarises the composition of the proposed development in terms of dwelling unit type.

Dwelling type	Number of dwellings
2 bedroom house with single carport	4
2 bedroom apartment with carport	18
3 bedroom house with single garage	13
4 bedroom house with double garage	28
4 bedroom house with single garage	6
5 bedroom house with double garage	8
TOTAL	**77**

Table 2 : Proposed Development

Figure 4 illustrates the proposed housing, roading layout and development staging:

- Stage 1, consisting of 35 houses, will be served by a new road network extending from Titch Place and the end of Woodbank Drive.
- Stage 2, consisting of 20 houses and 4 apartments, will be served by a new road forming an extension to Pyramid Place.
- Stage 3, consisting of 4 houses and 14 apartments, will be served by a new private access road directly off West Coast Road, between Albionvale Road and Woodbank Drive.



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PROJECT.

423-429 WEST COAST ROAD

RESIDENTIAL DEVELOPMENT

DRAWING.

PROPOSED SITE LAYOUT

TRAFFIC DESIGN GROUP

4

DRN. –	APP. –	DATE. 1999	DRAWING NO:
TCD. CTW	. Relevant Symbol	ORIGINAL SIZE. A1	8509A2A-SHT1
CHK. –	. Ref Site-Y11-TCD	SCALE. 1:1000	

4. TRAFFIC EFFECTS

4.1 Trip Generation and Distribution

The trip generating potential of the proposed subdivision has been estimated using the trip generation rates given in Section 3.0, Table 5.7 of the Waitakere City Council document 'Code of Practice for City Infrastructure & Land Development: Engineering Standards Manual'. For medium density housing the table gives the traffic generation rates per dwelling shown in Table 3 below.

	AM Peak		PM Peak	
	In	Out	In	Out
1 to 2 bedrooms	0.10	0.40	0.30	0.20
Over 2 bedrooms	0.10	0.50	0.35	0.25

Table 3 : Traffic generation rates per dwelling

The above rates were found to be comparable to the rates given within the Roads and Traffic Authority (RTA) of New South Wales (NSW) document "Guide to Traffic Generating Developments". Applying the generation rates in Table 3 to the proposed development yields the vehicle generation illustrated in Table 4 below.

	AM Peak		PM Peak	
	In	Out	In	Out
1 to 2 bedrooms	2	9	7	4
Over 2 bedrooms	6	28	19	14
Total	**8**	**37**	**26**	**18**

Table 4 : Predicted traffic generation

Table 4 indicates that a total of 45 trips are predicted to be generated by the proposed development in the AM peak hour and 44 trips in the PM peak hour.

It has been assumed that the development-associated traffic will distribute onto the surrounding road network as per the existing intersection turning movements. Figure 5 thus shows the predicted site generated traffic movements at the Woodbank Drive/West Coast Road and West Coast Road/Parrs Cross Road intersections. It is noted that the traffic that will ingress and egress the new private access has been assumed to distribute as per the turning movements for the adjacent Woodbank Drive/West Coast Road and that none of this traffic will enter or exit Woodbank Drive, but instead will continue along West Coast Road.

4.2 Intersection Assessment

The effect of the additional 45 trips will be most evident at the intersections of West Coast Road/Woodbank Drive and West Coast Road/ Parrs Cross Road. These two intersections have therefore been assessed using the aaSIDRA analysis programme.

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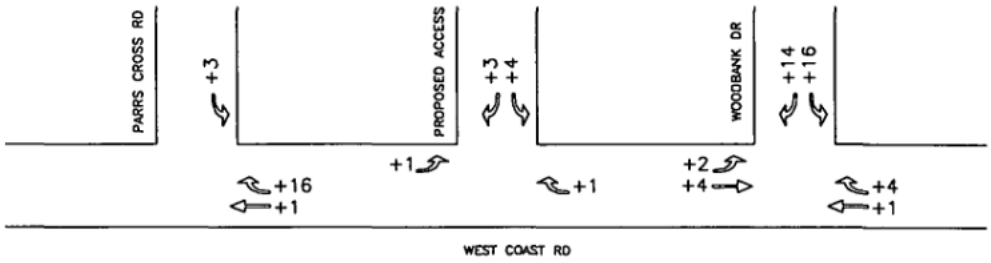
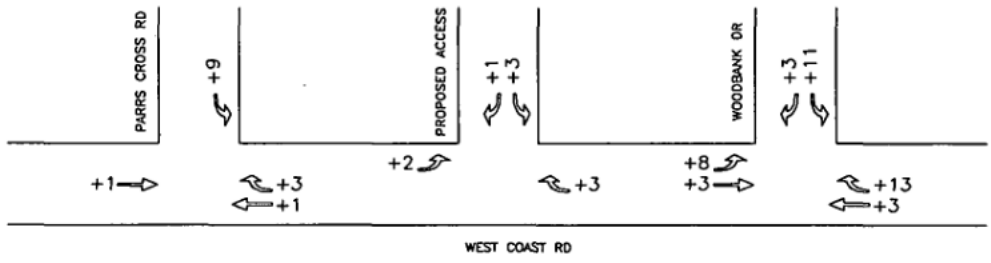


MORNING PEAK HOUR



EVENING PEAK HOUR

The West Coast Road/Woodbank Drive intersection was modelled as a 'give-way' priority intersection. Based on observations the West Coast Road eastbound approach was modelled as a full through lane with a 6m left turn lane, as through traffic was observed to overtake left turning vehicles. The westbound approach was modelled as a full through lane and a full right turn lane, as traffic was observed to manoeuvre fully into the flush median before turning right. The Woodbank Drive approach was modelled as one lane allowing left and right turn movements. The model was calibrated to reflect observed queue lengths.

The West Coast Road/Parrs Cross Road intersection was modelled as a roundabout with three approaches. The Parrs Cross Road approach was modelled as one through lane and one lane for through and right turn manoeuvres, as observed on site. The West Coast Road westbound approach was modelled as one through lane and one lane for through and left turn manoeuvres. The West Coast Road eastbound approach was modelled with one left turn lane and one right turn lane.

A comparison of the SIDRA results for existing traffic volumes and existing plus development traffic volumes at the two intersections is summarised in Tables 5 and 6 below. Full aaSIDRA results are provided in Appendix A.

Approach / Movement		Max Degree of Saturation		Average Delay (secs/veh)		Max. 95th%ile Queue (veh)	
		Base	Base + development	Base	Base + development	Base	Base + development
AM peak							
West Coast Rd	Through	0.23	0.23	0	0	0	0
Westbound	Right Turn	0.08	0.13	37	38	0	0
Woodbank	Left Turn	0.34	0.63	43	59	1	3
Road	Right turn	0.34	0.64	43	59	1	3
West Coast Rd	Left Turn	0.01	0.02	6	7	0	0
Eastbound	Through	0.70	0.70	0	0	0	0
All movements		0.70	0.70	1	3	-	-
PM peak							
West Coast Rd	Through	0.36	0.36	0	0	0	0
Westbound	Right Turn	0.08	0.13	18	18	0	1
Woodbank	Left Turn	0.09	0.16	23	24	0	1
Road	Right turn	0.09	0.16	23	24	0	1
West Coast Rd	Left Turn	0.03	0.05	7	7	0	0
Eastbound	Through	0.54	0.54	0	0	0	0
All movements		0.54	0.54	1	1	-	-

Table 5 : Woodbank Drive/West Coast Road - aaSIDRA Results

Approach / Movement		Max Degree of Saturation		Average Delay (secs/veh)		Max. 95th%ile Queue (veh)	
		Base	Base + development	Base	Base + development	Base	Base + development
AM peak							
Parrs Cross	Through	0.74	0.75	11	11	13	13
Road	Right Turn	0.74	0.75	16	16	13	13
West Coast Rd	Left Turn	0.60	0.61	15	15	6	6
Eastbound	Right Turn	0.51	0.51	19	19	4	4
West Coast Rd	Left Turn	0.53	0.53	10	10	6	6
Westbound	Through	0.53	0.53	9	9	6	6
All movements		0.74	0.75	12	12	-	-
PM Peak							
Parrs Cross	Through	0.54	0.55	7	7	7	7
Road	Right Turn	0.54	0.55	12	12	7	7
West Coast Rd	Left Turn	0.36	0.36	12	12	3	3
Eastbound	Right Turn	0.20	0.21	18	18	1	1
West Coast Rd	Left Turn	0.73	0.73	16	16	11	11
Westbound	Through	0.73	0.73	15	15	11	11
All movements		0.73	0.73	12	12	-	-

Table 6 : West Coast Road/Parrs Cross Road - aaSIDRA Results

As shown in the tables above, the effect of the proposed development-associated additional traffic on the capacity of the Woodbank Drive/West Coast Road and West Coast Road/Parrs Wood Road intersections will be minor.

At the Woodbank Drive/West Coast Road intersection the longest average delay per vehicle will increase from 43 to 59 seconds on the Woodbank Drive approach with the addition of development-associated traffic. At the West Coast Road/Parrs Cross Road intersection the average delay per vehicle will remain the same on all approaches with the addition of development-associated traffic.

The proposed private access road has not been modelled but given the low number of small apartments and houses that will be accessed from it no operational difficulties are envisaged.

5. PARKING

5.1 Parking Requirements

Waitakere City Council's 'Parking and Driveway Guideline' provides car parking ratios for specific activities. The requirements for medium density residential developments are summarised in Table 7 below.

Number of bedrooms	Parking spaces required
1 to 2	1 per 1 unit plus 1 per 4 units for visitors
3 or more	3 per 2 units plus 1 per 3 units for visitors

Table 7 : City Council Parking Requirements for Medium Density Housing

5.1.1 Resident parking

The proposed development will consist of 22 units with 1 or 2 bedrooms and 55 units with 3 or more bedrooms. Applying the ratios shown in Table 7 to the proposed development gives a minimum dedicated resident parking requirement of 105 spaces.

5.1.2 Visitor parking

The new development is not self contained, with the three stages, or areas, of the development to be served by roads that are not interlinked but instead link to the existing road network. It is reasonable to assume that visitors will wish to park in the area they are visiting and visitor parking should be provided accordingly. The visitor parking requirements for each development stage is thus shown in Table 8 below.

Development Stage	Development content	Visitor parking requirement (by stage)
Stage 1	35 x 3 or more bedroom units	12
Stage 2	4 x 2 bedroom units and 20 x 3 or more bedroom units	8
Stage 3	18 x 1 or 2 bedroom units	5
Total		**25**

Table 8 : Visitor parking requirements

5.2 Parking Provision

A total of 220 dedicated resident parking spaces are to be provided within the development consisting of carports, garages, and driveways in front of garages. A single garage and its associated driveway has been counted as two parking spaces. This is considered appropriate as the spaces are dedicated and will therefore both be used by the same resident.

The apartments will be provided with parking spaces at a ratio of between 1.3 and 2 per dwelling. The two and three bedroom houses will be provided with 2 parking spaces (a single garage or carport and driveway). The majority of the three, four and five bedroom houses will be provided with 4 parking

spaces (a double garage and double driveway), with the exception of four of the four bedroom houses which will have 2 parking spaces (a single garage and driveway).

The proposed visitor parking provision for each stage of the development is shown in Table 9.

Development stage	Proposed visitor parking provision (by stage)
Stage 1	21
Stage 2	13
Stage 3	6
Total	**40**

Table 9 : Visitor parking provision

The visitor parking is to be provided as in-dented, on-street parking bays situated at various locations and grouped to ensure that they remain a pooled resource, available to visitors in general on a first-come, first-served basis.

5.3 Parking Summary

It can be seen that dedicated resident and visitor parking will be provided in excess of minimum requirements outlined in the District Plan. This will help ensure that over-spill parking onto the streets need not occur.

6. ROAD LAYOUT

An internal network of roads will be constructed to serve the proposed development:

- Access driveway off West Coast Road
- Road extension of Pyramid Place
- Road extension of Titch Place and Woodbank Drive forming a circular route with additional connecting roads

The access driveway off West Coast Road will remain private, whilst the remainder of the proposed network will be vested with Waitakere City Council.

The Waitakere City Council discussion paper 'Developer's Design Guide for Residential Subdivision and Medium Density Housing' provides guidance on the design requirements for new roads within residential developments. The proposed road network has been designed as Type 4 Local Streets which consist of a 5.5m wide carriageway, 2.5m indented parking (where provided), 1.5m footpaths and grassed berms, all within a maximum road reserve of 15m.

It is noted that the intersections within the internal road layout will require further consideration at the detailed design stage to meet all current geometric and safety guidelines.

7. SERVICING

There will be no loading spaces provided as part of the proposed development. The development is comprised of residential lots that will need only infrequent servicing.

For Stages 1 and 2 of the development there is to be no central rubbish collection area or central postal area, with these services being provided to each dwelling individually as is currently the case in the area. For the Stage 3 development, rubbish collection will either be from a central rubbish collection area located at the West Coast Road end of the new private access road or from individual dwellings. The latter option will require a turning head capable of accommodating rubbish trucks. This is to be determined and finalised at detailed design stage.

Waitakere City Council's 'Parking and Driveway Guideline' lists various design vehicles used to aid design of road and parking layouts. It suggests a Medium Rigid Truck (MRT) design vehicle be used to assess ability to provide domestic refuse collection.

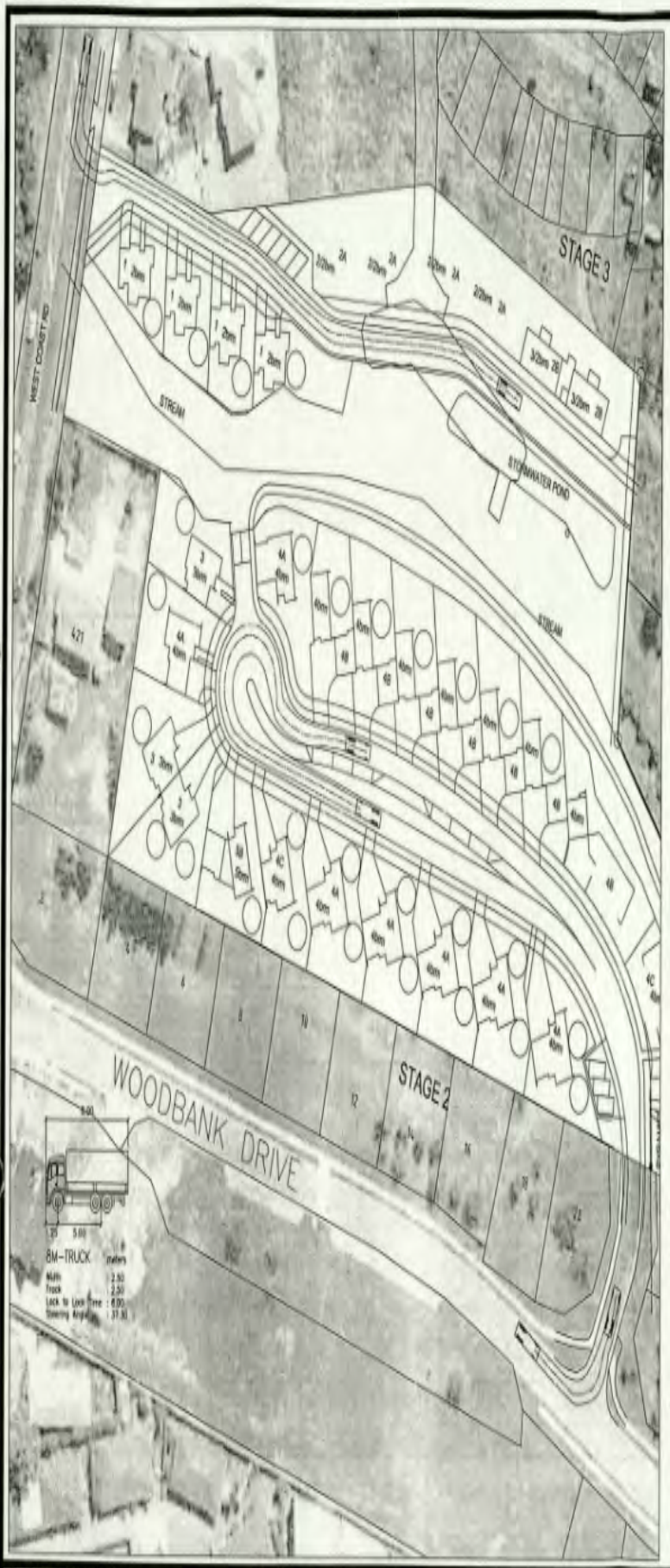
The tracking path of an MRT has therefore been used to illustrate the accessibility of the proposed road layout for a rubbish truck. The tracking path of an MRT at critical points within the development is illustrated in Figure 6. As shown, the site will be adequately accessible by rubbish trucks assuming adequate parking restrictions are implemented on the proposed roads. It is understood that Type 4 Local Streets will include broken yellow line parking restrictions due to their relatively narrow carriageway width.

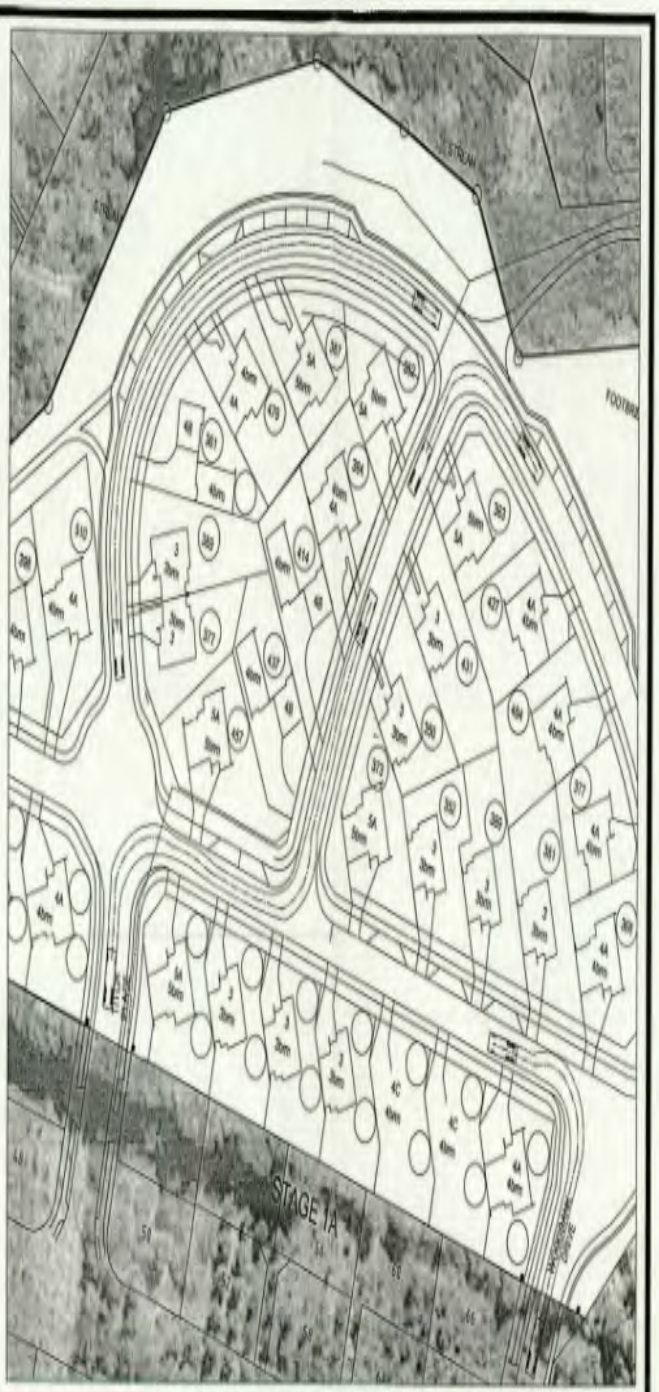
8. CONSTRUCTION TRAFFIC

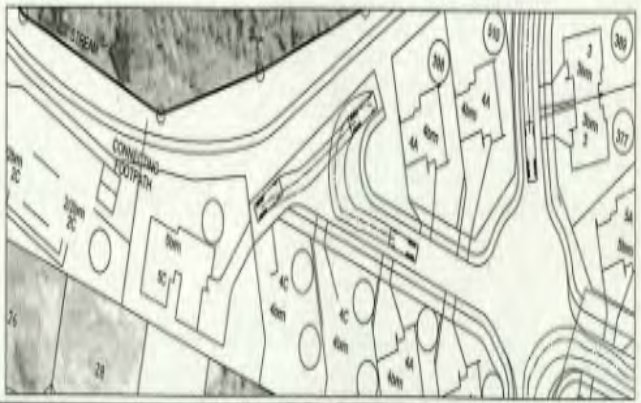
Whilst the exact amount of construction-related traffic that will be required to construct the development is unknown at this stage, it is considered that the volume will be minimal and not cause any operational or safety problems on the adjacent roads.

At the Woodbank Drive/West Coast Road intersection the majority of construction traffic will route to or from the east (either motorway or city-bound) and thus will not have to turn right out of Woodbank Drive. Further, construction traffic manoeuvres will be distributed throughout the day and will mainly occur outside of peak hours when background traffic flows are considerably lower.

During the initial period prior to construction when earthworks will be required to prepare the site it is understood that construction traffic movements will be minimal, with the equipment brought in at the beginning to remain on-site until works are complete. The exception will be a period of approximately 30 days when it will be necessary to move equipment between the two sides of the stream that runs through the site. It will also be necessary to remove around 15,000 m^3 of earth from the site. This equates to some 1,500 truck loads, distributed over a four month period. It is not considered that this will cause any problems given that West Coast Road is classified as an Arterial Road.







ISSUE	DATE	CHK	REVISION

PROJECT:

423-429 WEST COAST ROAD

RESIDENTIAL DEVELOPMENT

DRAWING:

TRUCK MANOEUVRES

TRAFFIC DESIGN GROUP

6

DRN:	APR:	DATE: 10/08	DRAWING NO:
TCD: CTH	Patrick Split	ORIGINAL SIZE: A1	8509A2A-SHT3
CHK:	Ref: 08-P11-TDG	SCALE: 1:100	

9. DISTRICT PLAN REQUIREMENTS

The District Plan's Medium Density Housing Criteria section is of relevance in terms of transportation-related design. The relevant criteria are given in Table 10 below together with comments on how the assessment criteria have been met.

Design Element	Assessment Criteria	Comment
Design Element B – Site Layout	B1 – Ensure the development is well connected into the neighbourhood with adequate vehicle and pedestrian links	Complies. The proposed road and associated footpath network will be linked to the existing road network, offering good connectivity
Design Element E- Car Parking and Vehicle Access	E1 – Sufficient car parking should be provided to meet projected needs of residents, including visitors. In general the minimum requirement is one parking space per residential unit. Visitor parking may also be necessary in large developments, or when the potential for off-site visitor parking is limited. E2 – Car parking facilities should: • be close and convenient to houses • be secure, or allow visual contact from houses • be well ventilated if enclosed • be well-lit and have well-lit pedestrian links to houses • clearly identify any visitor parking • be separate from bedroom windows to minimise noise and fumes E3 – Car parking areas and garages may be grouped to make efficient use of land, including the use of parking bays on roads and driveways internal to the medium density housing area. E4 – Car parking and driveways should: • allow safe and efficient vehicle movements • minimise access points, where abutting arterial routes, and ensure vehicle egress in forwards direction • not dominate the view of the development from the road • be surfaced and graded to ensure efficient stormwater disposal • be planted with shade trees and screening vegetation where practicable	Complies with criteria E1 to E4. Section 5 of this report has discussed the parking requirements for the development and demonstrated that the requirements will be fulfilled.

Table 10 : District Plan – Medium Density Housing Criteria

There are further transportation-related guidelines contained within the City Council document 'Code of Practice for City Infrastructure and Land Development – Parking and Driveway Guideline'. The relevant sections are summarised in Table 11 below.

Criterion	Comment
2. *Parking and Loading Space* *2.2 Number of Spaces* *... the number of car parking spaces should be in accordance with the ratios given in Tables 2.1 and 2.2, and the number of loading spaces should be in accordance with Table 2.3.*	The proposed development falls under the Residential – Medium Density Housing category. Section 5 of this report has discussed the requirements and demonstrated that the requirements will be fulfilled.
5. *Traffic Generation*	The traffic generation rates given in Table 5.7 of the Code of Practice were applied to the proposed development. Traffic generation estimates indicated that the development will generate 45 trips in each peak period.
6. *Access Capacity and Queuing*	The results of the road intersection analysis performed are given in Section 4 of this report. It was shown that the effect of the addition of development-associated traffic will be less than minor at the intersections of Woodbank Drive / West Coast Road and West Coast Road / Parrs cross Road.
7. *Access, driveway, and circulation road geometry*	The geometry of the internal road layout of the development has been designed through consultation with City Council officers and is considered to fulfil requirements.
8. *Neighbourhood Traffic Effects*	It is considered that the effects of the proposed development on the surrounding road network will be no more than minor. Refer to Section 4 of this report.

Table 11 : Waitakere City Council - Parking and Driveway Guideline

10. CONCLUSION

On the basis of this transportation assessment, it is concluded that the proposed residential development can be established with no more than minor effects to the function, capacity or safety of the surrounding traffic environment.

Specifically, the operation of the West Coast Road/Woodbank Drive and West Coast Road/Parrs Wood Road intersections will not be adversely affected as a result of this proposal with the development having only a minor effect.

Furthermore, there is nothing about the proposed new roads and intended development that should adversely affect the existing road safety record.

Accordingly, it is found there is no traffic planning reason to preclude the acceptance of the development proposal as presented.

Traffic Design Group Ltd
21 June 2006

APPENDIX A

aaSIDRA Analysis Results

Appendix 8

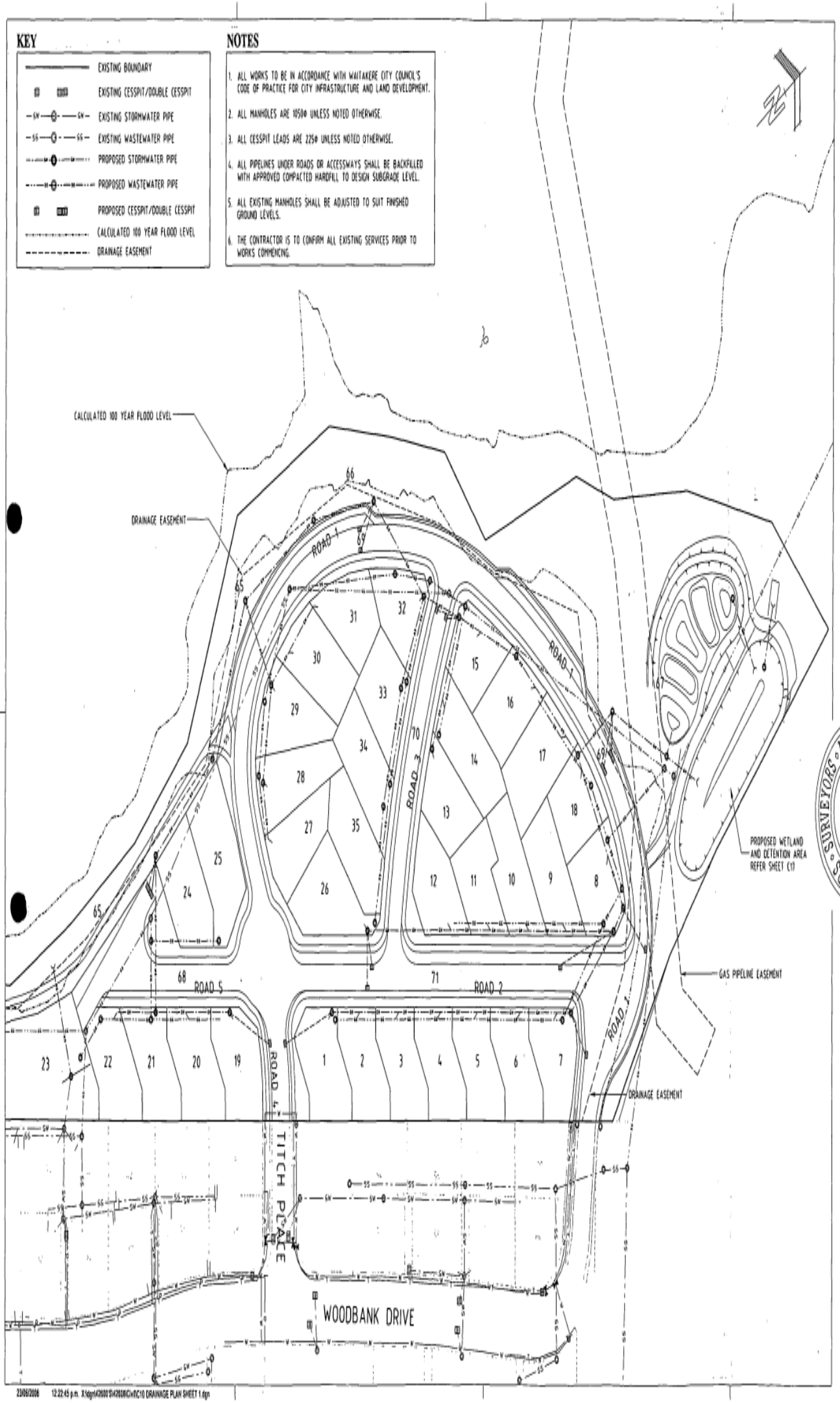
Services Plan

KEY

- EXISTING BOUNDARY
- EXISTING CESSPIT/DOUBLE CESSPIT
- SW — EXISTING STORMWATER PIPE
- SS — EXISTING WASTEWATER PIPE
- PROPOSED STORMWATER PIPE
- PROPOSED WASTEWATER PIPE
- PROPOSED CESSPIT/DOUBLE CESSPIT
- CALCULATED 100 YEAR FLOOD LEVEL
- DRAINAGE EASEMENT

NOTES

1. ALL WORKS TO BE IN ACCORDANCE WITH WAITAKERE CITY COUNCIL'S CODE OF PRACTICE FOR CITY INFRASTRUCTURE AND LAND DEVELOPMENT.
2. ALL MANHOLES ARE 1050ø UNLESS NOTED OTHERWISE.
3. ALL CESSPIT LEADS ARE 225ø UNLESS NOTED OTHERWISE.
4. ALL PIPELINES UNDER ROADS OR ACCESSWAYS SHALL BE BACKFILLED WITH APPROVED COMPACTED HARDFILL TO DESIGN SUBGRADE LEVEL.
5. ALL EXISTING MANHOLES SHALL BE ADJUSTED TO SUIT FINISHED GROUND LEVELS.
6. THE CONTRACTOR IS TO CONFIRM ALL EXISTING SERVICES PRIOR TO WORKS COMMENCING.



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CLIENT / PROJECT

WEST COAST ROAD HOUSING DEVELOPMENT

FOR

NZ HOUSING FOUNDATION

DRAWING TITLE

DRAINAGE PLAN (SHEET 1)

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DESIGNED	JUNE 2006	FK
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CHECKED		
APPROVED	23/06/06	

SCALE (A1)

1:500

JOB NUMBER	DRAWING NUMBER	REVISION
42608	C10	-

KEY

- EXISTING BOUNDARY
- EXISTING CESSPIT/DOUBLE CESSPIT
- EXISTING STORMWATER PIPE
- EXISTING WASTEWATER PIPE
- PROPOSED STORMWATER PIPE
- PROPOSED WASTEWATER PIPE
- PROPOSED CESSPIT/DOUBLE CESSPIT
- CALCULATED 100 YEAR FLOOD LEVEL
- DRAINAGE EASEMENT
- PROPOSED SWALE

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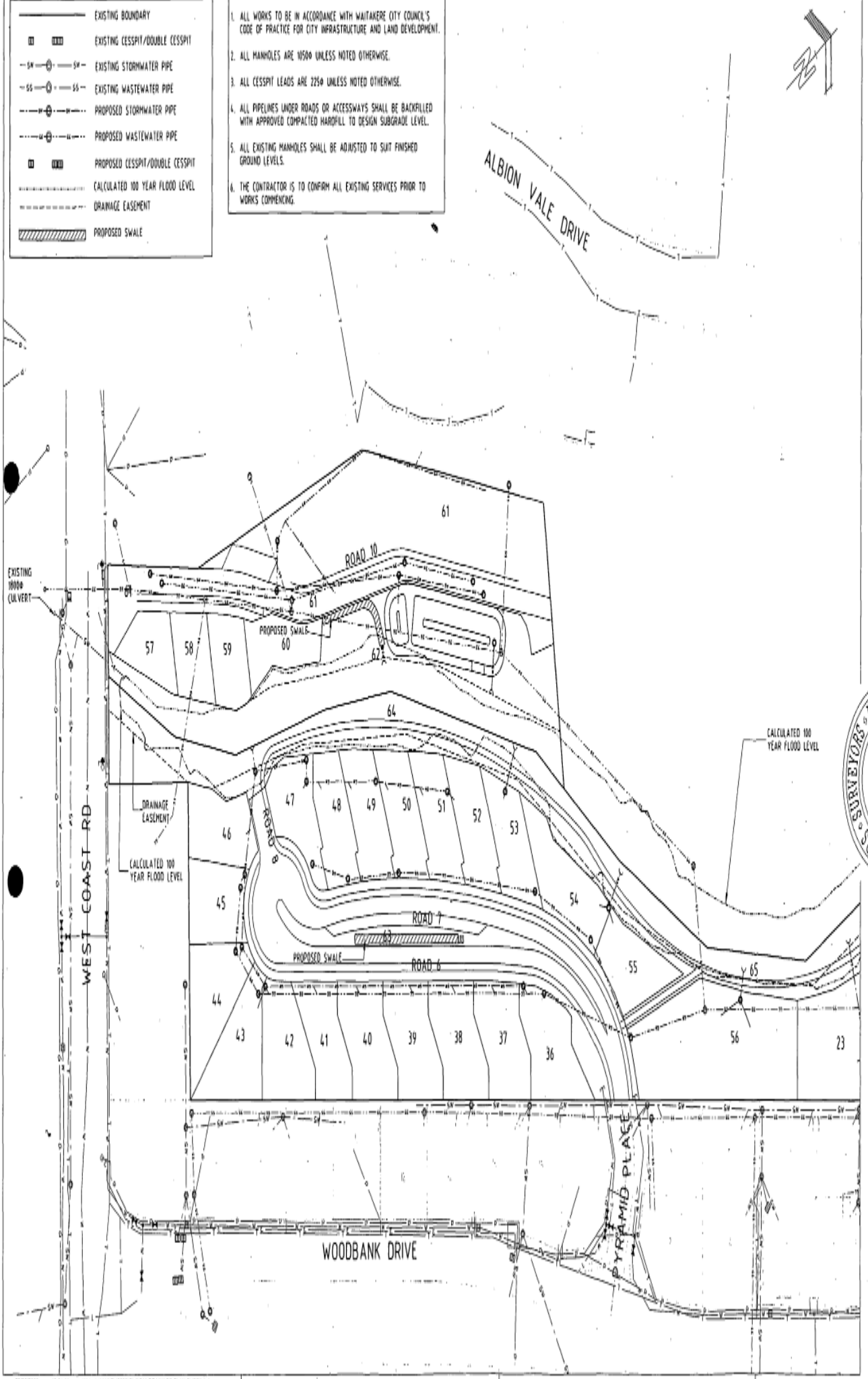

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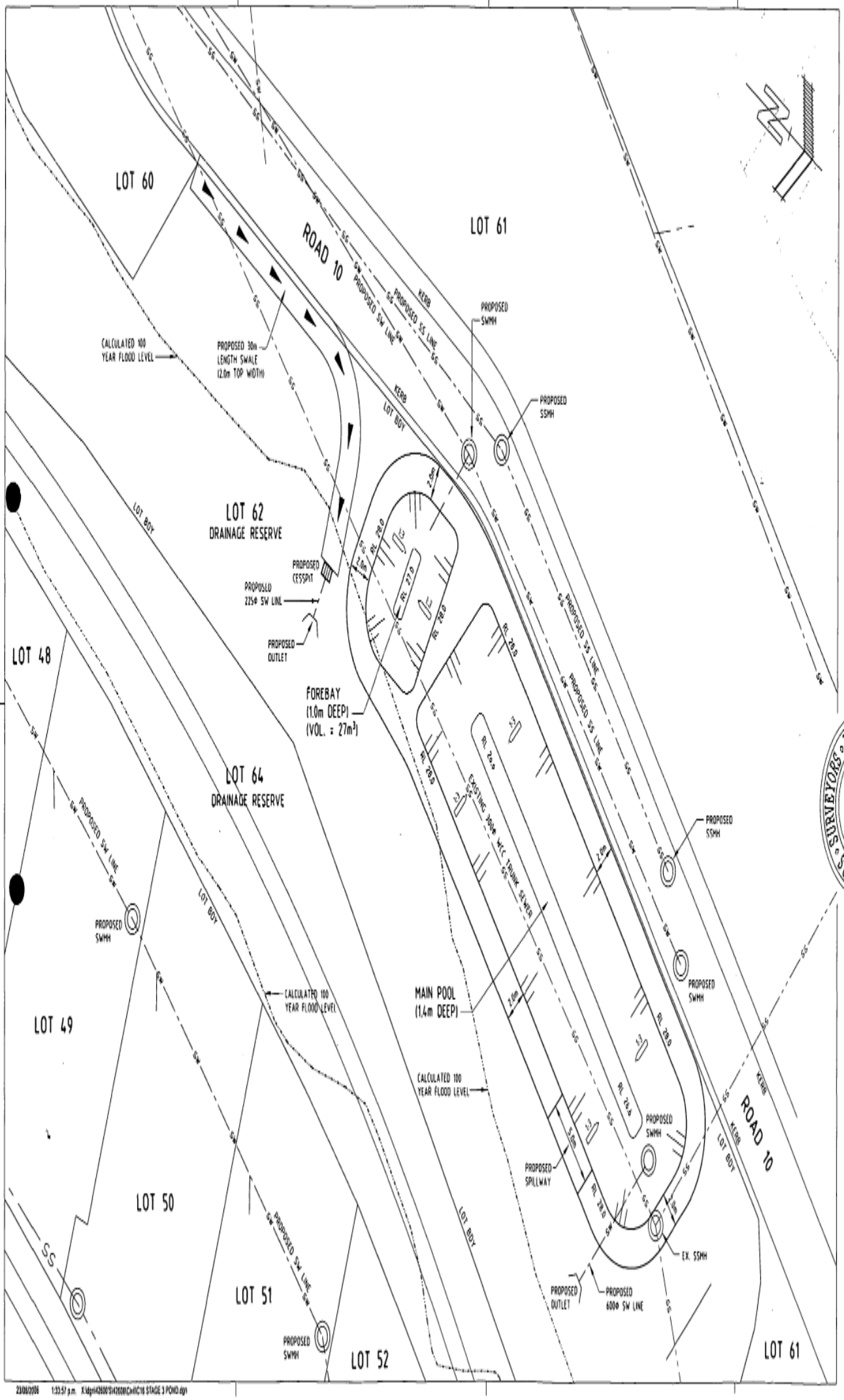

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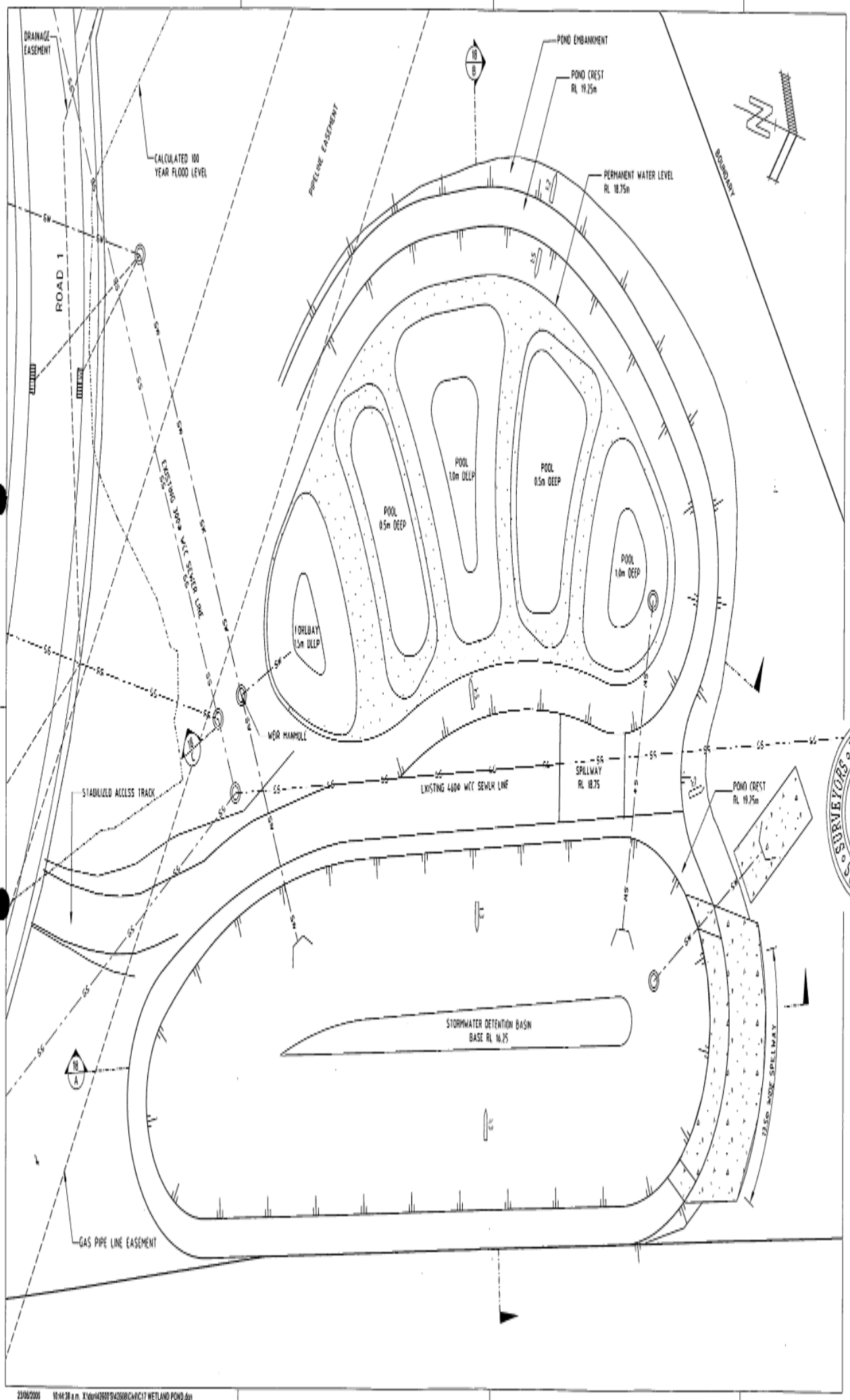

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WETLAND POND LAYOUT

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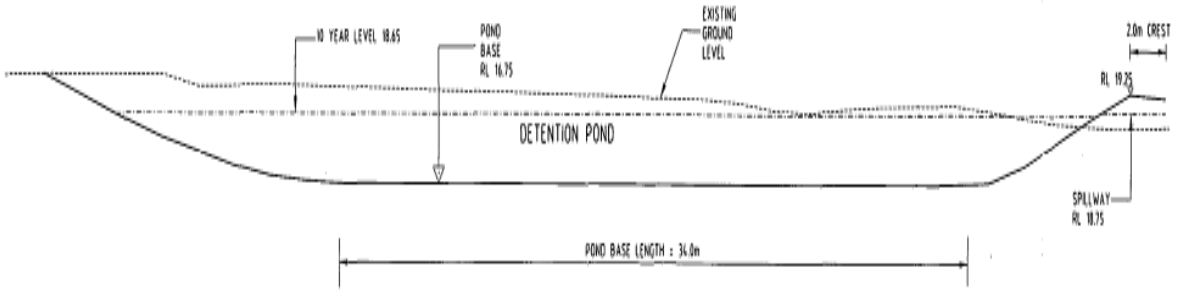

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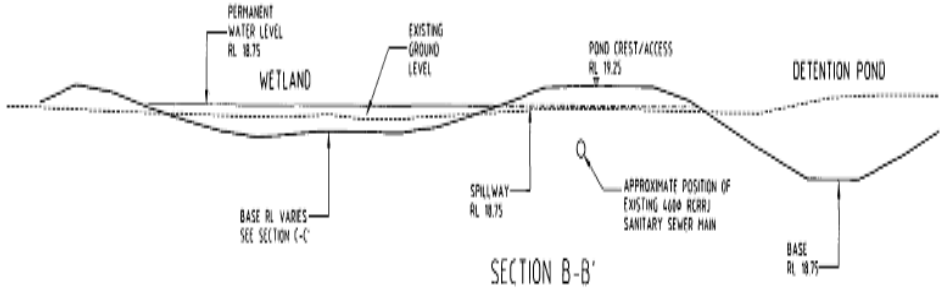

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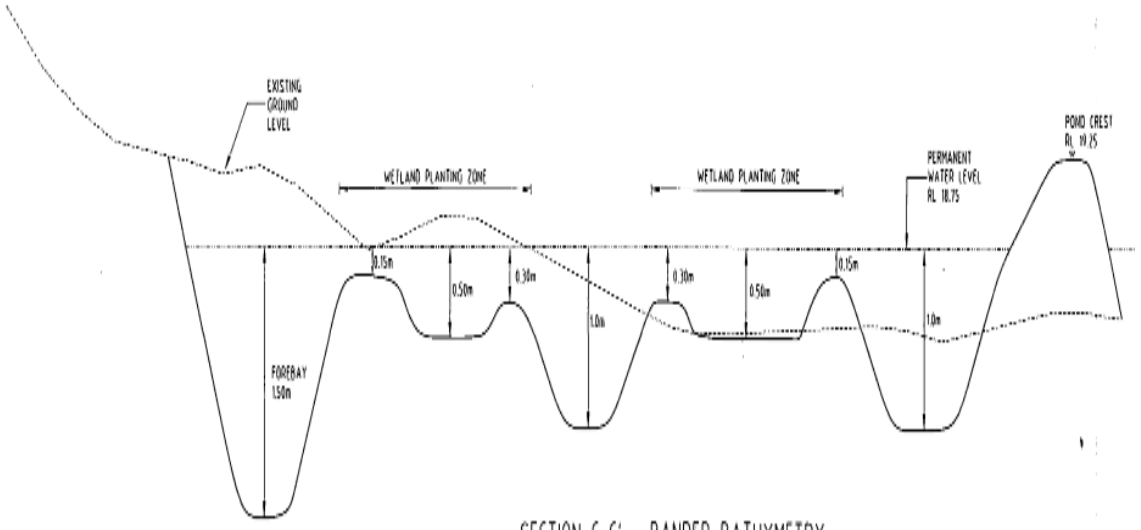

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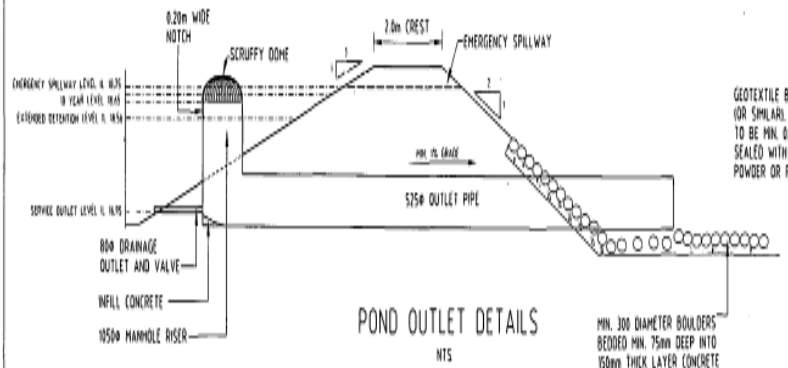

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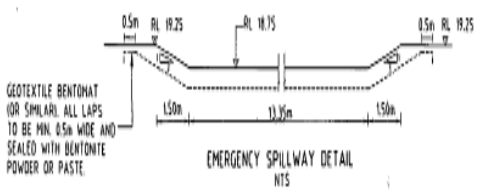

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POND DETAILS PLAN

	DATE	INITIAL
DESIGNED	JUNE 2006	CMR
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AS SHOWN

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Appendix 7

Landscape Plan / Visual Assessment / Arborist Report

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423-429 WEST COAST ROAD, HENDERSON HOUSING DEVELOPMENT

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ASSESMENT OF VISUAL EFFECTS

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ASSESMENT OF VISUAL EFFECTS

Introduction

This section reports on the visual effects of the proposal for residential development of land at 423-429 West Coast Road, Henderson. It also refers to the measures for the avoidance or mitigation of the adverse effects that have been incorporated in the proposals.

The assessment is based on the development proposals and the mitigation measures as shown on the following SOUL environments drawings:

LSP 01 – LANDSCAPE MASTERPLAN SHEET ONE
LSP 02 – LANDSCAPE MASTERPLAN SHEET TWO

Method of assessment

The approach used to assess likely visual and landscape effects was as follows:

1. Site visit and familiarisation
2. Survey of visual and landscape character of the site and its environment
3. Identification of the general visual envelope of the site and the key views.
4. Survey of the present condition of the site and its environs. Identification and assessment of vegetation, topography and other landscape features within the site and close to its boundaries.
5. Estimation of likely visual and other effects on landscape amenity of the proposed sub-division and development.
6. Consideration of proposals for avoiding or mitigating adverse effects that form part of the landscape proposals for the redevelopment.

Existing landscape character

Local Landscape character site environs

The application site is located to the west of Glen Eden between the West Coast Road and the Waikumete Steam. The general character of this suburb is of established suburban-residential with associated reserves and schools. The older houses in the area consist mostly of single storey, dwellings on average size sections with attractive gardens including trees and shrubs. More recent, infill development in the locality is denser. Examples of this are found adjoining the site to the west and the east. Recent housing west of the site includes two and three storey terraced (row house) dwellings, some of which are situated on high ground overlooking the application site (see figure 1).

Fig 1: Adjacent housing on ridge showing three storey row houses

Residential development currently under construction to the north west of the site consists of mainly single storey traditional brick faced bungalow houses.

A similar style of housing and streetscape is found in the recently developed area east of the site. (See figure 2).

Fig 2: Adjacent housing east of the site at the northern end

North of the site is a reserve that forms the setting of the Waikumete Stream and this contains regenerating native forest dominated by kanuka with young plants of other forest species establishing in their vicinity. (See figure 3).

Fig 3: Kanuka forest (following the Waikumete stream) is visible across gorse scrub north of the site

There are a fair number of small to medium sized trees established in the local residential areas, some larger trees are found in the older private sections and give a sense of maturity to these more established areas. The overall visual character of the vicinity is of a moderately leafy suburb.

The housing density proposed for the site is typical of recent subdivisions that consist of traditional detached house types, but on compact sections. The smaller sections often leave little room for larger trees and so the most important trees in the area are generally found on the road frontages.

Visual character of the site

The site itself forms the lower parts of the valley of a tributary of the Waikumete Stream. It consists mostly of gentle to moderate slopes covered with overgrown grassland and weed species of scrub, trees and grassland. In its present condition the site has only minor amenity value mainly as open space affording longer views than normally found within suburban residential streets.

Although part of the site is visible from West Coast Road, this view is restricted and it is easy to miss if driving past in a vehicle.

The present character of the site is run down due to lack of productive activity and management in recent times.

Topography

The site falls to the North along the stream. The undulating slopes down to the stream create topographic variety and, although its banks are currently overrun by weed growth, this stream is the major landscape feature of the site, helping to create a distinctive sense of place.

Existing vegetation

Please refer to the Arborist's Report for a full description of the exiting vegetation on the site.

Views to the site

The site is intermittently visible from the surrounding streets and the properties adjoining these streets but only for a limited distance. Because of the topography and the distribution of buildings and trees in the surrounding area, the visual envelope of the site extends little more than a few hundred metres from the site.

The key views of the site are from West Coast Road (See figure 4)

Fig 4: View from the footpath on West Coast Road looking north into the site

Other key views into the site are from the surrounding housing areas but these are generally limited in extent See figure 5

Fig 5: Typical view into the site from adjacent housing showing restricted visibility due to foreground features and topography. This view is from the west looking east across the site

Views from and within the site.

These are dominated by adjacent housing although views with the site feature the stream and its existing vegetation. There is a view to the trees in Parr's Park and the Waikumete stream from the elevated area of the site at its northern end.

Views out of the site are limited to little more than a few hundred metres and there are no notable views from the site to its surroundings.

Proposed development

The proposed development is for new dwellings, including detached homes and apartments, and ranging from 2 to five bedroom accommodation. Roads serve access to the dwellings. The strip of land adjacent to and including the stream is to be reserved for environmental and public amenity. This reserve will include a path that connects to a bridge and north through the adjacent site to connect with the Waitakere City proposed pedestrian and cycle network.

Residential character and architecture

The character of the proposed buildings features modest contemporary form and materials; they offer some traditional design references for the detached houses and more contemporary urban forms for the two and three storey apartment type dwellings (house types 2A, 2B and 2C).

The building forms are modulated to provide a domestic scale, and variety of shadow and surface texture.

The ends of the buildings will be in charcoal grey brick or split face block, and the remainder will be shiplap weatherboards, natural finish or a taupe brown. Roofs will be corrugated steel in matt silver/grey. These buildings will have strong visual ends with a softer colour and texture pallet in between.

Existing trees

The proposals include the removal of all existing trees with the exception of the groups of natives identified in the arborist report, and the native trees and shrubs to be found among the general growth in the reserve area. Trees to be retained include the mature totara and the mature kahikatea, both close to the stream, as well as groups of kanuka with their mainly native understorey.

Storm water management

The development includes two stormwater management areas. One is a pond in the south of the site. This will be planted at its margins with wetland species. A larger area at the north of the site includes a dry attenuation basin as well as permanent wetlands. These will all be planted with native wetland and moisture loving herbaceous and shrubby communities appropriate to the habitat and ground conditions. Areas required for access and maintenance will be kept as mown grass for ease of access. This planting will help to reduce sediments and pollutants in the storm water as it passes through the various bays and before it is discharged to the stream.

Proposed planting

There will be substantial new tree planting to streets, reserves and front gardens. In reserve areas, particularly along the margins of the stream, this will be native re-vegetation. In streets and private gardens exotic ornamentals and deciduous street trees will be planted, in keeping with the suburban character. Each street will have a different tree. In all, there will be a substantial increase in the vegetation on the site. This will be concentrated along the stream in the reserve and to the street frontage of the houses.

Fig 6: Existing stream area to benefit from weed removal, substantial wetland re-vegetation and will provide excellent waterside habitats. Existing kanuka and manuka will be retained.

Fencing

The rear yards and gardens will be fully fenced to 1.8 m tall for 'stand up' privacy and the side fences will be 1.35 m tall for 'sit down' privacy, the front boundaries will be defined either by retaining walls and planting, or by 0.8 m tall fence and low planting. These fences will be of a sturdy contemporary trellis type combined with vines to give an appropriate level of privacy for the various outdoor living areas.

The fencing adjacent to the reserve and storm water ponds will be standard metal pool type fencing combined with planting for visual amelioration. This fencing will allow visual surveillance of adjacent reserve areas from houses and gardens. At the same time low to medium planting around the fences will integrate them into the landscape.

The planting in the gardens will be of domestic character.

Assessment of visual effects

General

With the proposed development, an increased number of dwellings, structures, roads and hard surfacing would be visible from the immediate vicinity. This would include architecture that is generally in character with the range of types of the buildings at present adjacent to the site. There would also be an increase in planting in the reserve and on the street frontages to be created of the site.

A new wetland is proposed as part of the storm water management system. This includes marginal areas of native wetland plants that will help to increase habitat variety in the area as well as improve appearance and integrate the water management features with revegetation areas.

These improvements together with the removal of weed infestations will more than compensate for the loss of open space and the overall visual effects would be beneficial once the new planting matured and restored habitats help to re-introduce bird life and a healthy ecosystem to the stream environment

The landscape effects of the development would vary with time. As gardens and tree planting increase in size and bulk the conspicuousness of the buildings and new structures would reduce. Any further tree and shrub planting carried out by residents in their gardens would, after 3 to 5 years, begin to play a valuable role in the overall quality of the site.

Key views

The view from West Coast Road into the site will include one of the site entrances but also large areas of re-vegetation planting, so that the overall effect will be positive.

The views into and across the site will all include new planting as well as new housing thanks to the strategic location of the stream.

Avoidance and mitigation of adverse effects

The retention of the established native trees on the site will mitigate the short-term effects of construction before the new tree planting becomes well established. The inclusion of rain gardens in the southern street will moderate run-off to the public storm water disposal system and increase infiltration into the local groundwater. The rain gardens will also contribute to visual amenity, being planted with wetland species.

The use of planted embankments in place of retaining walls will reduce visual impact by reducing the area of hard surface that is visible. Planting on embankments will be an important part of the amenity of the site. Trailing plants will be used above the low retaining walls at the front of lots and will at least partly clothe the retaining structures

Conclusion regarding changes in visual character

The landscape of suburban living areas in this part of Waitakere is presently changing to accommodate medium density infill housing and create a landscape that is more urban in character. The proposed re-development of the site is in keeping with this trend and is in character with the surrounding areas. Little of specific visual merit will be lost from the site and the gains of new planting and public access and habitat restoration will be significant.

The modest but thoughtful quality of the architectural design will offer visual benefits by comparison with the present rather run-down site character.

Overall, the change in visual charter and habitat value will be beneficial to the site and its environs.

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423-429 WEST COAST ROAD, HENDERSON

HOUSING DEVELOPMENT

ARBORIST'S REPORT

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16 June2006

Housing Foundation NZ, West Coast Road Development. (Part of 423-429 West Coast Road)

This report should be read in context of the above application and will:

1. *Identify tree(s) and vegetation which may be affected by proposed works.*
2. *Assess condition of individual tree(s).*
3. *Assess to what extent vegetation may be affected and recommend remedial work./action with a view to minimize (potential) damage to trees)*

It is proposed to develop the above site for housing purposes with associated infrastructure and landscaping.

The proposed works and items referred to in this report are generally shown on the attached **"Housing Foundation NZ, West Coast Road Development. (Part of 423-429 West Coast Road), vegetation and major features plan 1 & 2".**

Summary:

- The proposed works are located within the General and Restoration **Natural Areas.**
- The majority of vegetation is located along the stream meandering through the site, and consists of areas of exotic weed growth interspersed with occasional native vegetation species. These areas are circled in **yellow** on the above vegetation plans
- There are some smaller areas of more significant native vegetation including a few larger native specimen trees, and mature Kanuka vegetation. These areas and the individual trees are circled in **blue** on the above vegetation plans, with significant specimens identified individually.

Vegetation on site

General;

The development site is part of an area which appears to have been farmed and in pasture until recent times, and since reverted to an unmaintained rough pasture land, with some natural streamside vegetation areas from West Coast Road joining up with an area along the Northern boundary which is in a relatively good condition.

The layout of the site is as per the attached subdivision and layout plans. It is intended to clear all vegetation from the areas circled in **yellow** and landscape, restore and revegetate these areas to the guidelines described in the "native to the west, a guide for planting and restoring the nature of Waitakere City" publication as part of the proposed landscape plans.

The areas circled in **yellow** largely consist of exotic weed species and rough pasture covering in excess of 98% of these areas including species such as:

Botanical Name	Common Name
Solanum mauritianum	Woolly Nightshade

Salix alba	Willow
Ligustrum	Privet
Lonicera sp.	Climbing Honeysuckle
Salix caprea	Pussy Willow

Sporadic natives such as Cordyline australis and a few Cyathea dealbata can also be found in these areas. Any specimens over 6 metres in height are marked on the Vegetation plans.

The areas covered in **blue** consist of typical streamside vegetation, but can be classified as "species poor", with the predominant species found Kunzea ericoides (Kanuka).

The areas marked Ref #5 and #11 are of reasonable quality with a good canopy cover.

Species found include:

Botanical Name	Common Name
Kunzea ericoides	Kanuka
Coprosma robusta	
Myrsine australis	Matipo
Cordyline australis	Cabbage Tree
Dacrydium dacrydioides (1 specimen only)	Kahikatea
Podocarpus totara (1 large specimen only)	Totara

In our opinion all areas marked in blue include native vegetation to the extent that restoration of these areas and enhancing the existing vegetation is preferable over complete clearing and replanting.

It is recommended that these areas are protected from damage during development and construction with suitable protective fencing, which should be installed prior to any works taking place, and maintained for the duration of the project.

Photos and further detail of the vegetation on site

Ref # 15: Photo looking towards West Coast Road consisting of mixed exotic weed species (not on aerial photo)

Ref # 15/16: Photo taken towards area behind 421 West Coast Road with exotic weed species and a Cyathea dealbata (under 3.00m in height) and a 10-15 yr old. Cordyline australis at appr. 5.00m in height. Both will require removal.

(not shown)

Ref # 2: A group of semi-mature Cordyline australis up t0 8.00m in height, in generally poor condition. These trees are to be removed.

Ref # 17: Photo of Pinus radiata shelterbelt, up to 14.00m tall and DBH of up to 400mm. These trees are to be removed.

Ref # 3, Pinus radiata to be removed, Ref# 4 Semi mature Podocarpus totara, 17.00m H x 500mm DBH to be retained. The latter is close to a proposed driveway access. Ensure driveway is located outside tree dripline, and protective fencing is in place during construction,

Ref # 5: Photo of area with mature native revegetation species, including Ref# 3&4. Area to be retained and fenced during construction, additional enhancement planting as per landscaping plan

Ref # 18. Small area with juvenile (planted) revegetation species < 5yrs of age. Includes Phormium, Cordyline australis and Coprosma robusta. This area will be within a future building lot, and all vegetation is to be removed

Ref #7. Large dacrydium dacrydioides (Kahikatea) appr. 18.00m in height and 500mm DBH. This tree located within area Ref #6 and is to be retained.

Ref #6, area vegetated with up to 20% naturally occurring native revegetation species (Cordlyine, Coprosma etc.) all under 3.00m in height, and exotic weed species (Mainly Privet, Salix alba). Tree Ref#7 is visible to the left. It is proposed to restore the native streamside vegetation in this area as per the "native to the west, a guide for planting and restoring the nature of Waitakere City"

Ref # 8, As per Ref# 6, but including few larger Cordyline australis. Much of the exotic weed cover in this area has already been cleared.
It is proposed to restore the native streamside vegetation in this area as per the "native to the west, a guide for planting and restoring the nature of Waitakere City"

Ref #12, photo showing vegetation within this area circled in yellow on the vegetation map. Only weed species occur in these areas, except for the Cordyline australis- ref #13. This area will be cleared and landscaped as per the attached plans, with the Cordyline retained, to be protected with suitable fencing during construction. A large stormwater detention pond is a also proposed within this area.

Photo of area Ref#12 towards NE corner. The Cordyline (Ref #14) is also visible. This tree is in close vicinity of the proposed access road, but if possible should be retained and fenced during construction.

Photo of area Ref #12, looking East from Ref #13, showing 95+% of exotic weed species such as Salix caprea, privet, interspersed with the odd Coprosma robusta and Myrsine australis less than 3.00m in height. This area is to be cleared, with the proposed access road from the existing housing development to be constructed on the left, and the remainder landscaped as per the landscape plans. All native plantings to be to the standards described in the "native to the west, a guide for planting and restoring the nature of Waitakere City" publication.

Ref #10, large, old Pyrus (Pear) tree, appr. 11.00m H x 550mm DBH in good

condition. Tree to be retained, protective fencing erected during construction, and incorporated in the proposed landscape design. There is another large pear tree also marked Ref #10 close by which appears to be within the proposed esplanade reserve. To be retained as above.

Photo from across the stream on the Western boundary of the proposed development, looking back to area Ref# 11.
This area includes part of the proposed esplanade reserve along the Northern boundary which is vegetated with good quality mature Kanuka, Coprosma robusta, Myrsine australis, Cyathea, and a range of understory species such as Carex and ground ferns. There is some light to moderate weed infestation, which is to be addressed as part of the proposed development, and enhancement plantings undertaken as per the "native to the west, a guide for planting and restoring the nature of Waitakere City" publication.

Impact/adverse effects on existing vegetation

As outlined in this report it is intended to either preserve areas with a good native vegetation cover present, or clear and revegetate other areas where the existing native vegetation cover is of such poor quality that clearing and revegation is considered a more appropriate option.

The bulk of the development will take place within already cleared areas, or areas largely void of significant vegetation.

It is noted however that the large Totara tree and other vegetation included within the area of significant vegetation marked Ref #5 may be within a proposed driveway alignment. It is highly recommended that the driveway is relocated to well outside the dripline of this tree and other significant vegetation present.

Mitigation works

Although the adverse effects on any protected or significant vegetation is very minor in nature, it is proposed to implement a comprehensive landscaping and revegetation plan.

This will seek to provide a high level of visual amenity and functionality, as well as restoration of the streamside native ecosystem.

It is considered that this will more than mitigate any adverse impacts which may be caused by the development

Assessment of vegetation using the General Natural Area Criteria

Rule Ref #	Description	Assessed effect
2a	The extent to which vegetation alteration adversely affects amenity values and neighbourhood character	The removal of weed species and subsequent revegetation of affected areas will improve amenity values and neighbourhood character to well beyond existing levels.
2b	The extent to which the vegetation alteration will threaten natural ecosystems	The removal of the weedcover could potentially cause erosion runoff into the stream. This will be addressed as part of the main Resource Consent application for the proposed works
2c	The extent to which vegetation alteration creates, contributes to or exacerbates stability problems	Nil
2d	The extent to which development is located or can be designed in a way that avoids the need to remove vegetation, and in particular the removal of any trees which are notable examples of their species	It is proposed to where possible locate any development outside any areas of significant or protected vegetation.
2e (A74)	The extent to which vegetation alteration is necessary: • To accommodate development otherwise permitted by the plan • To ensure the safety or integrity of existing development by the plan • For pruning to provide light • For pruning to preserve public views	The works are proposed To accommodate development otherwise permitted by the plan
2f	The extent to which vegetation alteration adversely affects plant health	Minor. The proposed works will require the removal of some protected vegetation, the adverse effects will however be fully mitigated as outlined in this report

		and attached landscape plans
2g	The effect the vegetation alteration adversely affects the historical, cultural or spiritual significance of any site or waahi tapu of significance to Iwi or archaeological site	Nil
2h	The extent to which more than minor adverse effects can be adequately avoided, remedied, mitigated or offset through provision of works and services on or off the site and/ or through payment or provision of a financial contribution	The adverse effects will be fully mitigated as outlined in this report and attached landscape plans
2i	The extent to which the vegetation alteration reduces the extent, range and linkages between vegetation, fauna habitats and natural features	When complete, the proposed restoration and enhancement of the streamside vegetation areas will greatly improve the range and linkages between vegetation, fauna habitats and natural features
2j	The effect the vegetation alteration can be offset by restoration or enhancement around and within the area subject to the application	Comprehensive restoration and enhancement of the natural areas and stream sides is proposed as part of the development
2k	The extent to which vegetation alteration adversely affects the significance, natural character or landscape value of any natural features	Nil, When complete, the proposed restoration and enhancement of the streamside vegetation areas will greatly improve the significance, natural character or landscape value of any natural features
2l	The extent to which the proposed vegetation alteration is for development proposed in a relative Operational Reserve Management Plan, Parks concept plan, current WCC Parks Strategy or current operative Regional Parks Management Plan	N/A

Assessment of vegetation using the Restoration Natural Area Criteria

Rule Ref #	Description	Assessed effect
2a	The extent to which vegetation alteration adversely affects the overall resilience, biodiversity and integrity of the Green Network.	Nil, When complete, the proposed restoration and enhancement of the streamside vegetation areas will greatly improve the overall resilience, biodiversity and integrity of the Green Network as

		well a being complementary to the aims of the Twin Streams project.
2b	The extent to which vegetation alteration reduces the ability to create linkages between vegetation, fauna habitats or natural features and landforms.	Nil, When complete, the proposed restoration and enhancement of the streamside vegetation areas will greatly improve the ability to create linkages between vegetation, fauna habitats or natural features and landforms.
2c	The extent to which vegetation alteration adversely affects the significance, natural character or landscape value of any natural features.	Nil, When complete, the proposed restoration and enhancement of the streamside vegetation areas will greatly improve the significance, natural character or landscape value of any natural features.
2d	The extent to which trees which are notable examples of their species can be retained..	It is recommended that several large significant native and exotic trees are retained as part of the development. No notable trees are proposed for removal.
2e	The extent to which vegetation alteration adversely affects the mauri (life force) of native vegetation.	Nil
2f	The extent to which vegetation alteration adversely affects heritage or amenity values.	When complete, the proposed restoration and enhancement of the streamside vegetation areas will greatly improve amenity values.
2g	The effect the vegetation alteration can be offset by restoration or enhancement around and within the area subject to the application	Comprehensive restoration and enhancement of the natural areas and stream sides is proposed as part of the development
2h	The extent to which vegetation alteration creates, contributes to, or exacerbates stability problems.	Minor in the short term only, the proposed restoration and enhancement of the streamside vegetation areas when complete will fully mitigate any stability

		issues.
2i	The extent to which the proposed development could be positioned on any area of the site within a General Natural Area.	The proposed development, wherever possible will be located within a General Natural Area
2j	The extent to which more than minor adverse effects can be adequately avoided, remedied, mitigated or offset through provision of works and services on or off site and/or through payment or provision of a financial contribution.	Comprehensive restoration and enhancement of the natural areas and stream sides is proposed as part of the development
2k	The extent to which the vegetation alteration adversely affects plant health.	Minor. The proposed works will require the removal of some protected vegetation, the adverse effects will however be fully mitigated as outlined in this report and attached landscape plans

A suitably qualified Arborist will be in attendance at the following stages:

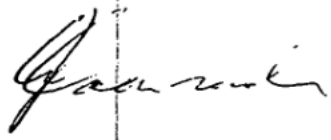
Setting out	Arborist to verify
Prior to commencement of work	Arborist to approve protective fencing
During construction	Arborist to monitor compliance with RC conditions in regards to vegetation
Completion of construction	Arborist to check for damage

Recommended conditions:

It is recommended that the following conditions are included as part of the Resource Consent:

- A suitably qualified Arborist to be in attendance at critical stages as outlined in the above table.
- Area adjacent works envelope to be temporarily fenced to prevent damage to desirable vegetation.

Yours sincerely



Willy Coenradi.
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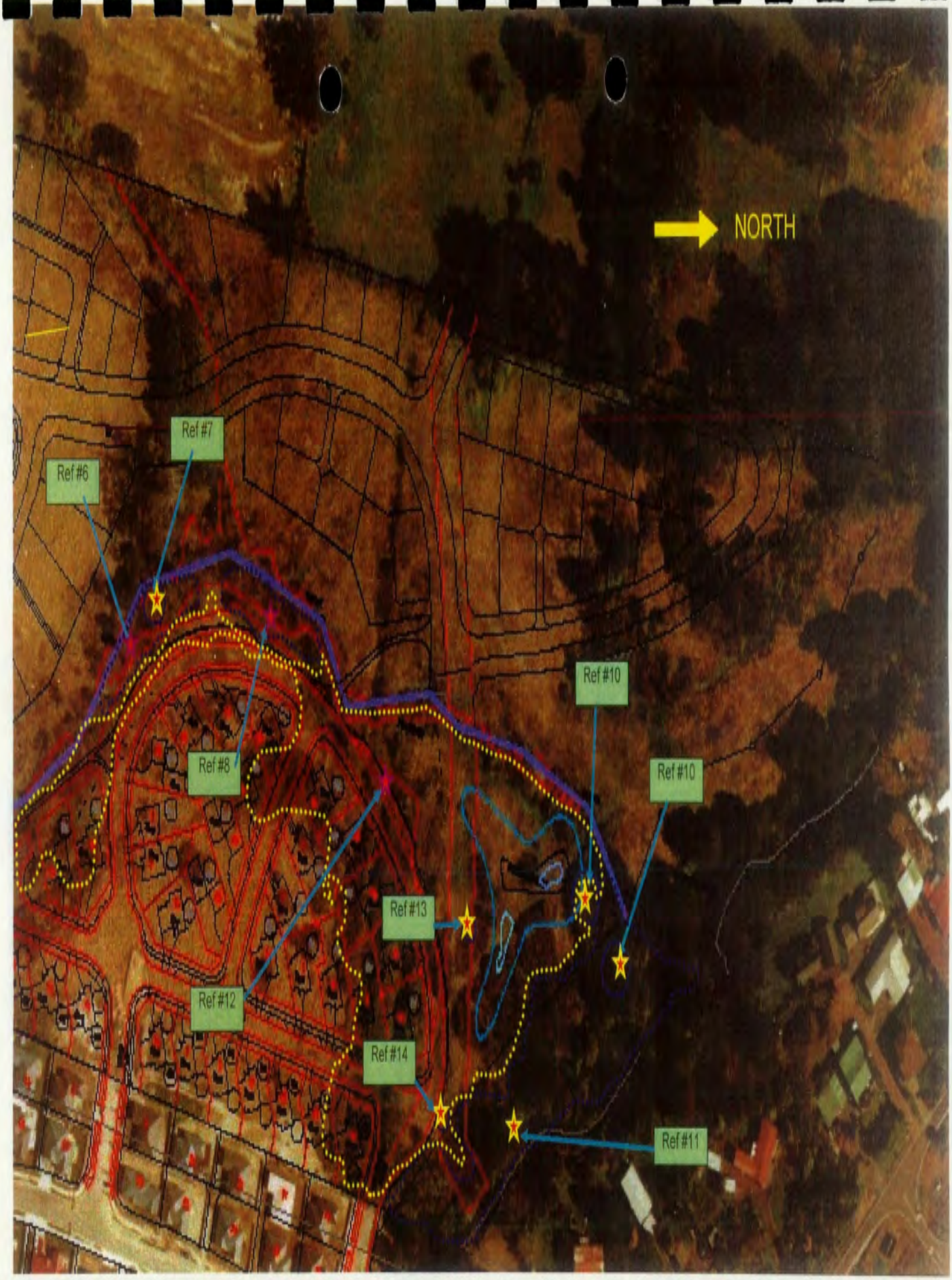

Housing Foundation NZ, West Coast Road Development. (Part of 423-429 West Coast Road), vegetation and major features, Sheet 2

Date: 12 June 2006	Approved by:
Drawn by: Willy Coenradi	Scale: Not To Scale

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NZ HOUSING FOUNDATION

423-429 WEST COAST ROAD, HENDERSON

HOUSING DEVELOPMENT

WEED MANAGEMENT PLAN

Introduction

All weed species listed below will be destroyed and removed from the site. Particular attention will be paid to the removals of invasive exotic woody and herbaceous weed species along the watercourse so that extensive re-vegetation with native species to form wetland and riparian communities can take place effectively.

Weeds will be removed before re-vegetation planting and follow up weed management will treat and remove any re-growth or missed areas of weed as specified in the table.

Specific methods for managing the weed species identified on the site are set out in the table below.

The re-vegatation planting species, stock sizes and densities to be used in the areas currently infested by weed are summarised in the plant schedules and located on the landscape concept plan.

TABLE OF WEED MANMAGEMENT TECHNIQUES				
weed scientific & common name	**weed removal program**			
	Initial treatment	**treatment after one month**	**treatment after five weeks** (treatment after five weeks in summer or if applicable or treatment after two months in winter)	**ongoing control**: treatment after six months, treatment after twelve months, treatment after eighteen months & two years
Hedychium gardnerianum and *H.flavescens*: Gingers	Spray using Escort (5g/15L) with pulse penetrant.	Repeat initial action on any ginger still showing signs of life. Dig up rhizome after specimen is dead and dispose of to the dump.	All areas are to be covered by cambium mulch to a minimum depth of 100mm once initial spraying and weed removal is complete. Initial revegetation planting may proceed at this point if weed eradication has been successful.	Check site after six months, twelve months, eighteen months and two years for signs of any weed regrowth or re-establishment. Any new growth to be spot sprayed using Roundup and removed by hand two weeks later. Any non-noxious minor superficial weeds to be removed by hand. Replace mulch or weed mat where it has moved or thinned out. Cover noxious weed 'flare up' sites with an extra 50mm depth of mulch.
Ulex europaeus: Gorse	Spray Roundup (1%) with pulse penetrant.	Repeat initial action on any Gorse still showing signs of life. Cut down and dispose of dead specimens to the dump.		
Acacia spp: Wattle	Cut down and remove to dump any specimens & paint stump with Roundup (20%).	Repeat initial action on any specimens still showing signs of life.		
Cortaderia selloana & *C.jubata*: Pampas Grass	Spray Roundup (1%) with pulse penetrant. Remove any seed heads carefully to rubbish dump. Ensure complete wetting of foliage. Spray after flowering.	Repeat initial action on any specimens still showing signs of life. Cut down and dispose of dead specimens to the dump.		
Ligustrum sinense & *L.lucidum*. Privet	Cut down and remove to dump any specimens & paint stump with Roundup (20%) or Escort (5g/10 litre + 10ml of pulse penetrant.	Repeat initial action on any specimens still showing signs of life.		

Pennisetum clandestinum Kikuyu Grass	Spray Roundup (2%).	Repeat initial action on any specimens still showing signs of life.		
Lonicera japonica Japanese honeysuckle	Spray Roundup (2%) or Escort (35g. per 100L water) manually clear including roots removing all parts to dump.	Repeat initial action on any specimens still showing signs of life.		
Paraserianthes lophantha (syn. *Albizzia lophantha)* Brush wattle	Fell trees, pull up seedlings and dispose.	Repeat initial action on any missed specimens or emerging seedlings		
Solanum mauritianum	Pull out young plants including roots. Cut down large shrubs and trees. Paint stump with glyphosate at 1 part to 5 parts water plus 'Pulse' penetrant.	Repeat initial action on any missed specimens or emerging seedlings		
Salix alba, S. fragilis (crack willow) and Salix caprea/cinerea (sallow/pussy willow)	Fell trees remove all parts of tree to dump & paint stump with Roundup (20%) or Escort (5g/10 litre + 10ml of pulse penetrant.) or Metsulfuron (35 g. per 100 L water).	Repeat initial action on any missed specimens or emerging seedlings		
Ipomoea indica Morning glory	Cut down and remove twining stems from other vegetation. Paint stumps and cut stems with one of the following Glyphosate 1 part per 4 parts of water Alternatively after cutting, the vines away the remaining weed foliage rooted in the ground may be sprayed with one of the mixtures: Glyphosate:100mls + 20mls Pulse per 10 litres of water Banvine:120mls per 10 litres of water Yates Woody eedkiller 120mls per 10 litres of water			

General requirements

The weed management plan is to be read in conjunction with the planting proposals and landscape concept. All herbicides must be used strictly according to the manufacturer's instructions and with all safety fully observed. Take particular care to avoid any spillage or drift of any herbicide into the water flow. All weeds in the water must be destroyed by mechanical removal.

The aim of the weed management program is to remove and clear the weed species from the proposed planting site until such a time as the replacement planting can form a reasonable protection against re-establishment of weed species- i.e. until canopy cover is achieved.

All work shall be carried out by a competent and experienced tradesman with suitable experience for the work to be undertaken. Keep all proposed planting areas weed free, remove weeds by hand where possible with minimal disturbance to mulch. Any site rubbish and undesirable debris is to be removed from the site before planting commences.

Herbicide application

- Check local authority for the need to publicly notify intention to spray herbicides.
- Apply herbicide when the plants are actively growing. Carefully follow manufacturer's instructions and wear protective clothing.
- Do not spray in windy weather or if rain is expected in the next few hours
- Leave plants in the ground until the foliage and the roots have died off
- Make sure herbicide does not come in contact with non-target plants
- Do not apply herbicide to the water or to plants emerging from the water. These are to be removed mechanically

Any spraying shall be in accordance with NZS 8409:1999 Agrochemical Users Code Of Practice.

Mulching

A 100mm layer of cambium mulch (80-100mm when settled) shall be evenly spread over the revegetation planting areas, which must be free of debris and approved by the project engineer or their representative prior to placement of the mulch. All mulch is to be certified free of weed material or seed. Mulch is to be kept clear of the trunks or bases of new or retained planting. Care shall be taken to ensure that no mulch enters the sea or any intertidal area. Revegetation planting should commence during the planting season and as soon as possible once the weed control has been implemented.

Replanting

Extensive re-vegetating planting is to be carried out on the site including the areas where the existing weed growth will be removed. The species to be used for re-vegetating the variety of habitats are listed in the table below. The reference letter refers to the landscape master plan.

Re-vegetation shrub and small tree pioneer mix ('C' on landscape masterplan); to be chosen from:

Riparian areas Open and higher stream bank		Typical spacing	Other areas (outside flood plain)		Typical spacing	Stock sizes
Cordyline australis	Ti kouka Cabbage tree	1 m	*Coprosma robusta*	karamu	1.5 m	PB3 minimum
Cortaderia fulvida	toetoe	1.2 m	*Aristotelia serrata*	makomako	1.2 m	
Phormium tenax	Harakeke flax	1 m	*Sophora microphylla*	Kowhai	0.9 m	
Leptospermum scoparium	Manuka Tee tree	1.2 m	*Coprosma lucida*	Shining karamu	1.2	
Hoheria populnea	Houhere lacebark	1.2 m	*Cyathea medullaris*	Mamaku	1.2	
Carpodetus serratus	Putaputaweta marbleleaf	1 m	*Cyathea dealbata*	Ponga	1.2	
Shefflera digitata	pate	1 m	*Leptospermum scoparium*	Manuka	1.2	
Coprosma propinqua	mingmingi	1 m	*Myrsine australis*	Mapou Red matipo	0.9	
Hedycarya arborea	Porokaiwhiri Pigeon wood	1 m	*Melicytus ramiflorus*	Mahoe Whiteywood	1.2	
			Solanum aviculare	poroporo	1..5 m	
			Pseudopanax arboreus	Fivefinger whauwhaupaku	1.2	

D: Grass like, flax like and herbaceous plants for wetland re-vegetation: for emergents, marginals and stream banks, wet ground ('D' on landscape masterplan);

Generally minimum stock size to be 1 L, typical spacing to be 750 mm apart; species to be chosen from:

Marginal emergents: marsh areas and below winter water levels		**Lower stream bank: ground above common water levels but subject to flooding**		**Upper bank: Generally moist ground with high watertable occasional flooding**	
Baumea articulata	Sedge tussock	*Blechnum novae zelandiae*	kiokio	*Dianella nigra*	Turutu
Cyperus ustulatus	Giant umbrella sedge	*Cyperus ustulatus*	Giant umbrella sedge	*Cyathea dealbata*	Ponga Silver tree fern
Baumea teretifolia		*Phormium tenax*	harakeke	*Cyatea medullaris*	Mamaku
Carex lessoniana	Rautahi	*Cortaderia fulvida*	Northern toetoe	*Carex flagellifera*	
Carex virgata	Small swamp sedge	*Carex virgata*	Small swamp sedge	*Carex lessoniana*	
Juncus pallidus	Giant rush	*Dicksonia squarrosa*	wheki	*Baumea tenax*	
Carex secta	purei	*Carex secta*	purei	*Phormium cookianum*	whaririki
Typha orientalis	raupo				

Key

N

Soft Landscape Elements

For planting mixes refer to accompanying report

A - Proposed Ornamental Specimen Trees mostly deciduous for streets front yards & rear property boundaries

Specimen shrub

Proposed hedge 0.8m High

Proposed hedge 1.35m High

Proposed hedge 1.8m High

Proposed low to medium height shrub planting including ground covers

Hard Landscape Elements

Proposed fence 0.8m high for front of properties

Proposed fence 1.35m high for between properties

Proposed fence 1.8m high for rear of properties

Proposed post type fence 1.2m high between properties and stream reserve and around storm water ponds

Proposed key-stone retaining wall (variable height)

Proposed concrete footpath

Proposed deck/patio adjacent to houses

Proposed stepping stones in public

Proposed paving at entrances to houses

Proposed concrete driveway and footpath

Proposed clothesline/outdoor utilities area

NOTE: Provision within each house lot has been allowed for owner occupiers to have the ability to enhance soft and hard landscape. What is shown is for diagrammatic purposes only

Revision	Description	Drawn	Checked

Drawing Status:

SOUL

Client: NZ Housing Foundation & Babbage

Project: West Coast Road Housing Development

Drawing Title: Typical Garden Layout
House Type 4A

Drawing Number:	LSP-03 Sheet 3 of 4	Job Number:	SOUL-05/06-161
Scale:	1:125@A3	Date:	19/06/06
Drawn:	AH		

Key
N
Soft Landscape Elements
For planting details refer to accompanying report
A - Proposed Ornamental Specimen Trees mostly deciduous for streets, front yards & rear property boundaries
B - Proposed native, medium to large trees for stream edge and other re-vegetation areas
C - Proposed re-vegetation of native shrubs and small tree planting mix
D - Proposed grass like, flax and herbaceous plants for wetland re-vegetation, for emergents, marginals and stream banks, wet ground.
D1 - Proposed grass like, flax and herbaceous plants for wetland re-vegetation, for emergents, marginals and stream banks, wet ground.
E - Proposed low to medium height shrub planting for reserve and garden areas including ground covers
F - Proposed swales for ground cover in attenuation points
Boundary of existing vegetation (refer to arborist report)
Hard Landscape Elements
Proposed fence 0.8m high for front of properties
Proposed fence 1.35m high for between properties
Proposed fence 1.8m high for rear of properties
Proposed post type fence 1.2m high between properties and stream reserve and around storm water ponds
Proposed key-stone retaining wall (variable heights)
Proposed concrete footpath
Proposed decks/patio adjacent to houses
Proposed stepping stones
Proposed paving at entrance to houses
Proposed gabion basket/rock cliff/dry wall
Proposed concrete driveway and paths
Proposed paving for traffic calming areas and round islands
NOTE: This landscape master plan is indicative only in relation to the layout of the typical house garden designs. Please refer to sheets LP8-03 and LP8-04 for typical house landscape designs.
Revision
Description
Drawn
Checked
Drawing Status:
SOUL
Client: NZ Housing Foundation & Babbage
Project: West Coast Road Housing Development
Drawing Title: Landscape Master Plan and Typical Garden Layout
Drawing Number: LSP-01 Sheet 1 of 4
Job Number: SOUL-05/06-161
Scale: 1:500@A1 1:1000@A3
Date: 18/08/06
Drawn: AH
Existing fence to be retained
Proposed fence 1.8m high
WEST COAST RD
STORMWATER POND
Approximate location
Weed management and replanting done by others in this area
Existing native vegetation to be retained
Approximate location of existing culvert to be removed
Proposed culvert
10% Batter
Vegetation to be removed
Vegetation to be retained

Key
N
Soft Landscape Elements
For planting mixes refer to accompanying report
A - Proposed Ornamental Specimen Trees mostly deciduous for streets, front yards & rear property boundaries
B - Proposed native, medium to large trees for stream edge and other re-vegetation areas
C - Proposed re-vegetation of native shrubs and small tree planting mix
D - Proposed grass like, flax and herbaceous plants for wetland re-vegetation, for emergent, marginal and stream banks, wet ground
D - Proposed grass like, flax and herbaceous plants for wetland re-vegetation, for emergent, marginal and stream banks, wet ground
E - Proposed low to medium height shrub planting for reserve and garden areas including ground covers
F - Proposed sedges for ground cover in attenuation ponds
Boundary of existing vegetation (refer to arborist report)
Hard Landscape Elements
Proposed fence 0.8m high for front of properties
Proposed fence 1.8m high for rear of properties
Proposed post type fence 1.2m high between properties and stream reserve and around storm water ponds
Proposed key stone retaining wall (variable heights)
Proposed concrete footpath
Proposed steppers adjacent to houses
Proposed stepping stones
Proposed paving at entrance to houses
Proposed cabinet/insulation utilities area
Proposed concrete driveway and paths
Proposed paving for traffic calming areas and road islands
NOTE: This landscape master plan is indicative only in relation to the layout of the typical house garden designs. Please refer to sheets LPS-03 and LPS-04 for typical house landscape designs.
Revision
Description
Drawn
Checked
Drawing Status:
SOUL
Client: NZ Housing Foundation & Babbage
Project: West Coast Road Housing Development
Drawing Title: Landscape Master Plan
Drawing Number: LSP-02 Sheet 2 of 4
Job Number: SOUL-05/06-161
Scale: 1:500@A1 1:1000@A3
Date: 16/06/06
Drawn: AH
STREAM
STREAM
STREAM
ITCH PLACE
WOODBANK DRIVE
Railway
Existing canopy line of vegetation
Tree 9 (reserve)

Pool type fence 1.2m
Footpath
Batter with planting
Fence 1.8m
Fence 1.8m
Hedge 1.8m
Living
Living Court
Dining
4B
Clothes line
Optional screen fence
Kitchen
Main Entrance
Laundry
Garage
Concrete Driveway
Service Berm
Street tree
Mail Box
Service Berm
Footpath
Road
Key
N
Soft Landscape Elements
Specimen trees
Proposed hedge 0.6m High
Proposed hedge 1.35m High
Proposed hedge 1.8m High
Hard Landscape Elements
Proposed fence 0.6m high for front of properties
Proposed fence 1.35m high for between properties
Proposed fence 1.8m high for rear of properties
Proposed pool type fence 1.2m high between properties and 3M diameter reserve and around 40mm water tower
Proposed concrete footpath
Proposed decking adjacent to house
Proposed stepping stones in pebble
Proposed paving at entrance to house
Proposed concrete driveway and footpath
Proposed clothesline/outdoor utilities area
NOTE: Pavilion within each house lot has been allowed for development to have the ability to enhance built and hard landscape. What is show is for diagrammatic purposes only!
Revision Description
Drawn
Checked
Drawing Status:
SOUL
Client: NZ Housing Foundation & Babbage
Project: West Coast Road Housing Development
Drawing Title: Typical Garden Layout
House Type 4B
Drawing Number: LSP-04 Sheet 4 Of 4
Job Number: SOUL-05/06-161
Scale: 1:125@A3
Date: 19/06/06
Drawn: AH

NZ HOUSING FOUNDATION

423-429 WEST COAST ROAD, HENDERSON
HOUSING DEVELOPMENT

PLANTING SCHEDUILES

NZ Housing Foundation
Babbage Consultants

West Coast Road Housing

Planting proposal typical species for planting types A, B, C, D and E
This schedule is to be read in conjunction with the Landscape Masterplan drawing numbers LSP 01 and LSP 02

A Ornamental mostly deciduous trees for streets, front yards and rear boundaries; Each street will have a different tree to give distinction and orientation. Species to be chosen from:

Larger trees for streets/front yards where space available		**Medium trees for Front yards and Rear boundaries**		**Stock sizes**
Fraxinus oxycarpa 'Raywood'	Claret ash	*Cornus florida*	Flowering dogwod	PB40 minimum
Quercus coccinea	Pin oak	*Jacaranda mimosaefolia*	Jacaranda	PB40 minimum
Quercus rubra	Red oak	*Largestroemia indica cvs.*	Crepe myrtle	PB40 minimum
Fraxinus excelsior 'Aurea'	Golden ash	*Albizia julibrissim*	Silk tree	PB40 minimum
Paulownia tomentosa	Foxglove tree	*Magnolia x soulangeana*	magnolia	PB40 minimum
Liquidamber styraciflua	Sweet gum	*Pistacia chinensis*	Chinese pistacio	PB40 minimum
Vitex lucens	Puriri			PB40 minimum

B Native, medium to large trees, for stream edge, and other re-vegetation areas; to be chosen from:

Stream edge		**Other areas on dryer ground**		**Stock sizes**
Laurelia novae-zelandiae	pukatea	*Vitex lucens*	Puriri	PB40 minimum
Dysoxylum spectabile	kohekohe	*Podocarpus totara*	Totara	PB40 minimum
Cordyline australis	Ti kouka	*Alectryon excelsa*	titoki	PB40 minimum
Vitex lucens	Puriri	*Phyllocladus trichomanoides*	Tanekaha Celery pine	PB40 minimum
Rhopalostylis sapida	nikau	*Kunzea ericoides*	kanuka	PB40 minimum

C Re-vegetation shrub and small tree pioneer mix; to be chosen from:

Riparian areas - open and higher stream bank		Typical spacing	Other areas - outside flood plain		Spacing	Stock sizes
Cordyline australis	Ti kouka Cabbage tree	1 m	*Coprosma robusta*	karamu	1.5 m	PB3 min
Cortaderia fulvida	toetoe	1.2 m	*Aristotelia serrata*	makomako	1.2 m	PB3 min
Phormium tenax	Harakeke flax	1 m	*Sophora microphylla*	Kowhai	0.9 m	PB3 min
Leptospermum scoparium	Manuka Tee tree	1.2 m	*Coprosma lucida*	Shining karamu	1.2	PB3 min
Hoheria populnea	Houhere lacebark	1.2 m	*Cyathea medullaris*	Mamaku	1.2	PB3 min
Carpodetus serratus	Putaputa-weta marbleleaf	1 m	*Cyathea dealbata*	Ponga	1.2	PB3 min
Shefflera digitata	pate	1 m	*Leptospermum scoparium*	Manuka	1.2	PB3 min
Coprosma propinqua	mingmingi	1 m	*Myrsine australis*	Mapou Red matipo	0.9	PB3 min
Hedycaria arboria	Poro-kaiwhiri Pigeon wood	1 m	*Melicytus ramiflorus*	Mahoe whiteywood	1.2	PB3 min
			Solanum aviculare	poroporo	1..5 m	PB3 min
			Pseudopanax arboreus	Five finger Whauwhau-paku	1.2	PB3 min

D Grass like, flax like and herbaceous plants for wetland re-vegetation: for emergents, marginals and stream banks, wet ground; generally minimum stock size 1 L, typical spacing to be 750 mm apart; species to be chosen from:

Marginal emergents: marsh areas and below winter water levels		**Lower stream bank: ground above common water levels but subject to flooding**		**Upper bank: Generally moist ground with high water table and occasional flooding**	
Baumea articulata	Sedge tussock	*Blechnum novae zelandiae*	kiokio	*Dianella nigra*	Turutu
Cyperus ustulatus	Giant umbrella sedge	*Cyperus ustulatus*	Giant umbrella sedge	*Cyathea dealbata*	Ponga Silver tree fern
Baumea teretifolia		*Phormium tenax*	harakeke	*Cyatea medullaris*	Mamaku
Carex lessoniana	Rautahi	*Cortaderia fulvida*	Northern toetoe	*Carex flagellifera*	
Carex virgata	Small swampsedge	*Carex virgata*	Small swampsedge	*Carex lessoniana*	
Juncus pallidus	Giant rush	*Dicksonia squarrosa*	wheki	*Baumea tenax*	
Carex secta	purei	*Carex secta*	purei	*Phormium cookianum*	whaririki
Typha orientalis	raupo				

E Low to medium height shrub planting for reserve and garden areas, to include:

For planting adjacent to reserves	**For planting adjacent to gardens and streets**	
Coprosma repens 'Poor Knights'	*Hebe* 'First Light'	
Coprosma 'Hawerea'	*Hebe* 'Wiri Charm'	
Coprosma 'Taiko'	*Coleonema* 'Winter Charm'	
Coprosma x kirkii	*Rhaphiolepis umbellata*	
Hebe 'First Light'	*Yucca filimentosa* 'Ivory'	Specimen shrub
Hebe 'Wiri Charm'	*Felicia amelloides*	
Phormium 'Green Dwarf'	*Grevillea* 'Mt. Tambouritha'	
	Strobilanthes anisophyllus	
	Viburnum 'Emerald Lustre'	Specimen shrub
	Luculia grandifolia	Specimen shrub
	Grevillea 'Red Cloud'	

F sedges for ground cover in attenuation ponds

Scientific name	Common name			Miinimum stock size
Carex flagellifera				1 litre
Carex litorosa				
Carex comans cultivars	maurea			

Appendix 6

Earthworks Plan

WEST COAST ROAD

MEDIUM INTENSITY HOUSING SUBDIVISION

EARTHWORKS AND CIVIL CONSTRUCTION

for

NZ HOUSING FOUNDATION

SURVEYORS • ARCHITECTS • ENGINEERS

Babbage CONSULTANTS

189 PANGHARE STREET
PO BOX 3027
AUCKLAND 1 NEW ZEALAND
PHONE 09 - 379 9680 FAX 09 - 377 1170
admin@babbage.co.nz

JOB No.	42608
JUNE 2006	
DRAWING No.	42608 C00
REVISION:	CONSENT

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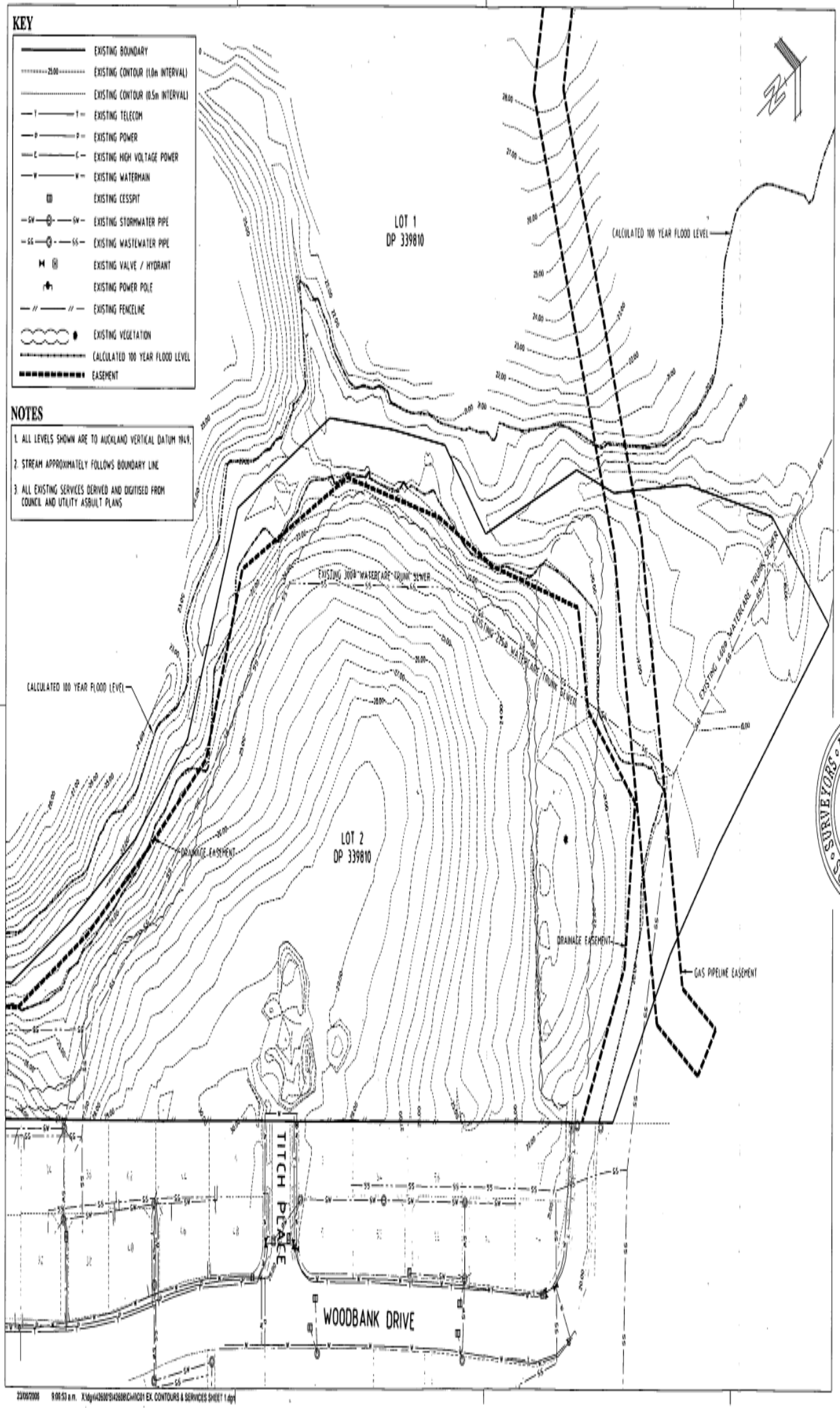

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CLIENT / PROJECT

WEST COAST ROAD HOUSING DEVELOPMENT

FOR

NZ HOUSING FOUNDATION

DRAWING TITLE

TOPOGRAPHICAL PLAN (SHEET 1)

	DATE	INITIAL
DESIGNED		
DRAWN	JUNE 2006	PK
CHECKED		
APPROVED	23/5/06	TP

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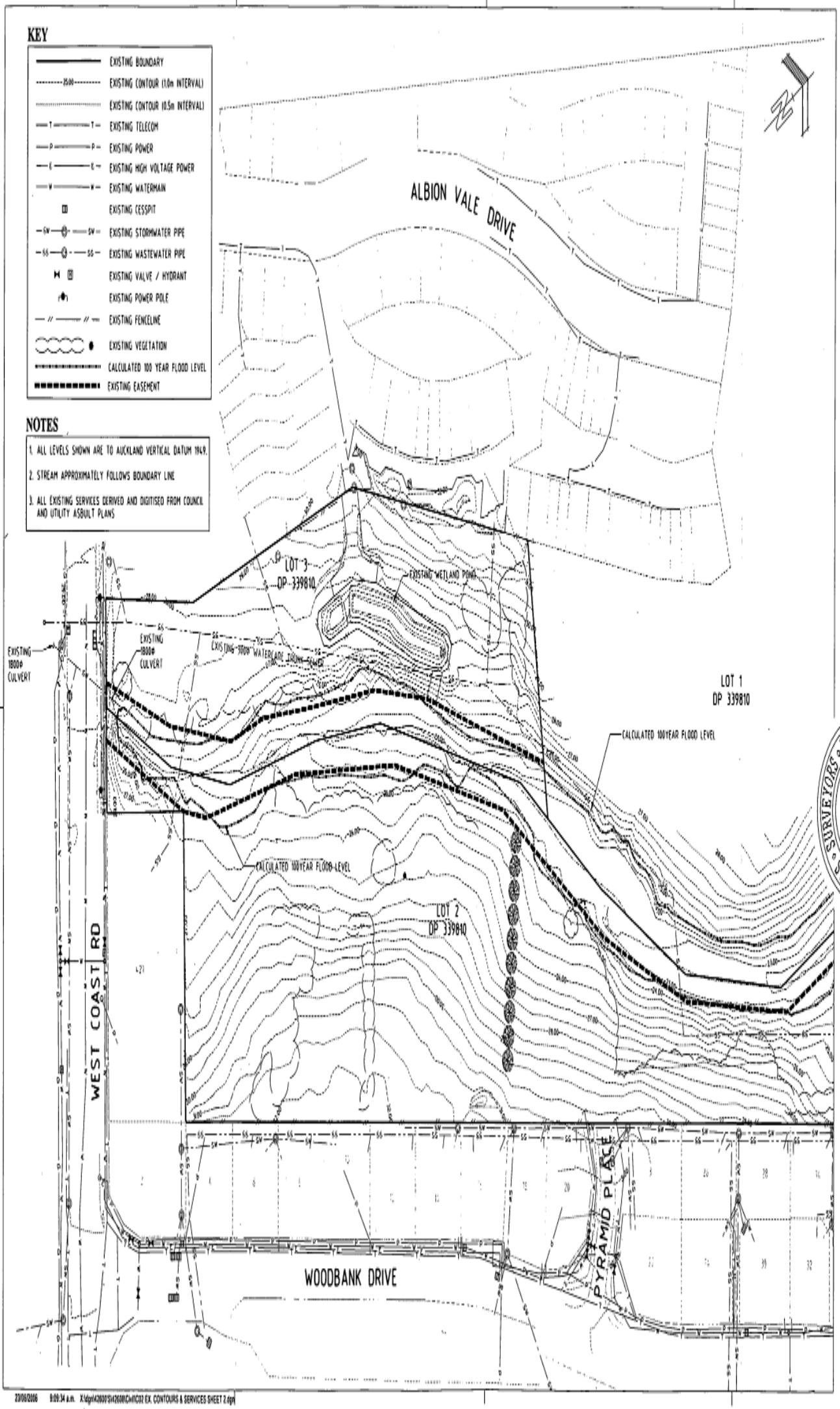

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CLIENT / PROJECT

WEST COAST ROAD HOUSING DEVELOPMENT

FOR

NZ HOUSING FOUNDATION

DRAWING TITLE

TOPOGRAPHICAL PLAN (SHEET 2)

	DATE	INITIAL
DESIGNED		
DRAWN	JUNE 2006	FK
CHECKED		
APPROVED	23/06/06	IP

SCALE (A1)

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JOB NUMBER	DRAWING NUMBER	REVISION
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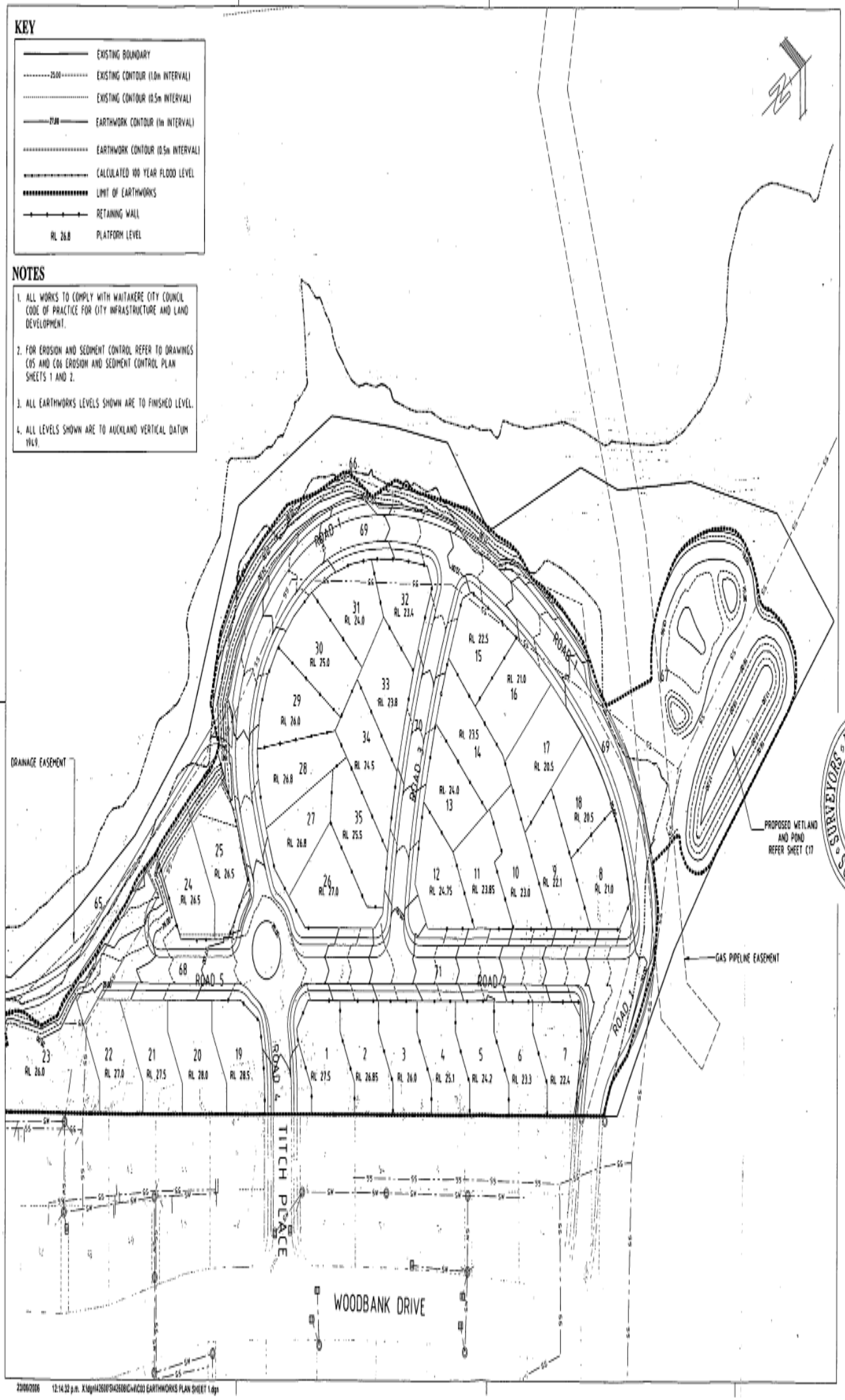

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CLIENT / PROJECT

WEST COAST ROAD HOUSING DEVELOPMENT

FOR

NZ HOUSING FOUNDATION

DRAWING TITLE

EARTHWORKS PLAN (SHEET 1)

	DATE	INITIAL
DESIGNED	JUNE 2006	FK
DRAWN	JUNE 2006	FK
CHECKED		
APPROVED	23/06/06	

SCALE (A1)

1:500

JOB NUMBER	DRAWING NUMBER	REVISION
42608	C03	-

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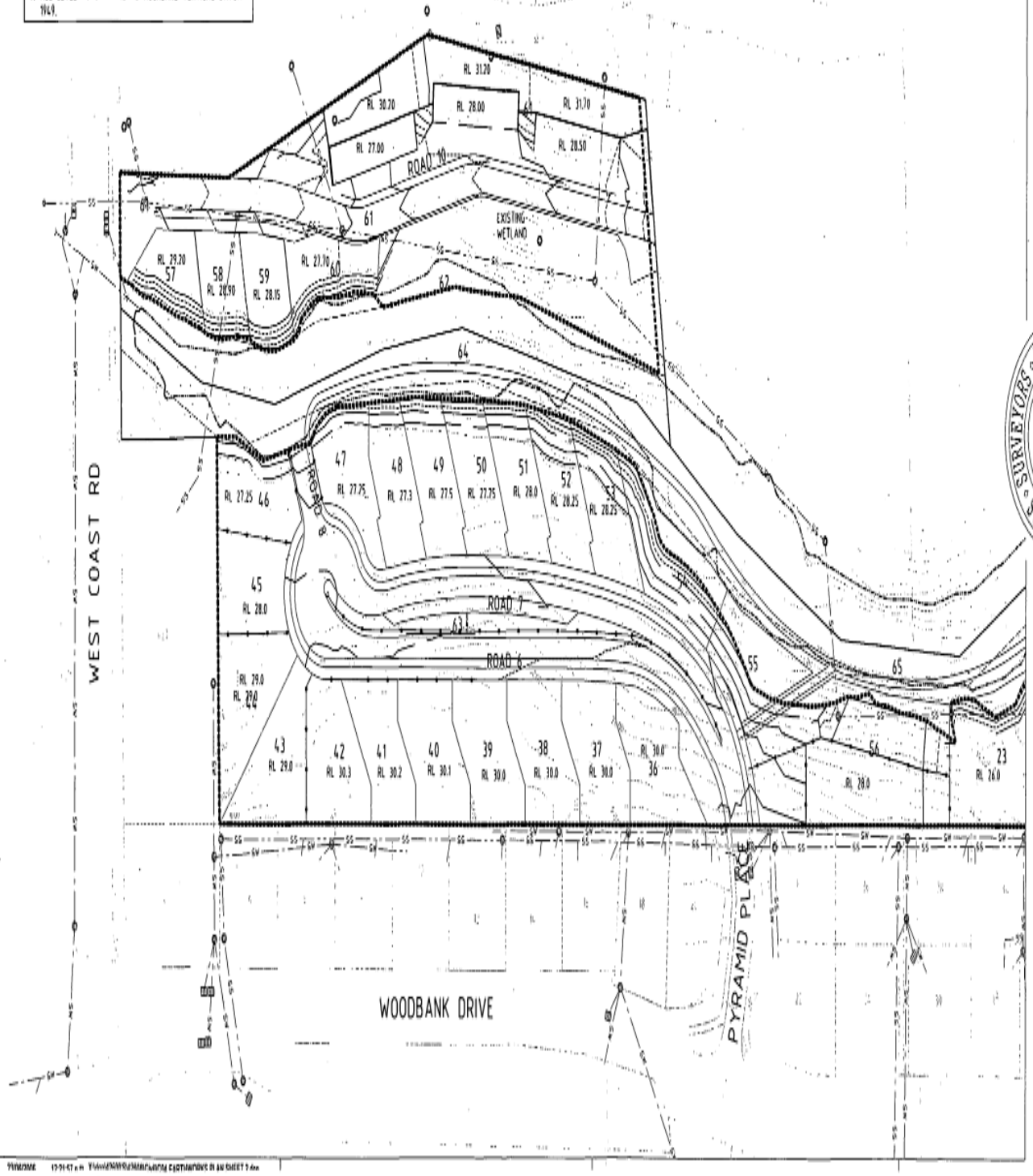
DRAWING NOTES

KEY

- EXISTING BOUNDARY
- 25.00 EXISTING CONTOUR (1.0m INTERVAL)
- EXISTING CONTOUR (0.5m INTERVAL)
- 27.00 EARTHWORK CONTOUR (1m INTERVAL)
- EARTHWORK CONTOUR (0.5m INTERVAL)
- CALCULATED 100 YEAR FLOOD LEVEL
- LIMIT OF EARTHWORKS
- RETAINING WALL
- RL 26.8 PLATFORM LEVEL

NOTES

1. ALL WORKS TO COMPLY WITH WAITAKERE CITY COUNCIL CODE OF PRACTICE FOR CITY INFRASTRUCTURE AND LAND DEVELOPMENT.
2. FOR EROSION AND SEDIMENT CONTROL REFER TO DRAWINGS C05 AND C06 EROSION AND SEDIMENT CONTROL PLAN SHEETS 1 AND 2.
3. ALL EARTHWORKS LEVELS SHOWN ARE TO FINISHED LEVEL.
4. ALL LEVELS SHOWN ARE TO AUCKLAND VERTICAL DATUM 1949.



REV	DATE	DESCRIPTION	DRAWN	CHECK

DRAWING REVISIONS

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CLIENT / PROJECT

WEST COAST ROAD HOUSING DEVELOPMENT

FOR

NZ HOUSING FOUNDATION

DRAWING TITLE

EARTHWORKS PLAN (SHEET 2)

	DATE	INITIAL
DESIGNED	JUNE 2006	FK
DRAWN	JUNE 2006	FK
CHECKED		
APPROVED	23/06/06	

SCALE (A1)

1:500

JOB NUMBER	DRAWING NUMBER	REVISION
42608	C04	-

Appendix 5

Subdivision Plan

EXISTING EASEMENTS IN GROSS

PURPOSE	SERVIENT TENEMENT	CREATED BY	GRANTEE
OIL AND GAS SUPPLY	LOT 2 DP 339810	B344219.1	NATURAL GAS CORPORATION OF NEW ZEALAND LTD.
DRAINAGE	LOTS 2 AND 3 DP 339810	6135712.4	WAITAKERE CITY COUNCIL
STORMWATER DETENTION AND DRAINAGE	LOT 3 DP 339810	6070221.2	
RIGHT OF WAY	LOT 3 DP 339810	6070221.1	

PROPOSED EASEMENTS

PURPOSE	SHOWN	SERVIENT TENEMENT	DOMINANT TENEMENT
RIGHT OF WAY RIGHT TO SUPPLY TELECOM, WATER, ELECTRICITY AND GAS	(A)	LOT 61 HEREON	LOTS 57, 58, 59 AND 60 HEREON

PROPOSED EASEMENTS IN GROSS

PURPOSE	SHOWN	GRANTEE
RIGHT OF WAY	(A) (B)	WAITAKERE CITY COUNCIL

AREA SCHEDULE

LOTS 1 - 61 INCL.	RESIDENTIAL	2.8682ha
LOTS 62 AND 64 - 67 INCL.	LOCAL PURPOSE (DRAINAGE) RESERVE TO VEST	1.6040ha
LOTS 63 AND 68 - 71 INCL.	ROAD TO VEST	1.2449ha
	TOTAL =	5.7171ha

KEY

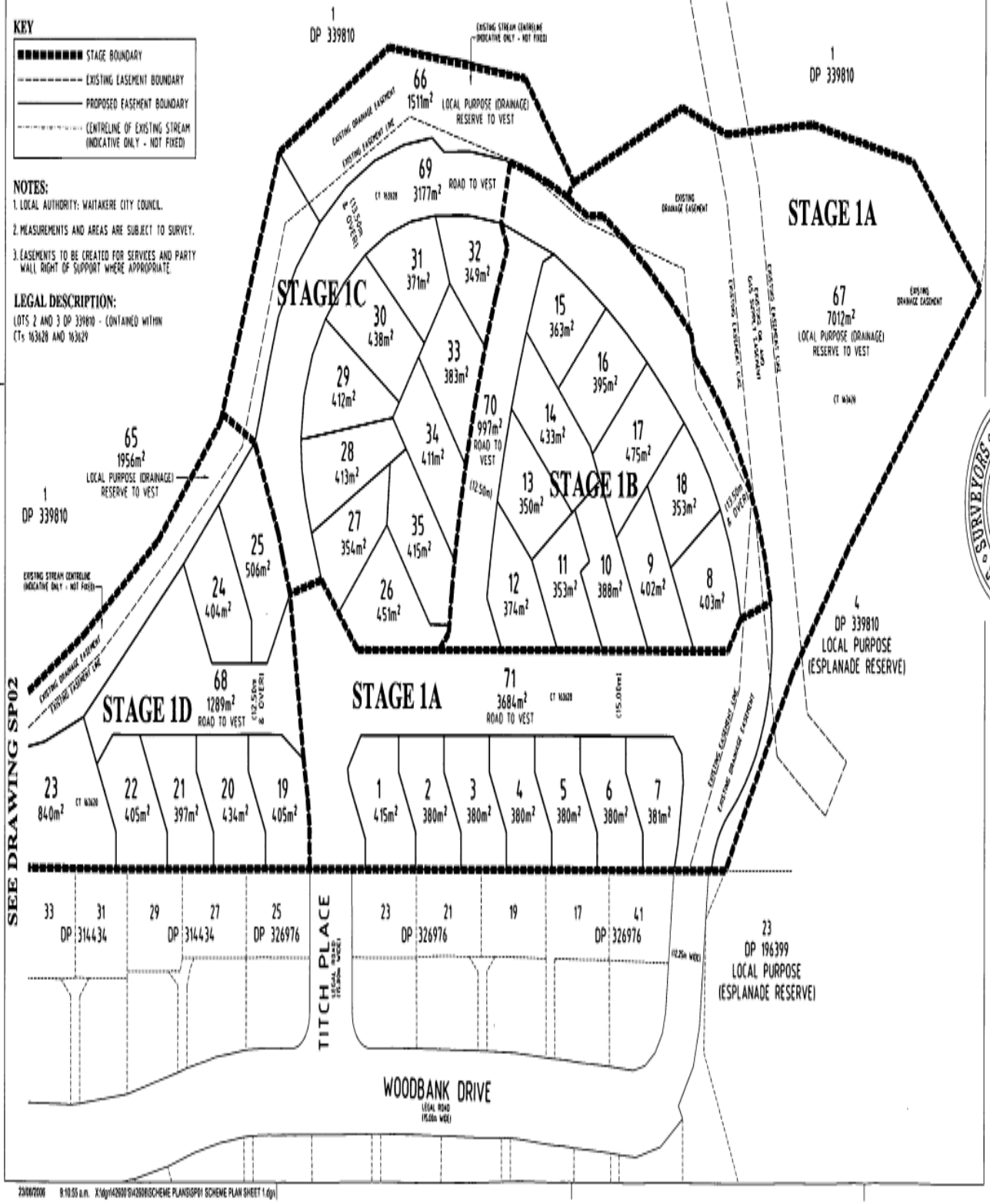
- STAGE BOUNDARY
- EXISTING EASEMENT BOUNDARY
- PROPOSED EASEMENT BOUNDARY
- CENTRELINE OF EXISTING STREAM (INDICATIVE ONLY - NOT FIXED)

NOTES:

1. LOCAL AUTHORITY: WAITAKERE CITY COUNCIL.
2. MEASUREMENTS AND AREAS ARE SUBJECT TO SURVEY.
3. EASEMENTS TO BE CREATED FOR SERVICES AND PARTY WALL RIGHT OF SUPPORT WHERE APPROPRIATE.

LEGAL DESCRIPTION:

LOTS 2 AND 3 DP 339810 - CONTAINED WITHIN CTs 163628 AND 163629



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DRAWING NOTES

REV	DATE	DESCRIPTION	DRAWN	CHECK

DRAWING REVISIONS

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Babbage CONSULTANTS
109 FANSHAWE STREET
PO BOX 2027
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PHONE 09 - 379 6660 - FAX 09 - 377 1170
admin@babbage.co.nz

CLIENT / PROJECT

WEST COAST ROAD HOUSING DEVELOPMENT

FOR

NZ HOUSING FOUNDATION

DRAWING TITLE

PROPOSED SUBDIVISION OF LOTS 2 AND 3 DP 339810 (SHEET 1 OF 2)

	DATE	INITIAL
DESIGNED	JUNE 2006	JA
DRAWN	JUNE 2006	MJD
CHECKED	23.06.06	KM
APPROVED	23.06.06	LP

SCALE (A1)

1:500

JOB NUMBER	DRAWING NUMBER	REVISION
42608	SP01	-

23/06/2006 9:10:55 a.m. X:\dgn\42600\51\42608\SCHEME PLANS\SP01 SCHEME PLAN SHEET 1.dgn

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DRAWING NOTES

PROPOSED EASEMENTS

PURPOSE	SHOWN	SERVIENT TENEMENT	DOMINANT TENEMENT
RIGHT OF WAY RIGHT TO SUPPLY TELECOM, WATER, ELECTRICITY AND GAS	(A)	LOT 61 HEREON	LOTS 57, 58, 59 AND 60 HEREON

PROPOSED EASEMENTS IN GROSS

PURPOSE	SHOWN	GRANTEE
RIGHT OF WAY	(A) (B)	WAITAKERE CITY COUNCIL

EXISTING EASEMENTS IN GROSS

PURPOSE	SERVIENT TENEMENT	CREATED BY	GRANTEE
OIL AND GAS SUPPLY	LOT 2 DP 339810	B344219.1	NATURAL GAS CORPORATION OF NEW ZEALAND LTD.
DRAINAGE	LOTS 2 AND 3 DP 339810	6135712.4	WAITAKERE CITY COUNCIL
STORMWATER DETENTION AND DRAINAGE	LOT 3 DP 339810	6070221.2	
RIGHT OF WAY	LOT 3 DP 339810	6070221.1	

AREA SCHEDULE

LOTS 1 - 61 INCL.	RESIDENTIAL	2.8682ha
LOTS 62 AND 64 - 67 INCL.	LOCAL PURPOSE (DRAINAGE) RESERVE TO VEST	1.6040ha
LOTS 63 AND 68 - 71 INCL.	ROAD TO VEST	1.2449ha
	TOTAL ±	5.717ha

KEY

- STAGE BOUNDARY
- EXISTING EASEMENT BOUNDARY
- PROPOSED EASEMENT BOUNDARY
- CENTRELINE OF EXISTING STREAM INDICATIVE ONLY - NOT FIXED!

NOTES:

1. LOCAL AUTHORITY: WAITAKERE CITY COUNCIL.
2. MEASUREMENTS AND AREAS ARE SUBJECT TO SURVEY.
3. EASEMENTS TO BE CREATED FOR SERVICES AND PARTY WALL RIGHT OF SUPPORT WHERE APPROPRIATE.

LEGAL DESCRIPTION:

LOTS 2 AND 3 DP 339810 - CONTAINED WITHIN CTs 163628 AND 163629

REV	DATE	DESCRIPTION	DRAWN	CHECK

DRAWING REVISIONS

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CLIENT / PROJECT

WEST COAST ROAD HOUSING DEVELOPMENT

FOR

NZ HOUSING FOUNDATION

DRAWING TITLE

PROPOSED SUBDIVISION OF LOTS 2 AND 3 DP 339810 (SHEET 2 OF 2)

	DATE	INITIAL
DESIGNED	JUNE 2006	JA
DRAWN	JUNE 2006	MJD
CHECKED	23/06/06	RM
APPROVED	23/06/06	

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42608	SP02	-

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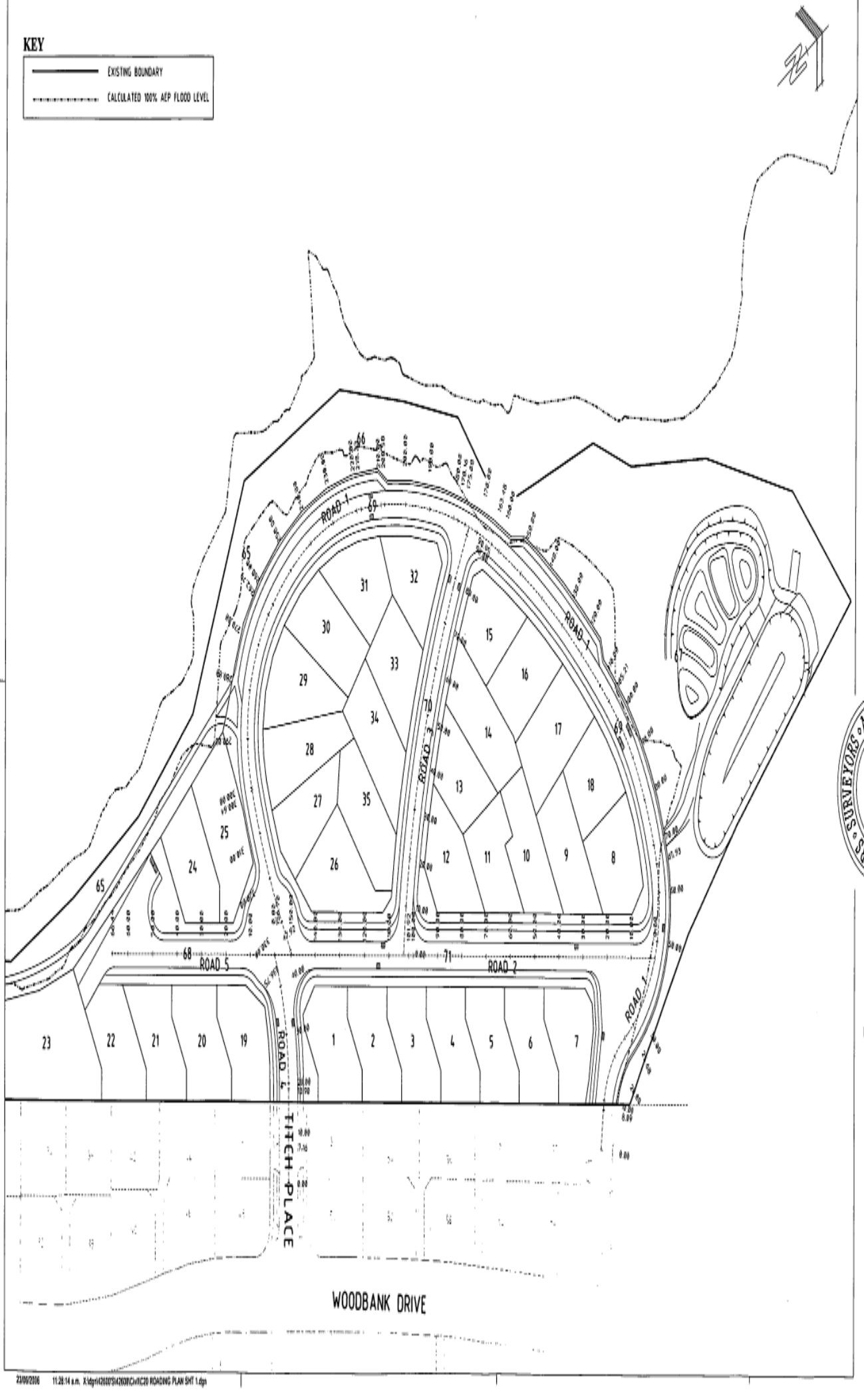
KEY

EXISTING BOUNDARY

CALCULATED 100% AEP FLOOD LEVEL



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CLIENT / PROJECT

WEST COAST ROAD
HOUSING DEVELOPMENT

FOR

NZ HOUSING FOUNDATION

DRAWING TITLE

ROADING PLAN
(SHEET 1)

	DATE	INITIAL
DESIGNED	JUNE 2006	FK
DRAWN	JUNE 2006	CW
CHECKED		
APPROVED	23/06/06	

SCALE (A1)

1:500

JOB NUMBER	DRAWING NUMBER	REVISION
42608	C20	-

23/06/2006 11:28:14 a.m. X:\dgn\42600\42608\Civil\C20 ROADING PLAN SHT 1.dgn

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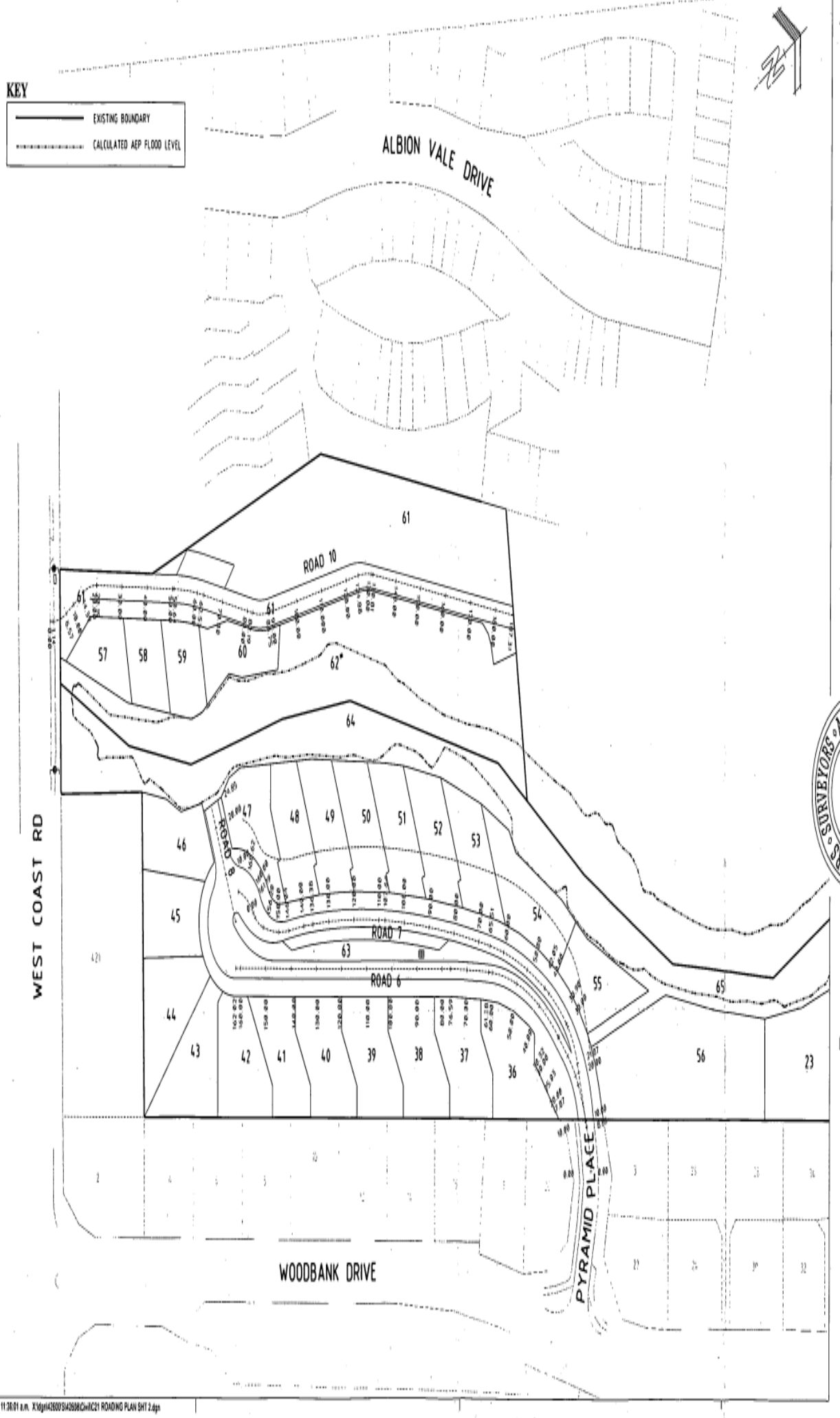

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CLIENT / PROJECT

WEST COAST ROAD
HOUSING DEVELOPMENT

FOR

NZ HOUSING FOUNDATION

DRAWING TITLE

ROADING PLAN (SHEET 2)

	DATE	INITIAL
DESIGNED	JUNE 2006	PK
DRAWN	JUNE 2006	GW
CHECKED		
APPROVED	23/06/06	

SCALE (A1)

1:500

JOB NUMBER	DRAWING NUMBER	REVISION
42608	C21	-

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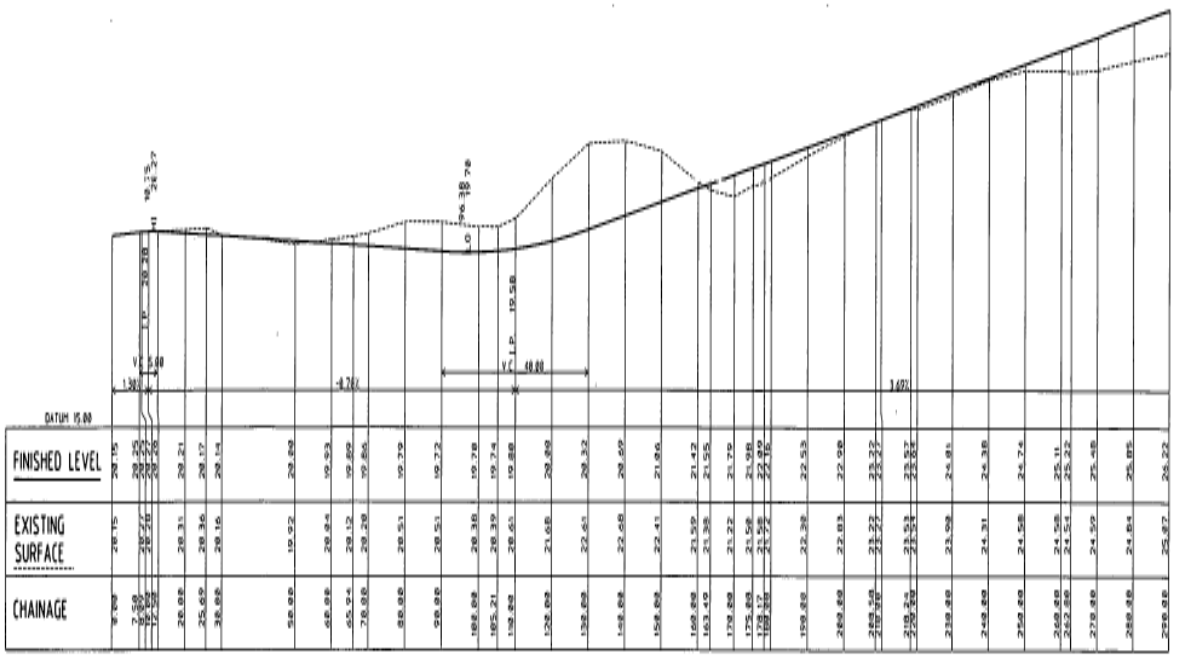
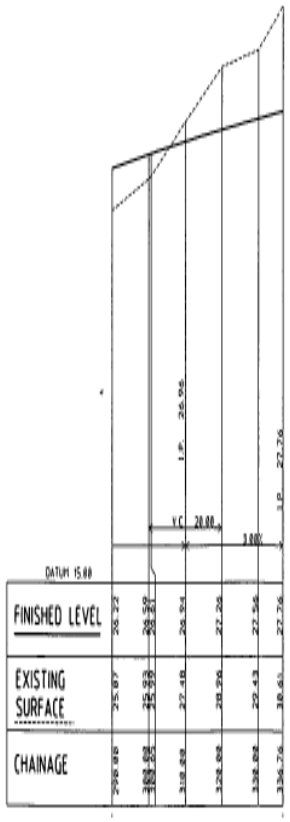


ROAD 1 LONGITUDINAL SECTION



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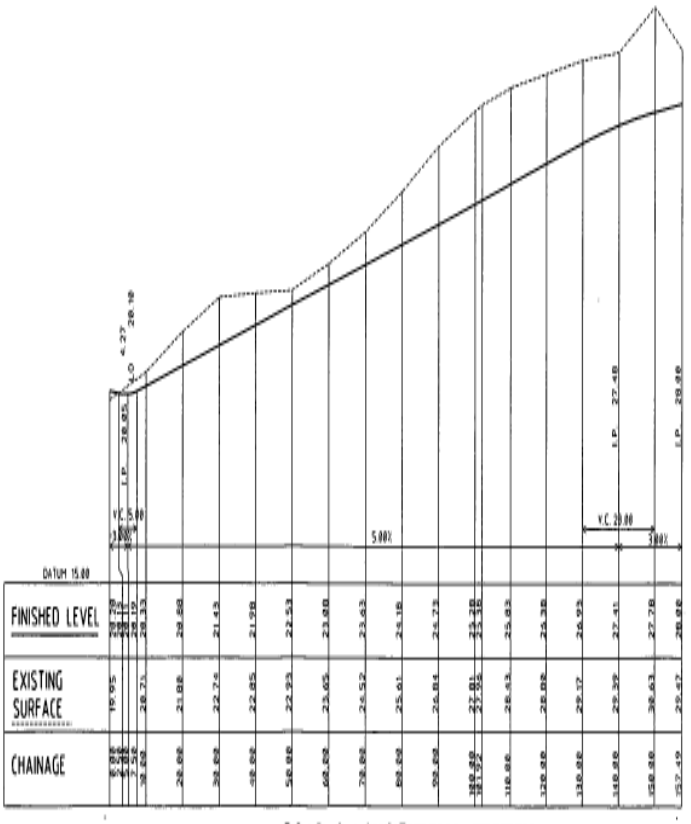

ROAD 2 LONGITUDINAL SECTION

REV	DATE	DESCRIPTION	DRAWN	CHECK

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CLIENT / PROJECT

WEST COAST ROAD HOUSING DEVELOPMENT

FOR

NZ HOUSING FOUNDATION

DRAWING TITLE

ROAD LONGITUDINAL SECTIONS (SHEET 1)

	DATE	INITIAL
DESIGNED	JUNE 06	FK
DRAWN	JUNE 06	GW
CHECKED		
APPROVED	23/06/06	IP

SCALE (A1)

HORT 1:500 VERT 1:100

JOB NUMBER	DRAWING NUMBER	REVISION
42608	C22	-

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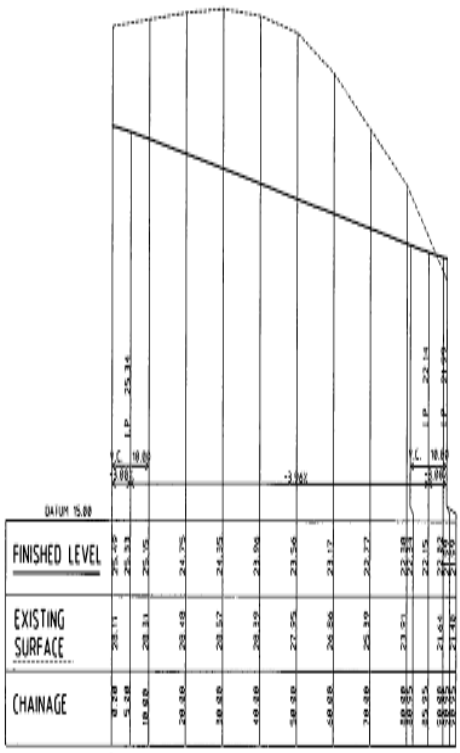

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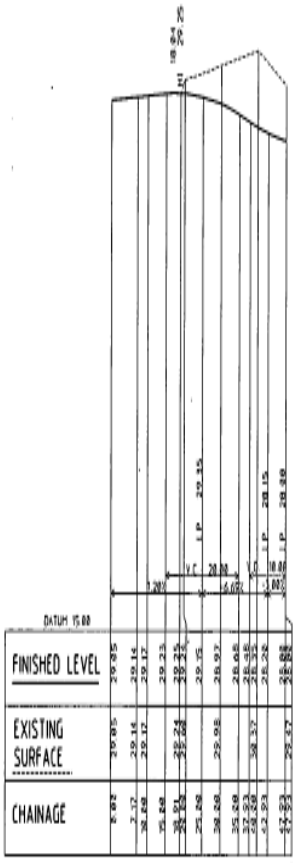

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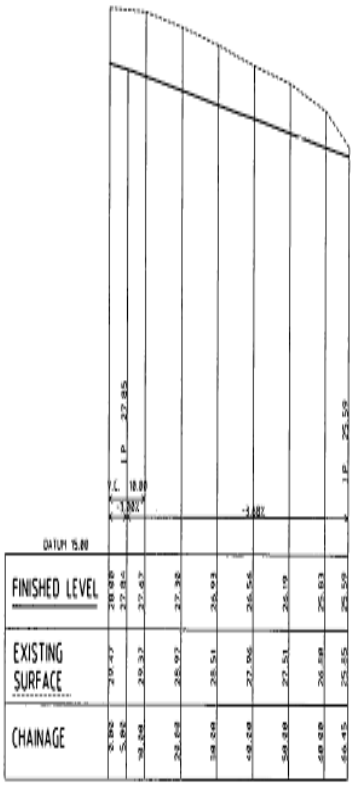
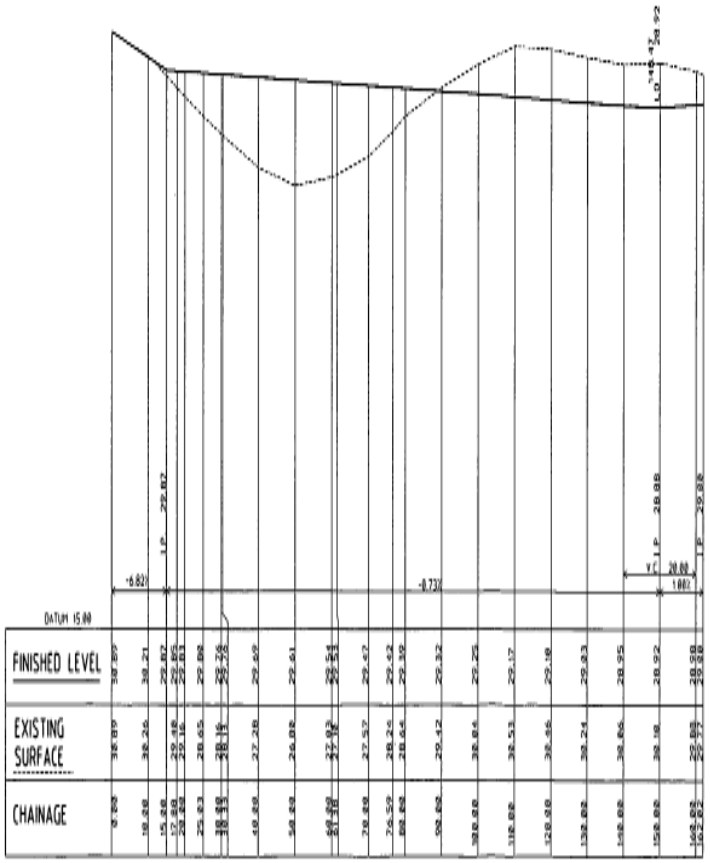


ROAD 5 LONGITUDINAL SECTION

REV	DATE	DESCRIPTION	DRAWN	CHECK

DRAWING REVISIONS



ROAD 6 LONGITUDINAL SECTION

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CLIENT / PROJECT

WEST COAST ROAD HOUSING DEVELOPMENT

FOR

NZ HOUSING FOUNDATION

DRAWING TITLE

ROAD LONGITUDINAL SECTIONS (SHEET 2)

	DATE	INITIAL
DESIGNED	JUNE 06	FK
DRAWN	JUNE 06	GW
CHECKED		
APPROVED	23/06/06	

SCALE (A1)

HORT 1:500 VERT 1:100

JOB NUMBER	DRAWING NUMBER	REVISION
42608	C23	-

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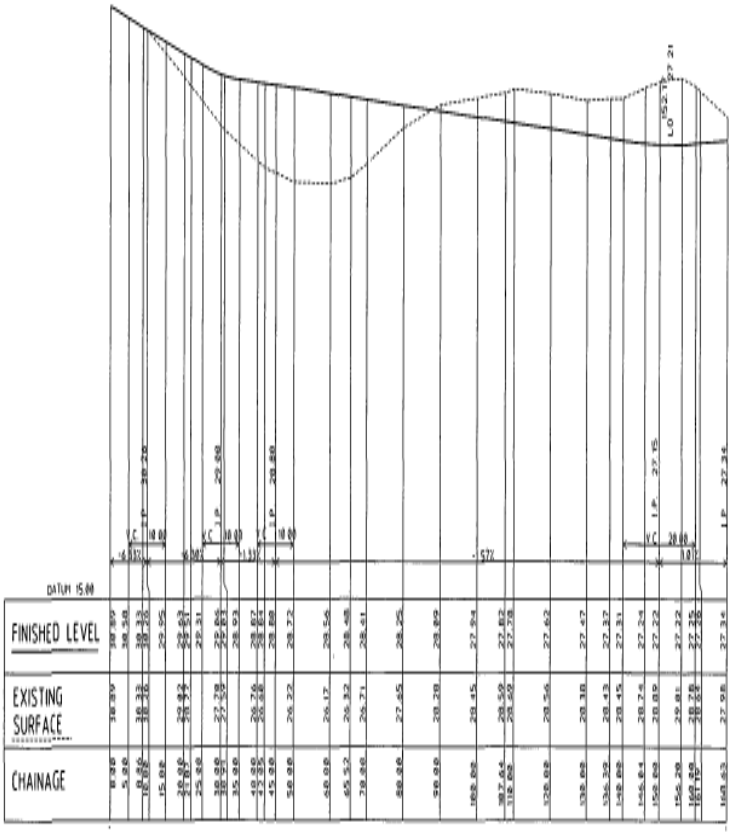

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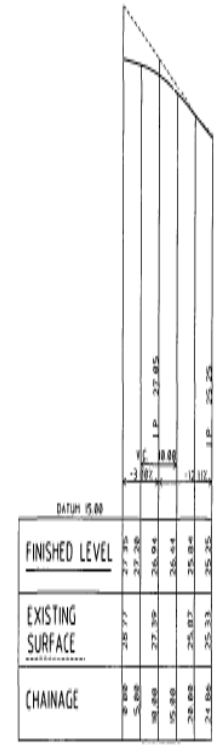

ROAD 8 LONGITUDINAL SECTION

REV	DATE	DESCRIPTION	DRAWN	CHECK

DRAWING REVISIONS

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CLIENT / PROJECT

WEST COAST ROAD HOUSING DEVELOPMENT

FOR

NZ HOUSING FOUNDATION

DRAWING TITLE

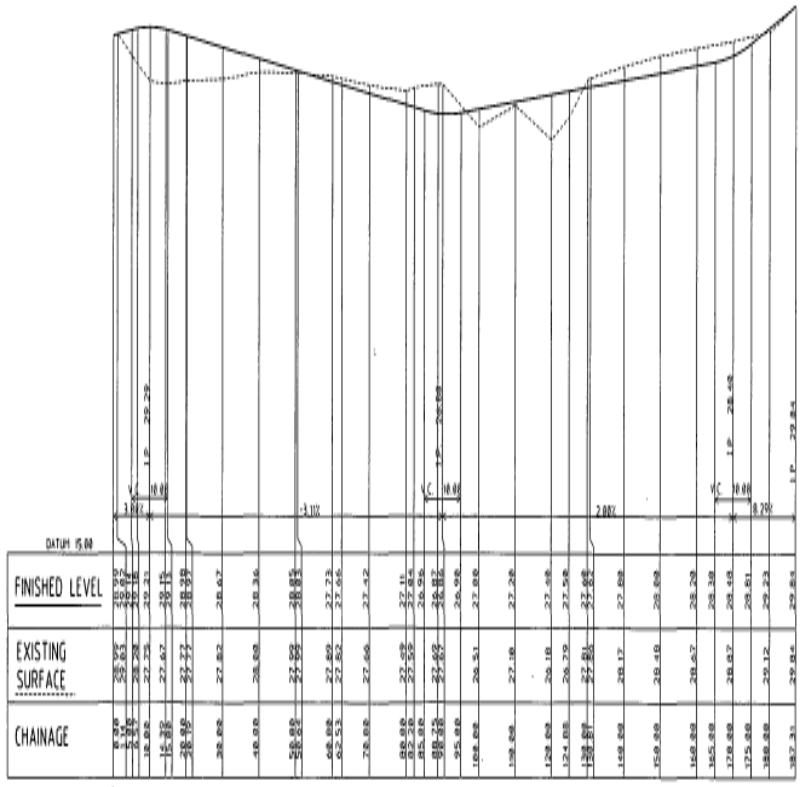
ROAD LONGITUDINAL SECTIONS (SHEET 3)

	DATE	INITIAL
DESIGNED	JUNE 06	FK
DRAWN	JUNE 06	GW
CHECKED		
APPROVED	23/06/06	

SCALE (A1)

HORT 1:500 VERT 1:100

JOB NUMBER	DRAWING NUMBER	REVISION
42608	C24	-



ROAD 10 LONGITUDINAL SECTION

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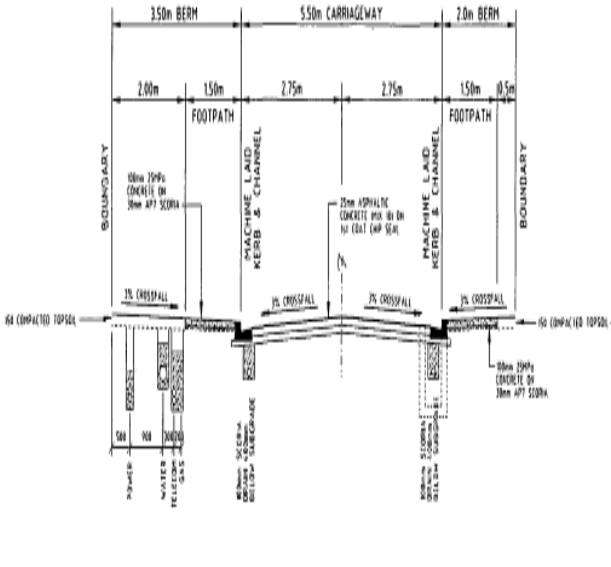

TYPICAL CROSS SECTION ROAD 1
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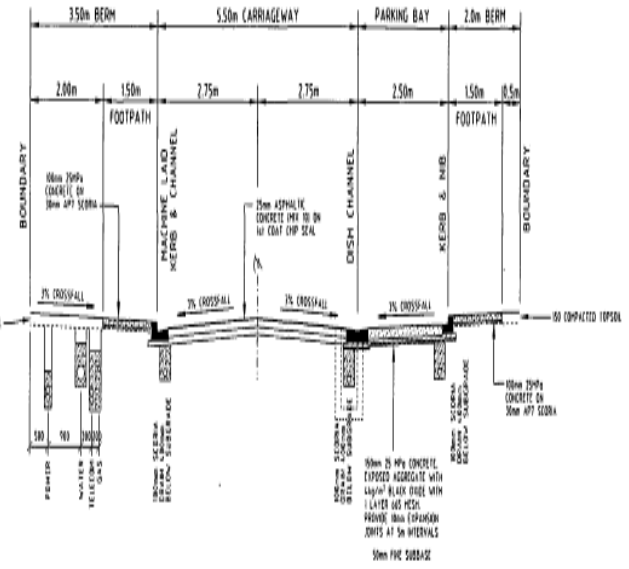

TYPICAL CROSS SECTION ROAD 1
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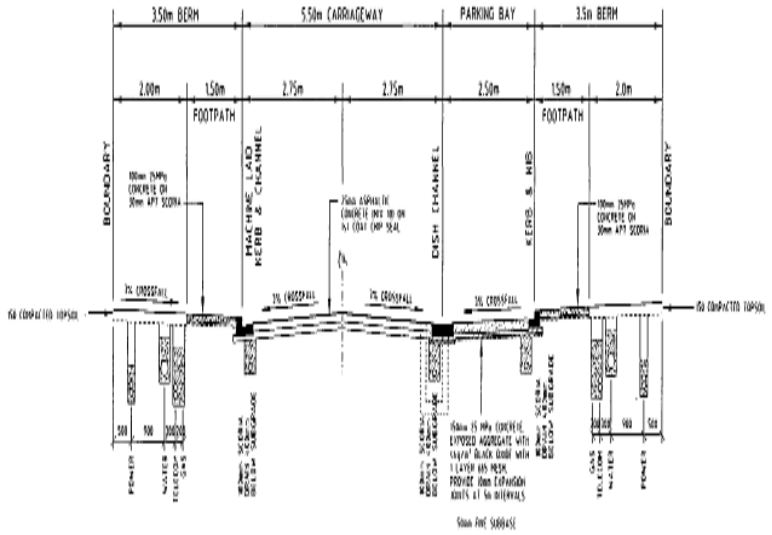
REV	DATE	DESCRIPTION	DRAWN	CHECK

DRAWING REVISIONS



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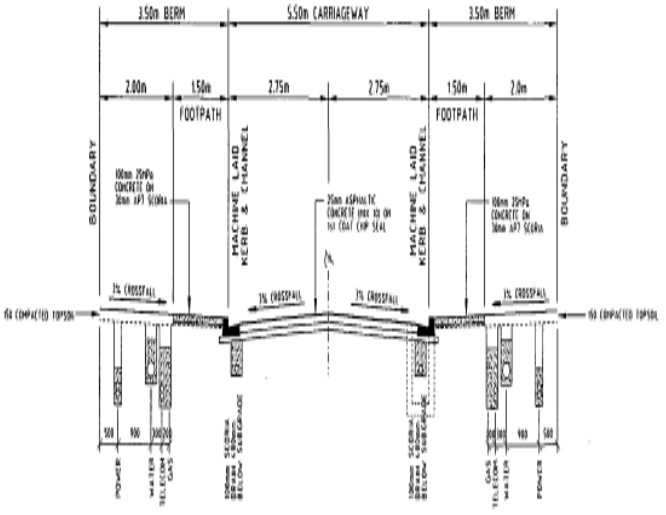

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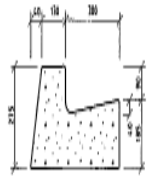
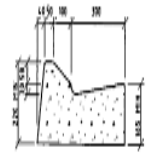
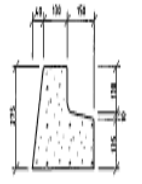


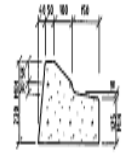
VERTICAL KERB & CHANNEL



MOUNTABLE KERB & CHANNEL



VERTICAL KERB & NIB



MOUNTABLE KERB & NIB

INSITU KERB DETAILS
SCALE 1:10

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CLIENT / PROJECT
WEST COAST ROAD
HOUSING DEVELOPMENT
FOR
NZ HOUSING FOUNDATION

DRAWING TITLE
ROAD
CROSS SECTIONS
(SHEET 1)

	DATE	INITIAL
DESIGNED	JUNE 2006	FK
DRAWN	JUNE 2006	DB
CHECKED		
APPROVED	23/06/06	

SCALE (A1)
1:50

JOB NUMBER	DRAWING NUMBER	REVISION
42608	C25	-

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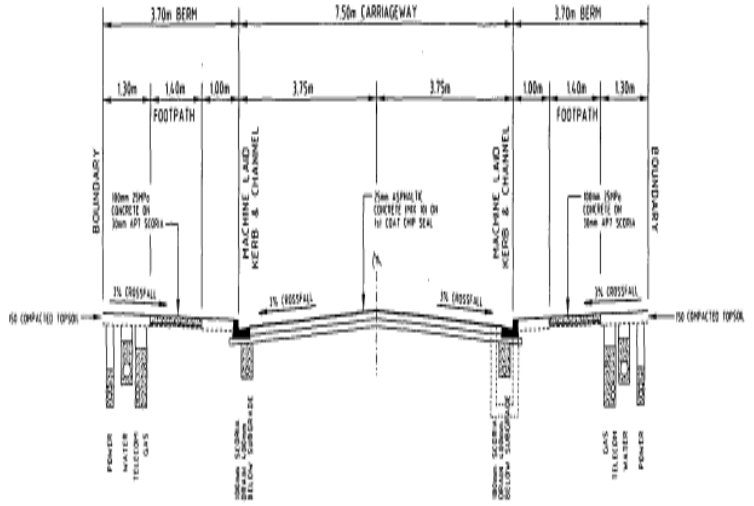

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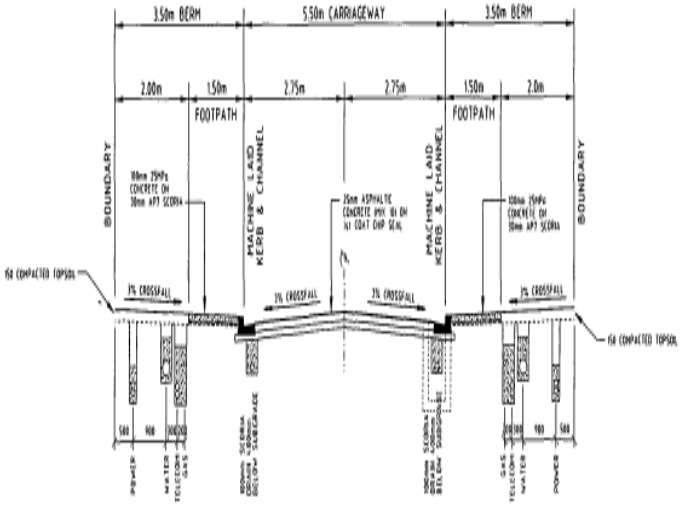

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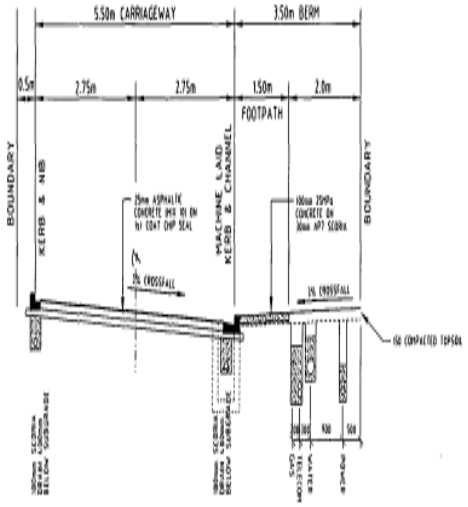

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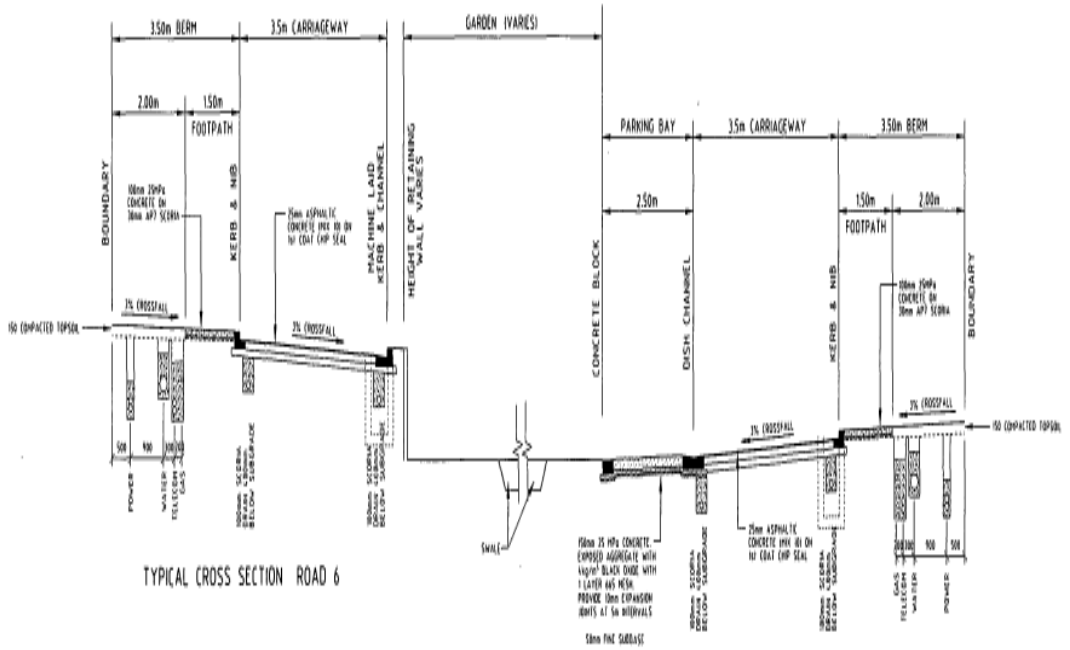

TYPICAL CROSS SECTION ROAD 6

TYPICAL CROSS SECTION ROAD 7

REV	DATE	DESCRIPTION	DRAWN	CHECK

DRAWING REVISIONS

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admin@babbage.co.nz

CLIENT / PROJECT

WEST COAST ROAD HOUSING DEVELOPMENT

FOR

NZ HOUSING FOUNDATION

DRAWING TITLE

ROAD CROSS SECTIONS (SHEET 2)

	DATE	INITIAL
DESIGNED	JUNE 2006	FK
DRAWN	JUNE 2006	GB
CHECKED		
APPROVED	23/06/06	

SCALE (A1)

1:50

JOB NUMBER	DRAWING NUMBER	REVISION
42608	C26	-

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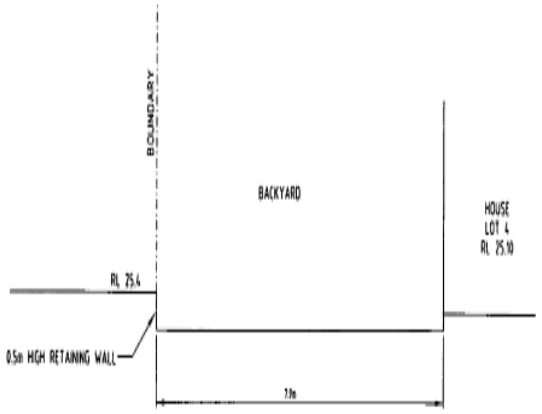
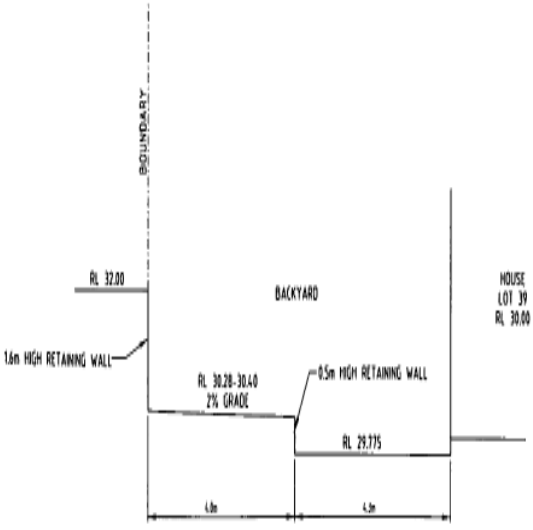
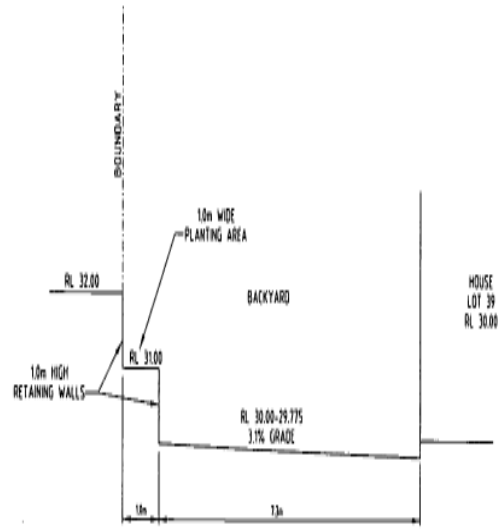


SECTION A-A



SECTION B-B
OPTION ONE



SECTION B-B
OPTION TWO

REV	DATE	DESCRIPTION	DRAWN	CHECK

DRAWING REVISIONS

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109 FANSHAWE STREET
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CLIENT / PROJECT

WEST COAST ROAD
HOUSING DEVELOPMENT

FOR

NZ HOUSING FOUNDATION

DRAWING TITLE

RETAINING WALL SECTIONS ALONG EASTERN BOUNDARY

	DATE	INITIAL
DESIGNED	AUG 2008	FK
DRAWN	AUG 2008	FK
CHECKED	AUG 2008	DR
APPROVED		

SCALE (A1)

1:50

JOB NUMBER	DRAWING NUMBER	REVISION
42608	M01	-

Appendix 4

Architectural Plans

D O C U M E N T R E G I S T E R

Housing Development

Job No: 42608

West Coast Rd (No. 423-429), Henderson

Babbage CONSULTANTS

Find attached the following documents / drawings:

TYPE : Resource Consent Drawings	Day	20	23								
	Month	06	06								
	Year	06	06								

REGISTER

Reference	Title	Revision									
	SITE PLANS										
A001	Site Plan	X	X								
A002	Stage 1A & 1B	X	X								
A003	Stage 1C & 1D	X	X								
A004	Stage 2A & 2B	X	X								
A005	Stage 3	X	X								
	HOUSE PLANS										
A101	House Type 1	X	X								
A102-1	House Type 2A – sheet 1	X	X								
A102-2	House Type 2A – sheet 2	X	X								
A103-1	House Type 2B – sheet 1	X	X								
A103-2	House Type 2B – sheet 2	X	X								
A104 -1	House Type 2C – sheet 1	X	X								
A104-2	House Type 2C – sheet 2	X	X								
A105	House Type 3	X	X								
A106	House Type 4A	X	X								
A107	House Type 4B	X	X								
A108	House Type 4C	X	X								
A109	House Type 5A	X	X								
A110	House Type 5B	X	X								
A111	House Type 5C	X	X								
	HOUSE ELEVATIONS										
A201	House Type 1	X	X								
A202-1	House Type 2A – sheet 1	X	X								
A202-2	House Type 2A – sheet 2	X	X								
A203-1	House Type 2B – sheet 1	X	X								
A203-2	House Type 2B – sheet 2	X	X								
A203-3	House Type 2B – sheet 3	X	X								
A204-1	House Type 2C – sheet 1	X	X								
A204-2	House Type 2C – sheet 2	X	X								
A205	House Type 3	X	X								
A206	House Type 4A	X	X								
A207	House Type 4B	X	X								
A208	House Type 4C	X	X								
A209	House Type 5A	X	X								
A210-1	House Type 5B – sheet 1	X	X								
A210-2	House Type 5B – sheet 2	X	X								
A211-1	House Type 5C – sheet 1	X	X								
	STREET ELEVATIONS / SECTIONS										
A301	Street Elevation – sheet 1	X	X								
A302	Street Elevation – sheet 2	X	X								

SENT: SURFACE MAIL ☐ FAST POST ✓ COURIER OTHER

[redacted]

BDOC02876500

Babbage Consultants Limited, P O Box 2027, 109 Fanshawe Street, Auckland 1, New Zealand - Phone + (09) 379 9980 Fax + (09) 377 1170

A303	Street Elevation – sheet 3	X	X								
A304	Stage 1A Bulk & Location Study	X	X								
A305	Stage 1B Bulk & Location Study	X	X								
A306	Stage 1B Bulk & Location Study	X	X								
A307	Stage 1C Bulk & Location Study	X	X								
A308	Stage 1C Bulk & Location Study	X	X								
A309	Stage 1D Bulk & Location Study	X	X								
A310	Stage 2A Bulk & Location Study	X	X								
A311	Stage 2A & 2B Bulk & Location Study	X	X								
A312	Stage 2B Bulk & Location Study	X	X								
A313	Stage 3 Bulk & Location Study	X	X								
A401	Coverage Calculations	X	X								
Soul Report	Soul Visual Assessment Report 19.06.06	X	X								

DISTRIBUTION	No. of Copies (A1/A3)									
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Project Manager	1									
Council		8								
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It is the responsibility of the recipient to either mark 'Superseded' on or destroy superseded versions of the accompanying document(s) and to notify the sender if information is incorrect or incomplete.

WEST COAST RD
HOUSING DEVELOPMENT
EARTHWORKS LOCATION STUDY

SITE PLAN

BabBape

42606

HOUSE KEY

ANNOTATION KEY

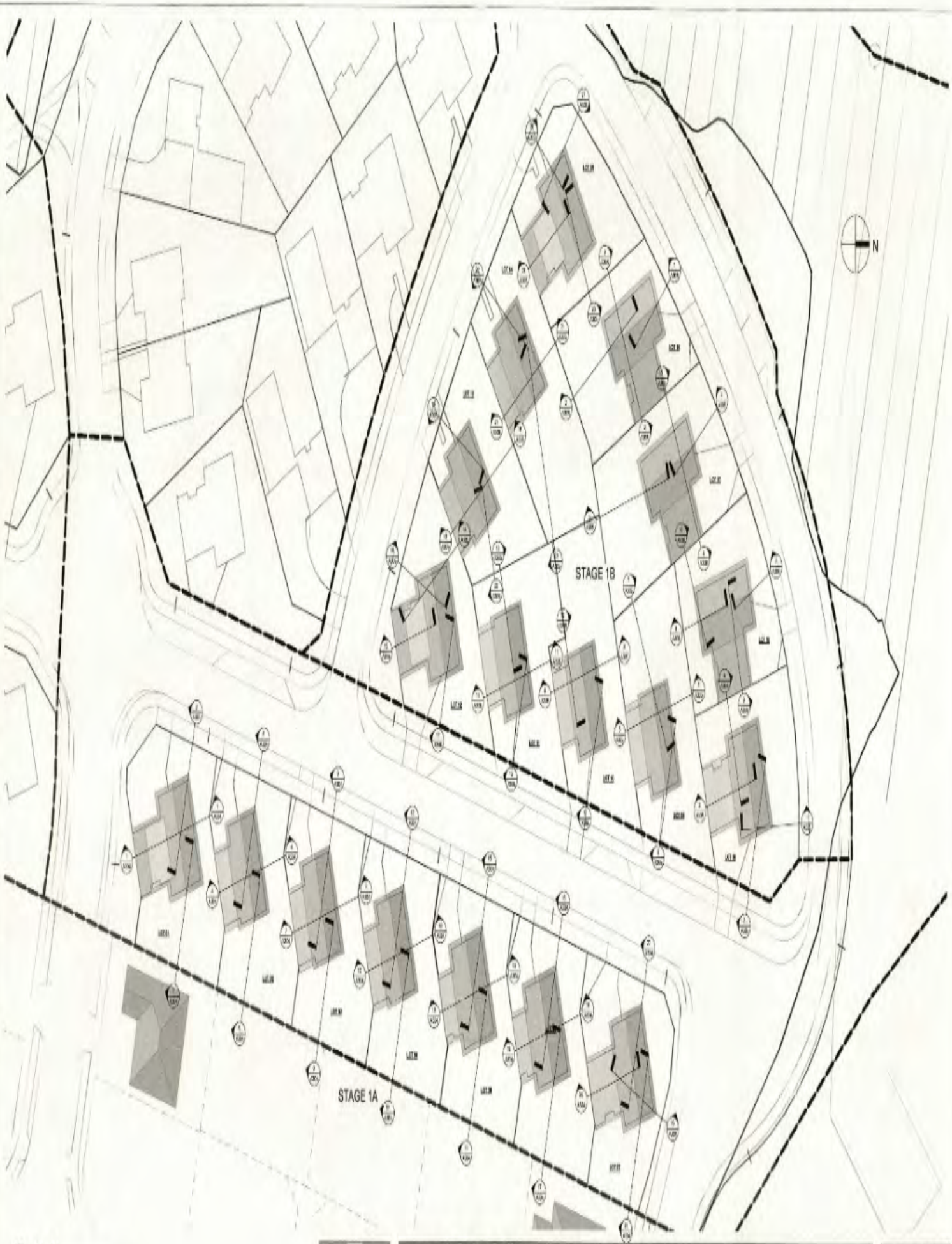
STAGE 1A

STAGE 1B

STAGE 1C

WEST COAST RD
HOUSING DEVELOPMENT
BULK & LOCATION STUDY

SITE PLAN



1 / A002 Site 1A
1 500

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42608

WEST COAST ROAD HOUSING DEVELOPMENT

BULK & LOCATION STUDY

SITE PLAN STAGE 1A & 1B

rev A002

1 / A003 Site 1B
1 : 500

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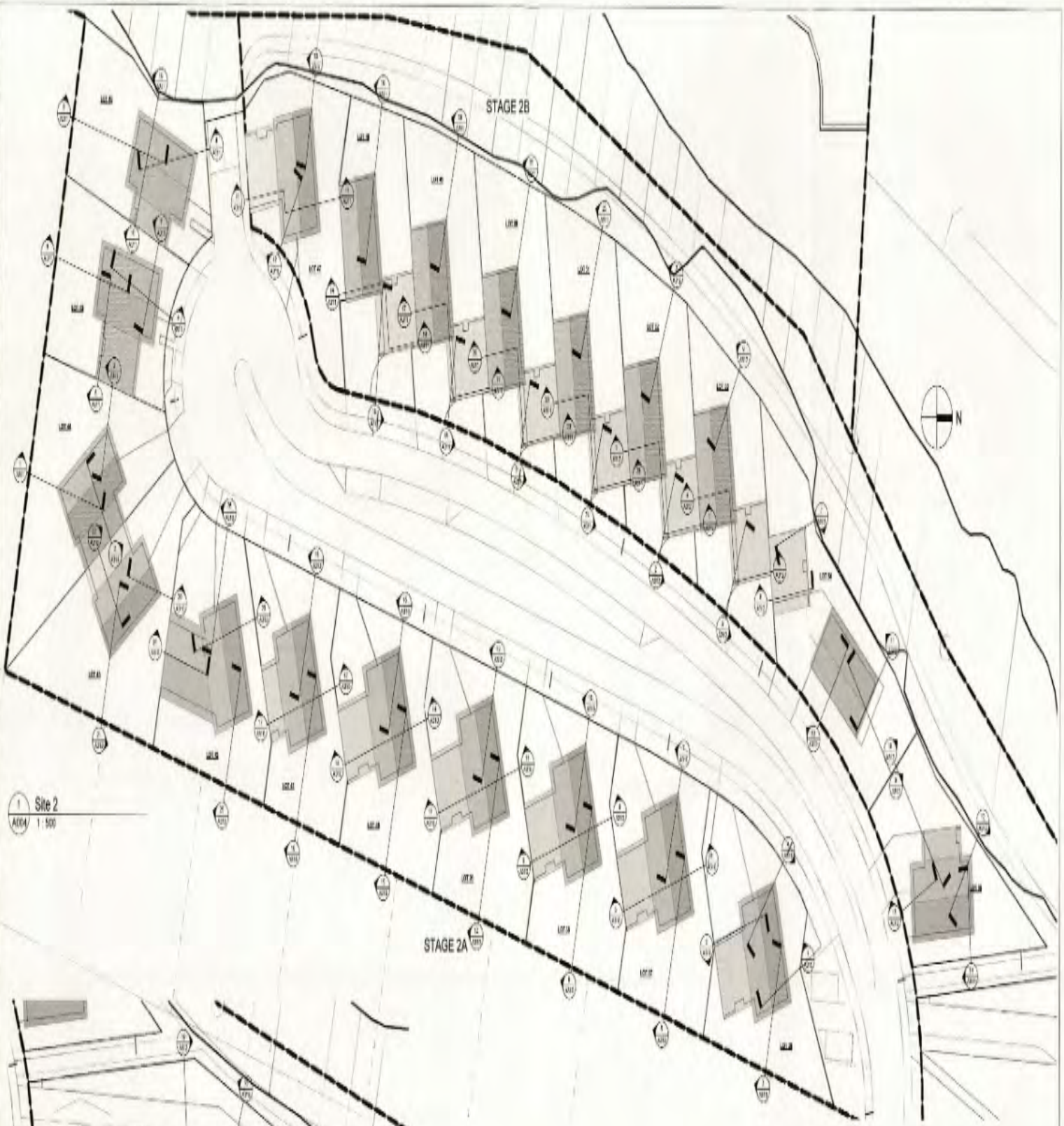
WEST COAST ROAD HOUSING DEVELOPMENT

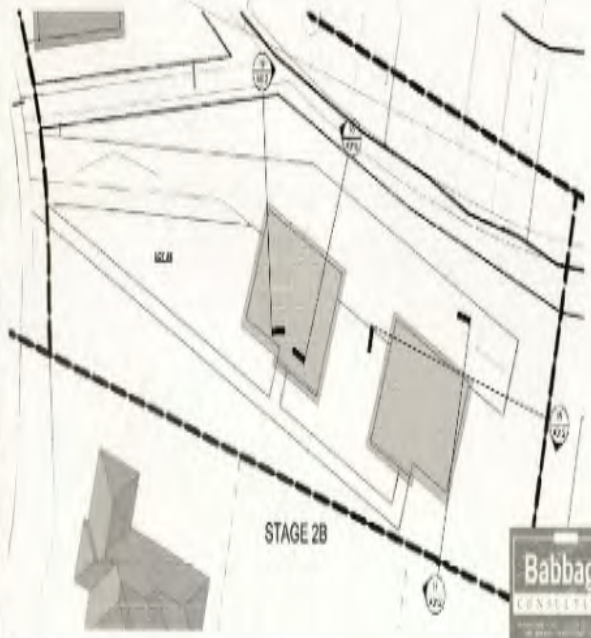
BULK & LOCATION STUDY

SITE PLAN STAGE 1C & 1D

DRAWING NO. A003



1 Site 2
A004 1 : 500



2 Site 2 - Lot 56
A004 1 : 500

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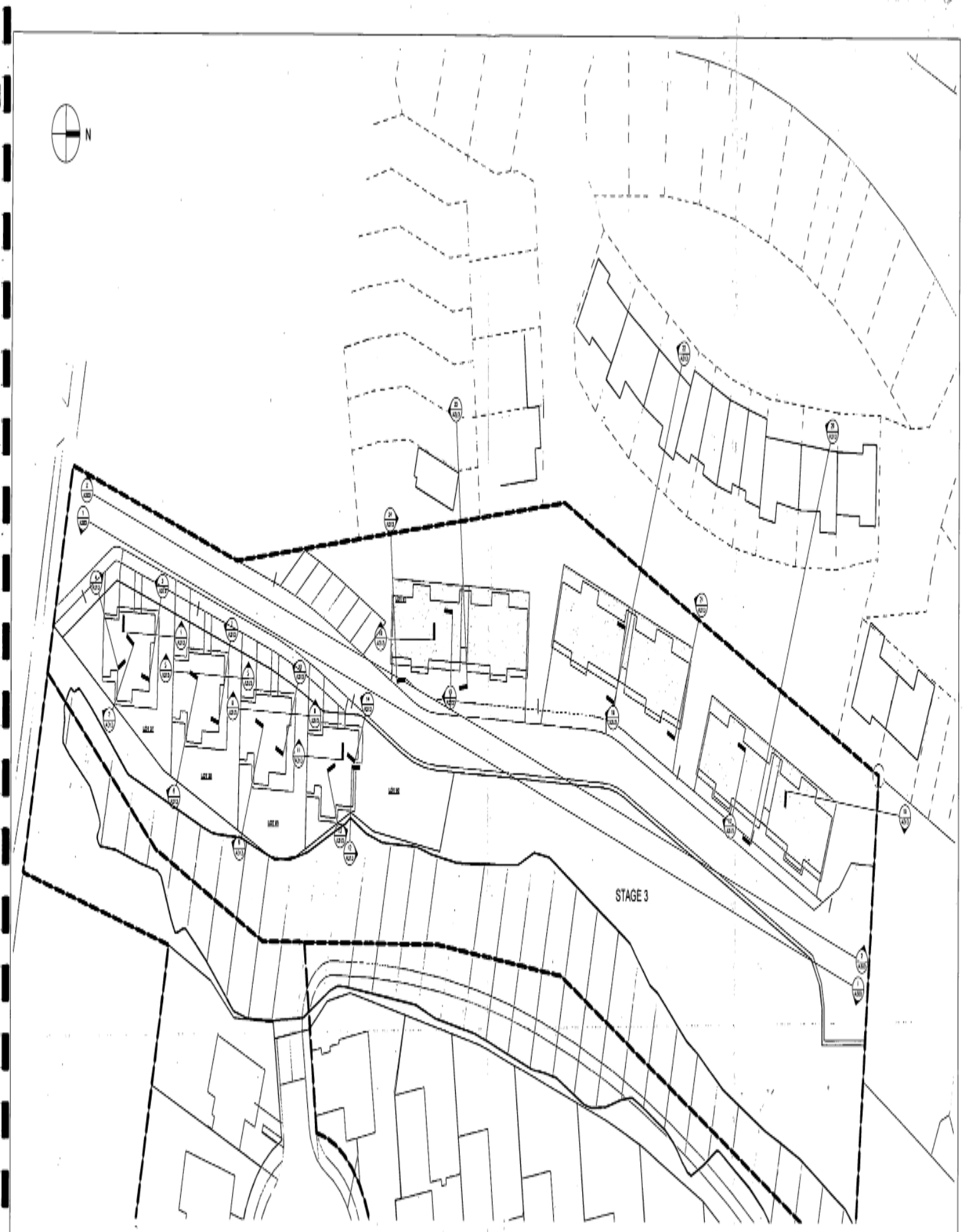
WEST COAST ROAD HOUSING DEVELOPMENT

BULK & LOCATION STUDY

SITE PLAN STAGE 2A & 2B

DRAWING NO. A004



1 / A005 Site 3
1 : 500

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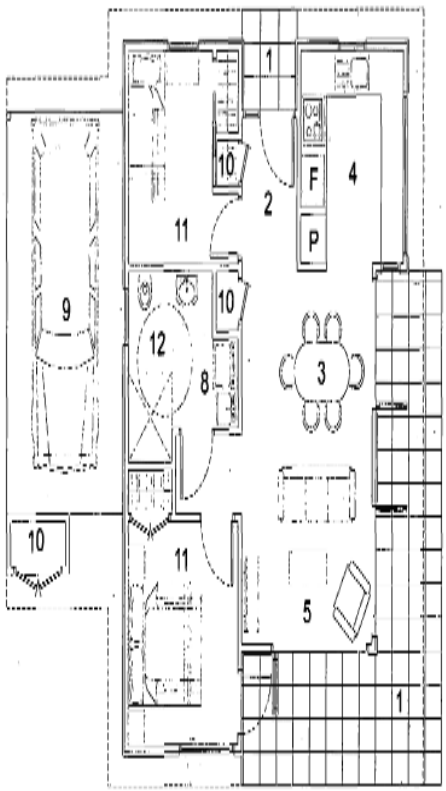
JOB NO 42608

WEST COAST ROAD HOUSING DEVELOPMENT

BULK & LOCATION STUDY

SITE PLAN STAGE 3

DRG NO. A005



GROUND FLOOR PLAN

ROOF PLAN

PLAN KEY

1	Covered Porch
2	Entry Hall
3	Dining
4	Kitchen
5	Living
6	WC
7	Stairs
8	Laundry
9	Garage
10	Storage
11	Bedroom
12	Bathroom
13	Ensuite
14	Hallway

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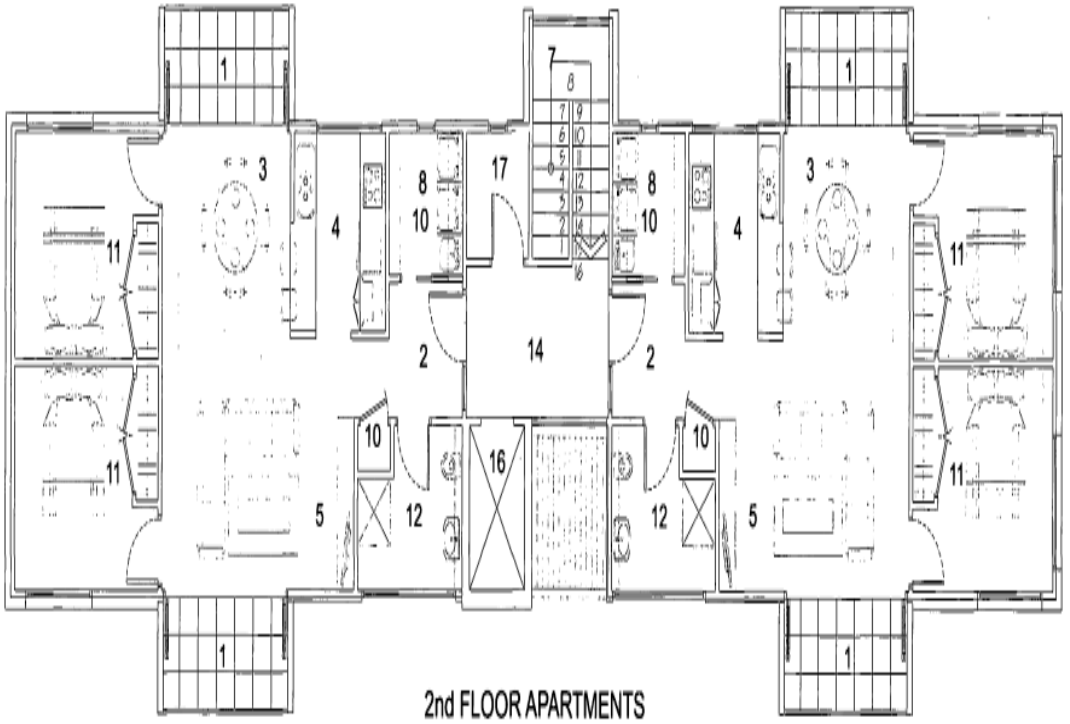
WEST COAST RD HOUSING DEVELOPMENT

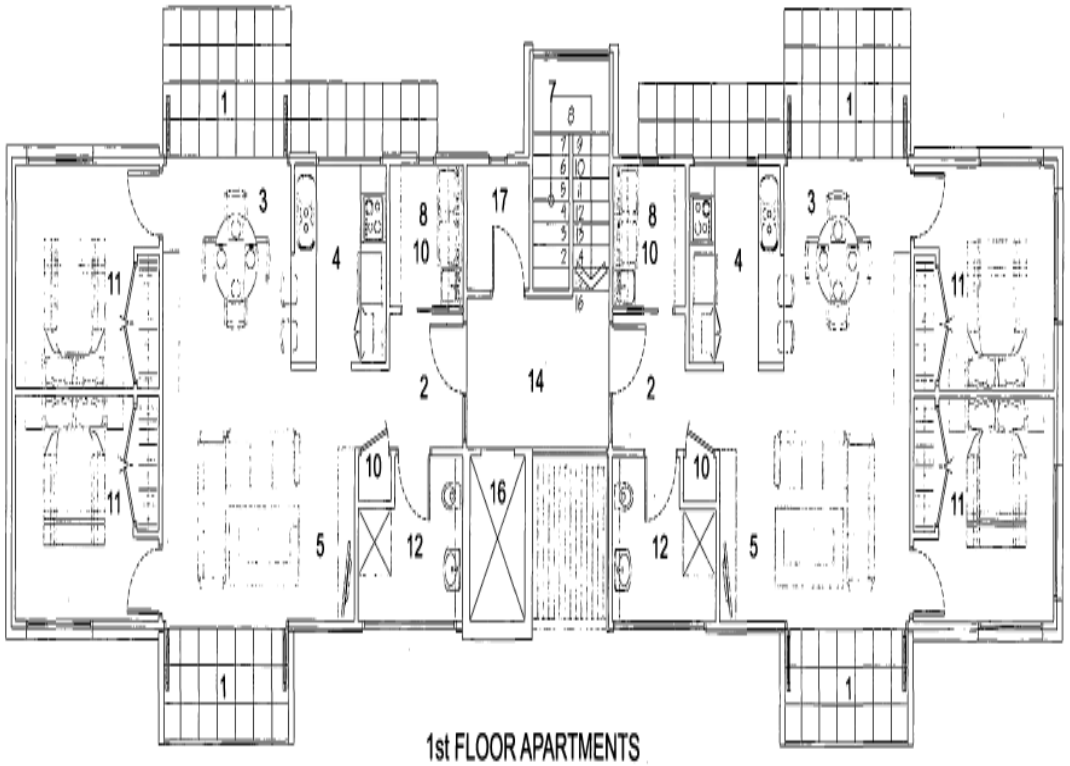
TYPE 1 HOUSE - 2 BEDROOM SENIOR / CARPORT

FLOOR PLAN

A101



2nd FLOOR APARTMENTS



1st FLOOR APARTMENTS

PLAN KEY

1	Covered Porch
2	Entry Hall
3	Dining
4	Kitchen
5	Living
6	WC
7	Stairs
8	Laundry / Utility
9	Garage
10	Storage
11	Bedroom
12	Bathroom
13	Ensuite
14	Hallway
15	Common entry lobby
16	Lift
17	Services cupboard
18	Mail boxes / Intercom

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WEST COAST RD HOUSING DEVELOPMENT

TYPE 2A HOUSE - 2 BEDROOM APARTMENT / DOUBLE GARAGE

FLOOR PLAN

scale @A3 1:100
scale @A1 1:50
14 JUN 2006

A102-1

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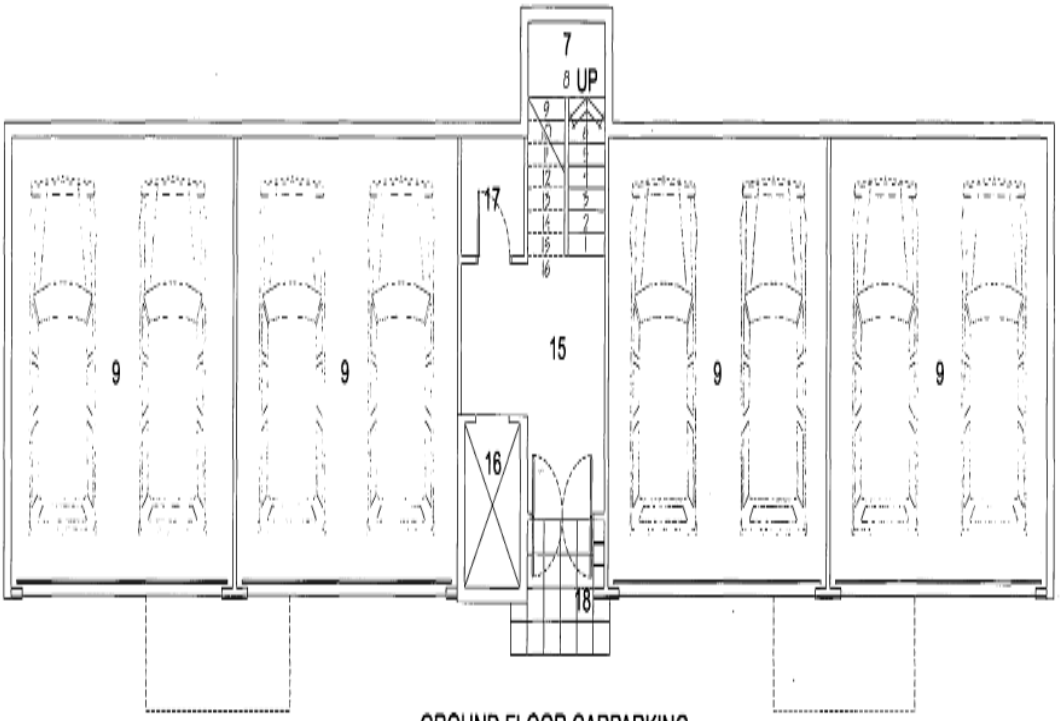
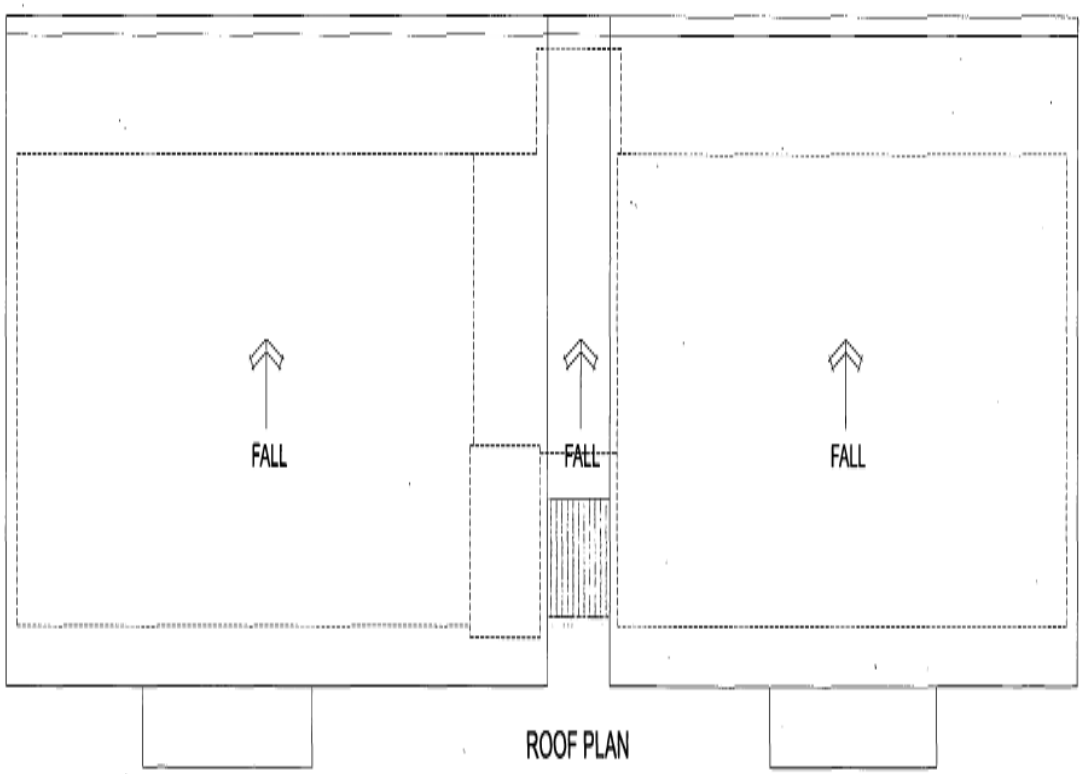


GROUND FLOOR CARPARKING



ROOF PLAN

N

PLAN KEY

1 Covered Porch
2 Entry Hall
3 Dining
4 Kitchen
5 Living
6 WC
7 Stairs
8 Laundry / Utility
9 Garage
10 Storage
11 Bedroom
12 Bathroom
13 Ensuite
14 Hallway
15 Common entry lobby
16 Lift
17 Services cupboard
18 Mail boxes / Intercom

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WEST COAST RD HOUSING DEVELOPMENT

TYPE 2A HOUSE - 2 BEDROOM APARTMENT / DOUBLE GARAGE

FLOOR PLAN
scale 1:100
date JULY 2008
A102-2

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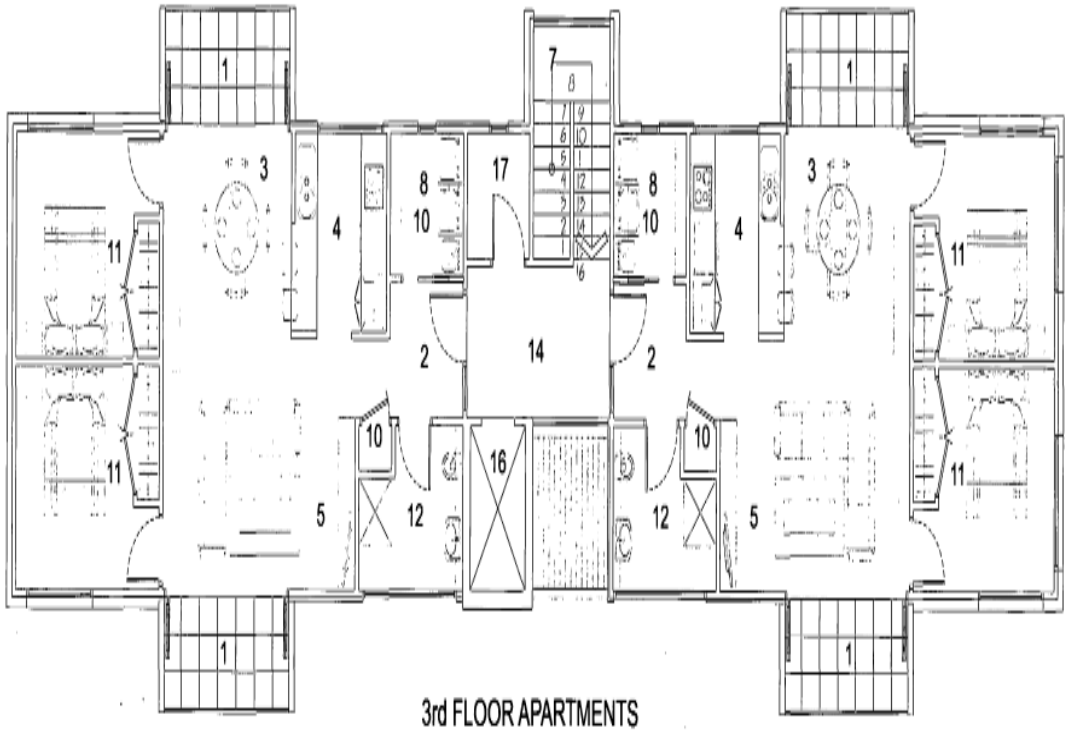
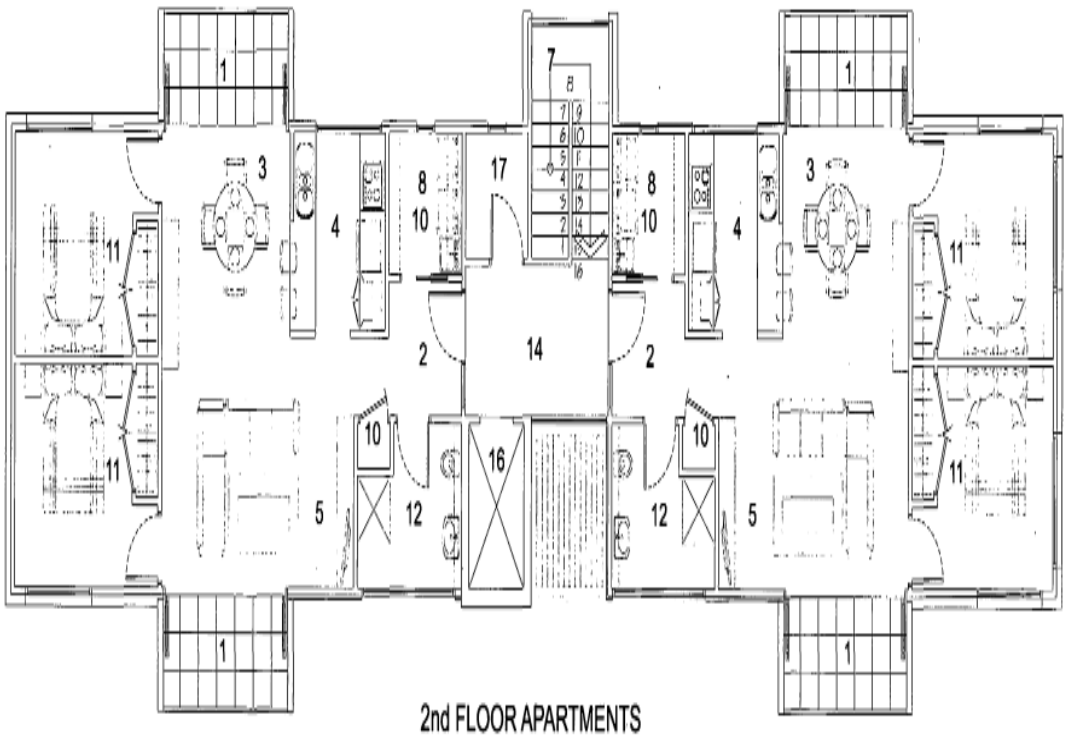


3rd FLOOR APARTMENTS



2nd FLOOR APARTMENTS

PLAN KEY

1	Covered Porch
2	Entry Hall
3	Dining
4	Kitchen
5	Living
6	WC
7	Stairs
8	Laundry / Utility
9	Garage
10	Storage
11	Bedroom
12	Bathroom
13	Ensuite
14	Hallway
15	Common entry lobby
16	Lift
17	Services cupboard
18	Mail boxes / Intercom

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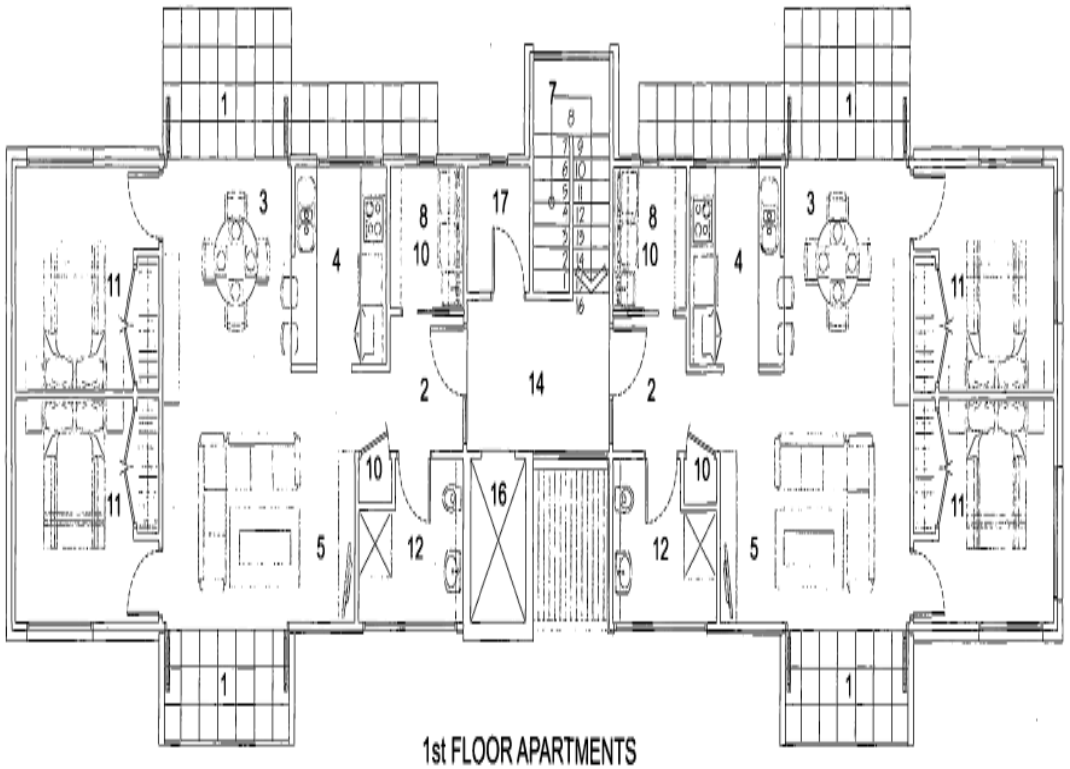
WEST COAST RD HOUSING DEVELOPMENT

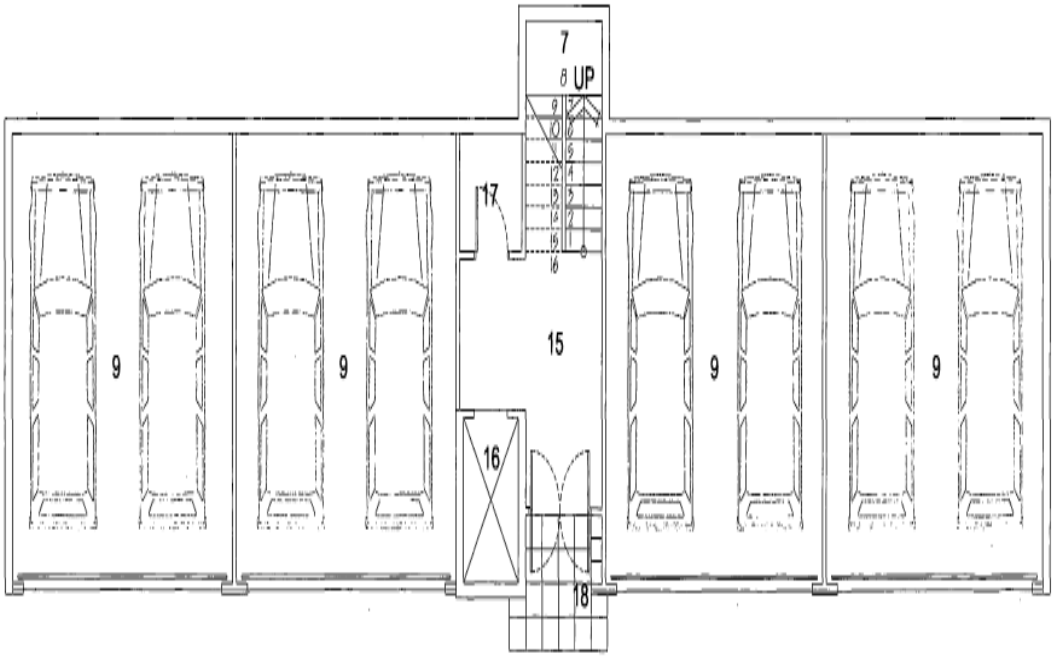
TYPE 2B HOUSE - 2 BEDROOM APARTMENT / GARAGE

FLOOR PLAN

A103-1



1st FLOOR APARTMENTS



N

PLAN KEY

1	Covered Porch
2	Entry Hall
3	Dining
4	Kitchen
5	Living
6	WC
7	Stairs
8	Laundry / Utility
9	Garage
10	Storage
11	Bedroom
12	Bathroom
13	Ensuite
14	Hallway
15	Common entry lobby
16	Lift
17	Services cupboard
18	Mail boxes / Intercom

NOTE: ROOF PLAN SAME AS TYPE 2A APARTMENTS

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WEST COAST RD HOUSING DEVELOPMENT

TYPE 2B HOUSE - 2 BEDROOM APARTMENT / GARAGE

FLOOR PLAN

A103-2

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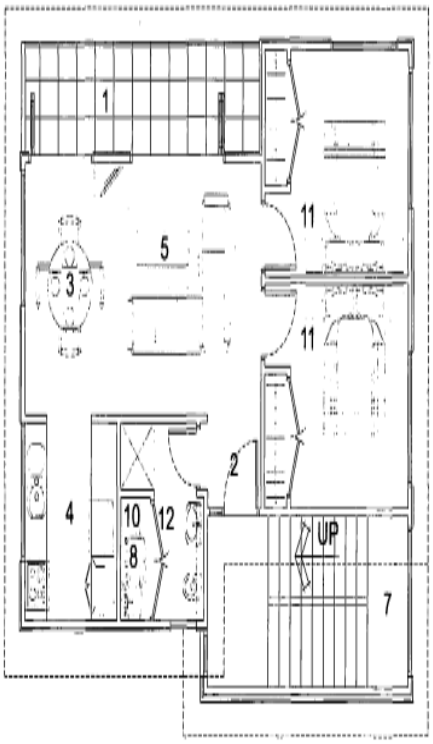

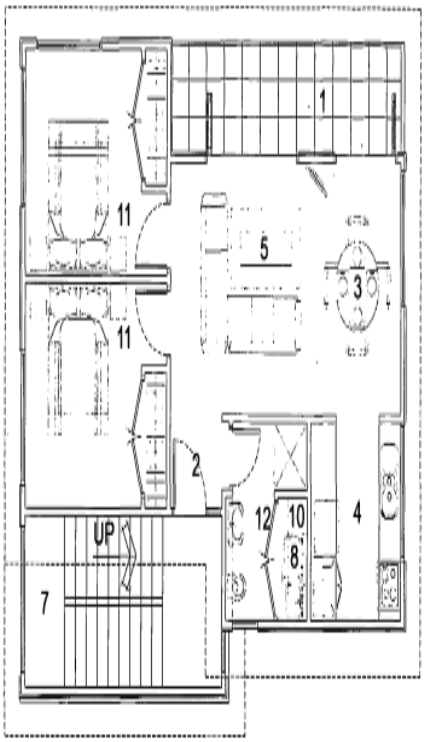

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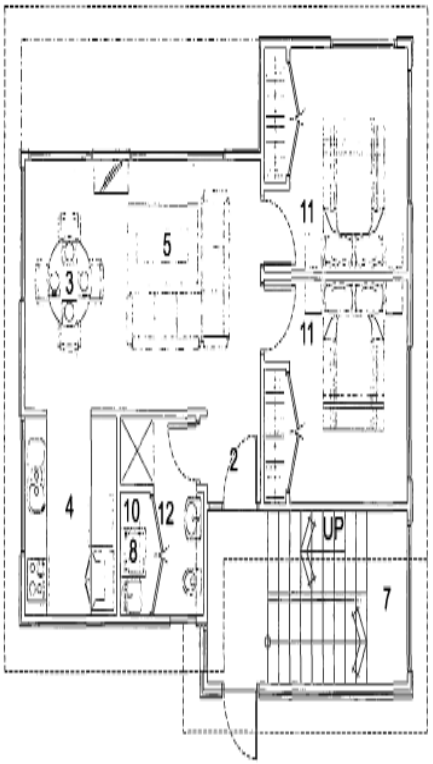

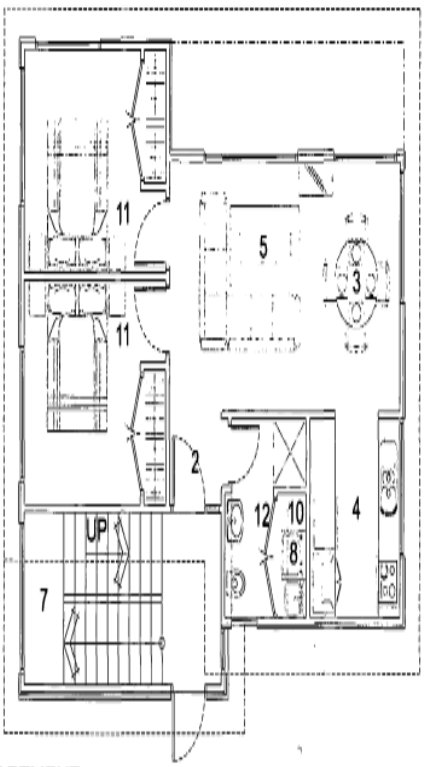

UPPER GROUND FLOOR APARTMENT

PLAN KEY

1	Covered Porch
2	Entry Hall
3	Dining
4	Kitchen
5	Living
6	WC
7	Stairs
8	Laundry / Utility
9	Garage
10	Storage
11	Bedroom
12	Bathroom
13	Ensuite
14	Hallway
15	Common entry lobby
16	Lift
17	Services cupboard
18	Mail boxes / Intercom

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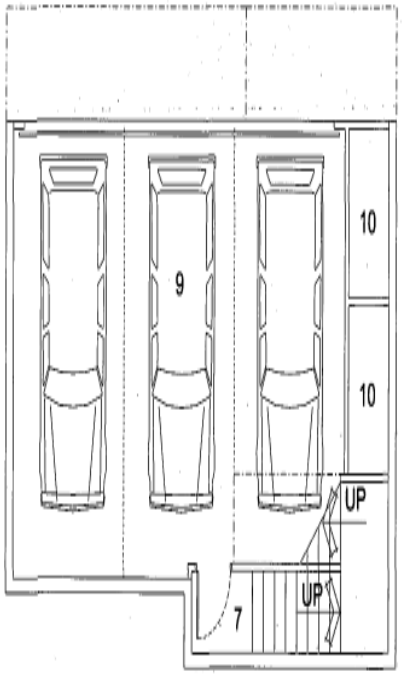
WEST COAST RD HOUSING DEVELOPMENT

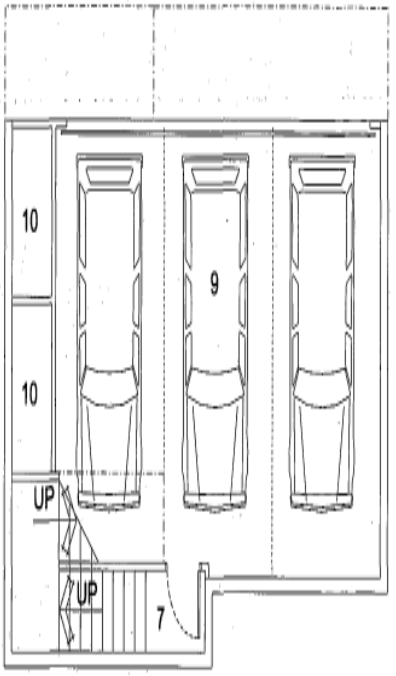
TYPE 2C HOUSE - 2 BEDROOM APARTMENT / UNDERCROFT GARAGE

FLOOR PLAN

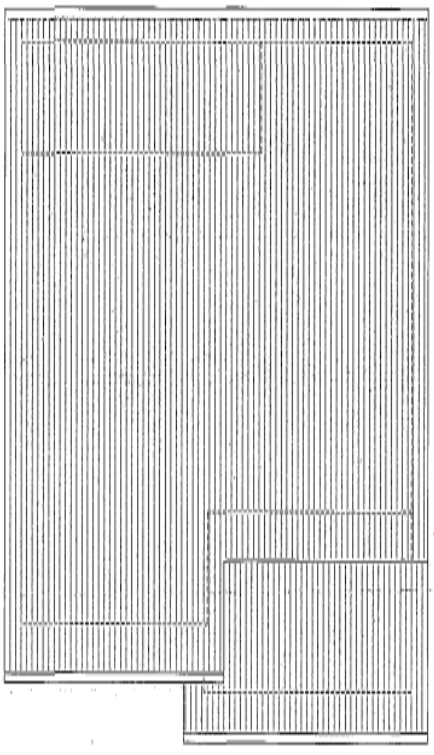
scale @A3 1:100
scale @A1 1:50
07 Jun 2006

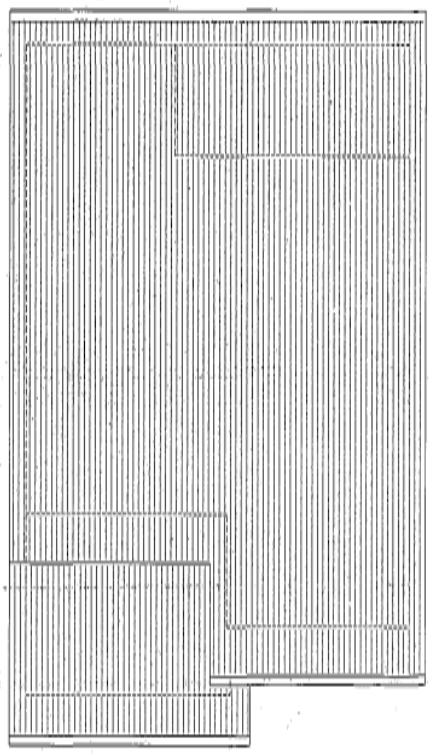
A104-1





LOWER GROUND FLOOR GARAGE





ROOF PLAN

PLAN KEY

1	Covered Porch
2	Entry Hall
3	Dining
4	Kitchen
5	Living
6	WC
7	Stairs
8	Laundry / Utility
9	Garage
10	Storage
11	Bedroom
12	Bathroom
13	Ensuite
14	Hallway
15	Common entry lobby
16	Lift
17	Services cupboard
18	Mail boxes / Intercom

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WEST COAST RD HOUSING DEVELOPMENT

TYPE 2C HOUSE - 2 BEDROOM APARTMENT / UNDERCROFT GARAGE

FLOOR PLAN

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scale @A1 1:50
JUN 2008

A104-2

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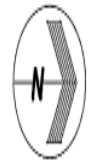
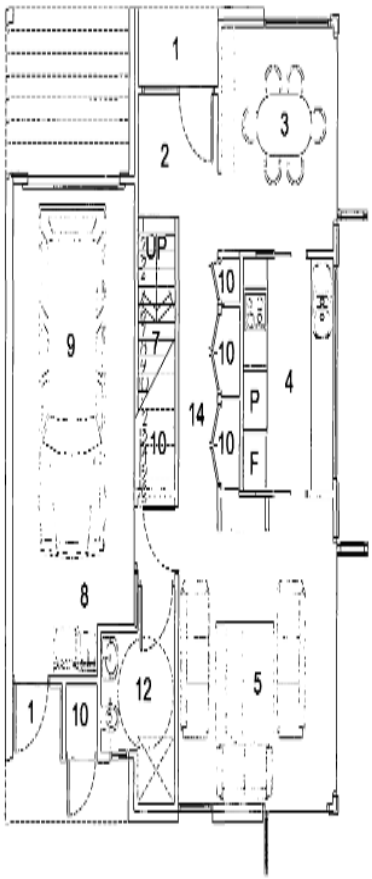
(optimal orientation)

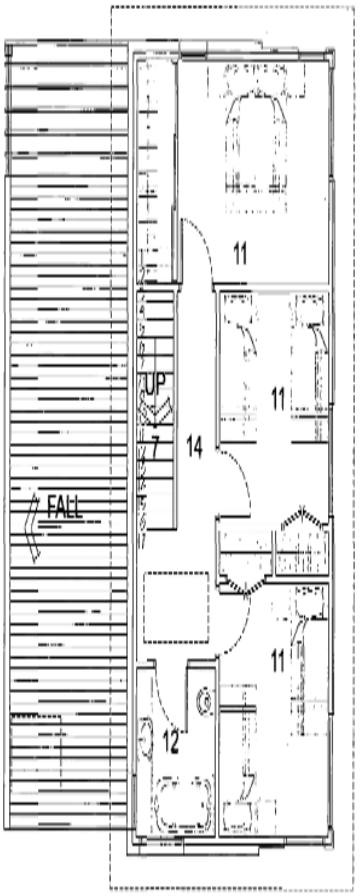


PLAN KEY

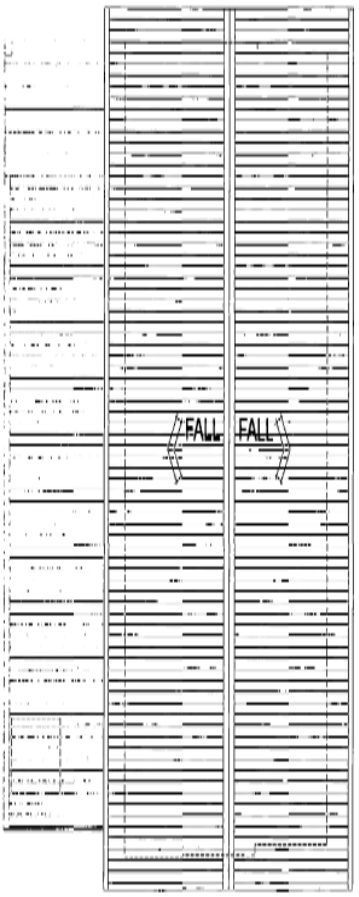
1	Covered Porch
2	Entry Hall
3	Dining
4	Kitchen
5	Living
6	WC
7	Stairs
8	Laundry
9	Garage
10	Storage
11	Bedroom
12	Bathroom
13	Ensuite
14	Hallway



GROUND FLOOR PLAN



UPPER FLOOR PLAN



ROOF PLAN

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WEST COAST RD HOUSING DEVELOPMENT

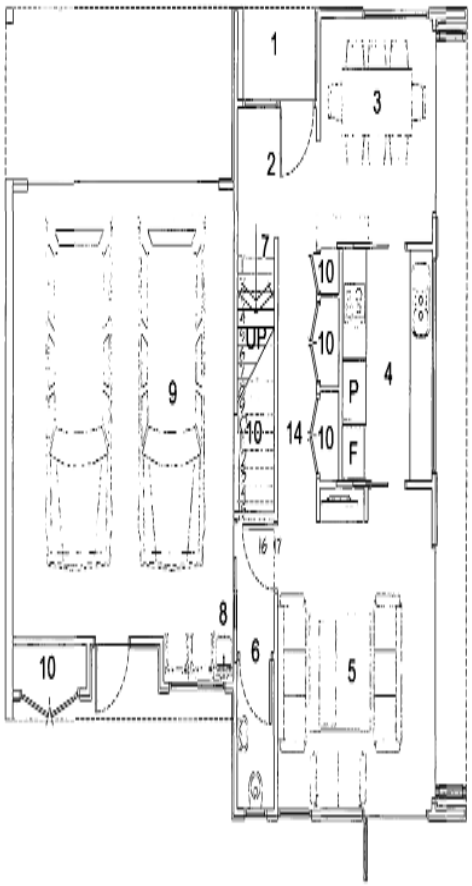
TYPE 3 HOUSE - 3 BEDROOM / SINGLE GARAGE

FLOOR PLAN

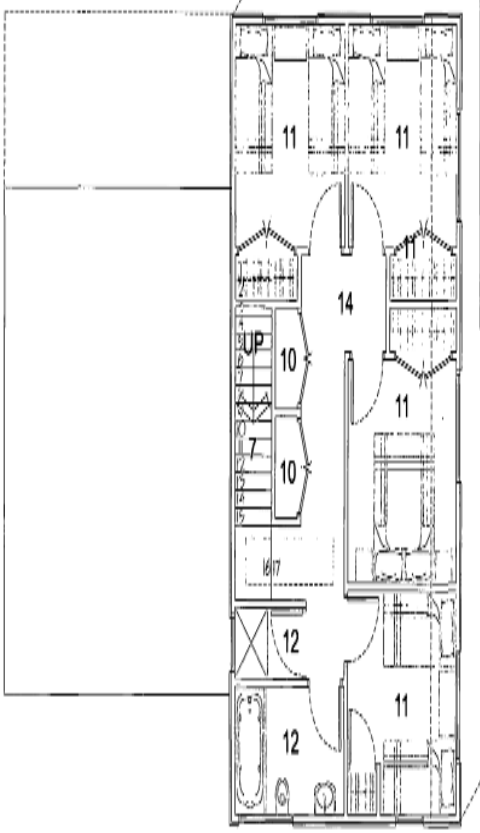
scale 1:100 @A1 1:50

14 JUN 2006

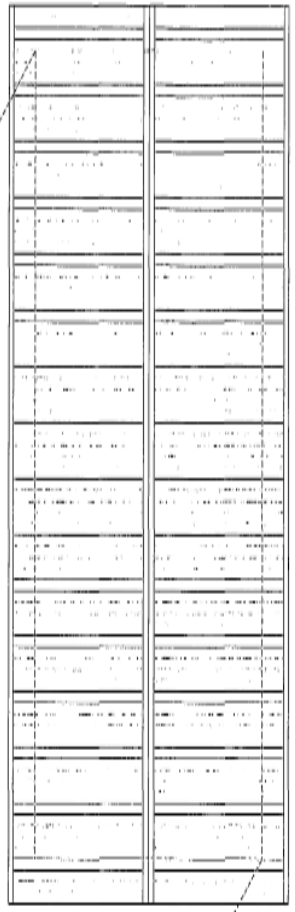
A105



GROUND FLOOR PLAN



UPPER FLOOR PLAN



ROOF PLAN

(optimal orientation)

PLAN KEY

1	Covered Porch
2	Entry Hall
3	Dining
4	Kitchen
5	Living
6	WC
7	Stairs
8	Laundry
9	Garage
10	Storage
11	Bedroom
12	Bathroom
13	Ensuite
14	Hallway

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WEST COAST RD HOUSING DEVELOPMENT

TYPE 4A HOUSE - 4 BEDROOM / DOUBLE GARAGE

FLOOR PLAN

A106

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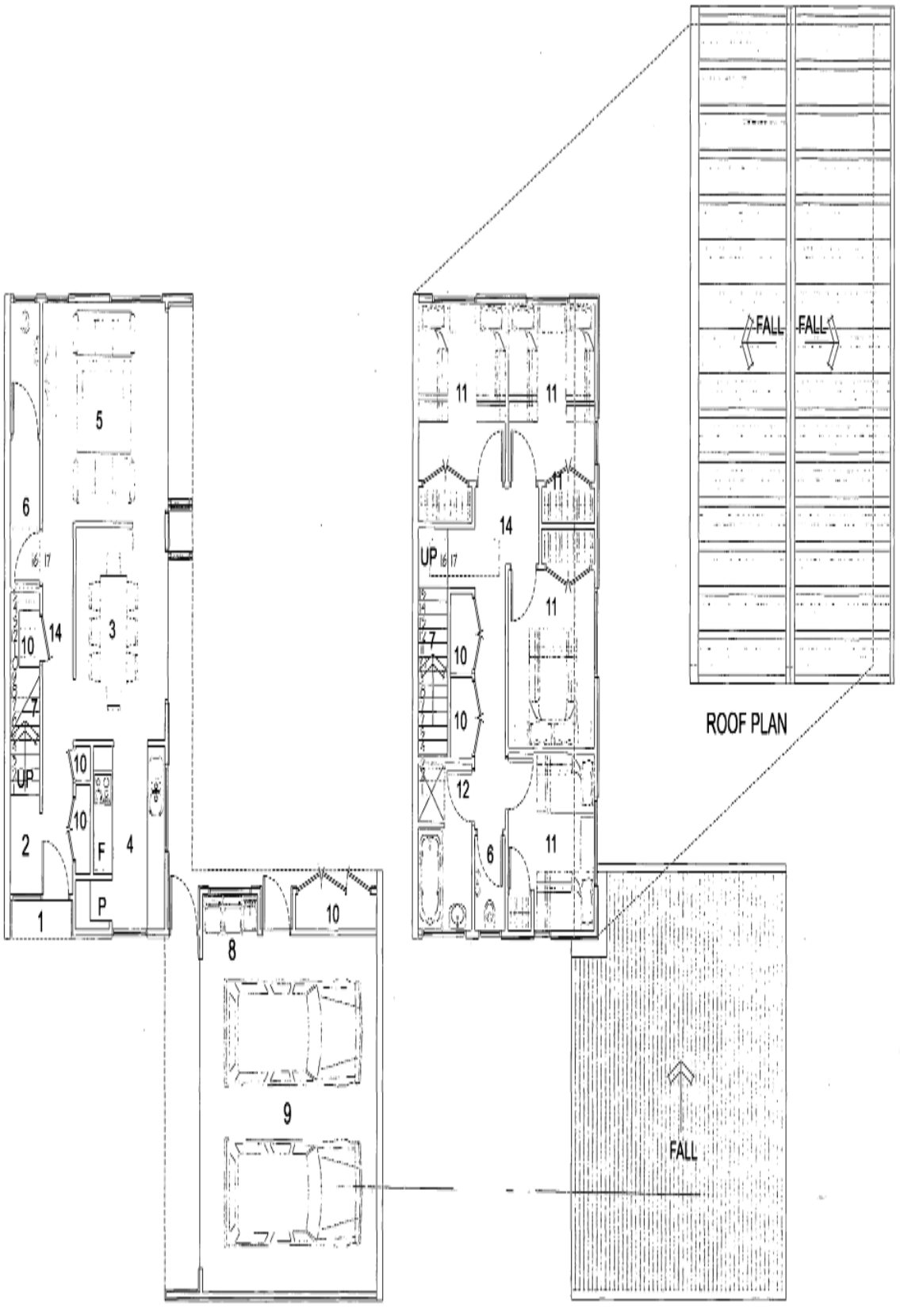

Babbage CONSULTANTS

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WEST COAST RD HOUSING DEVELOPMENT

TYPE 4B HOUSE - 4 BEDROOM / DOUBLE GARAGE

FLOOR PLAN

A107

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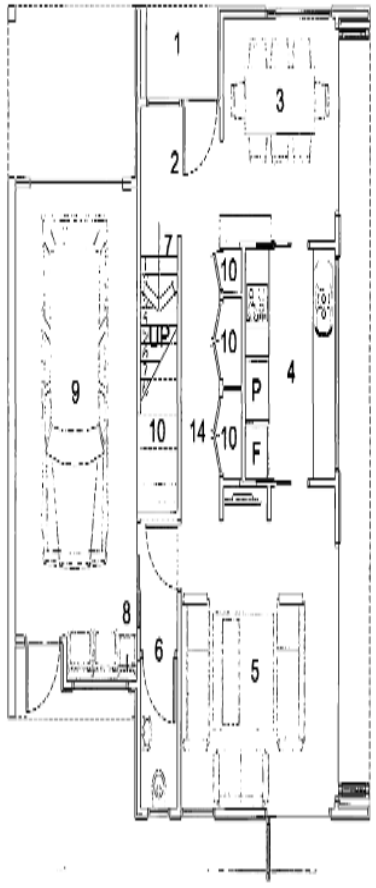
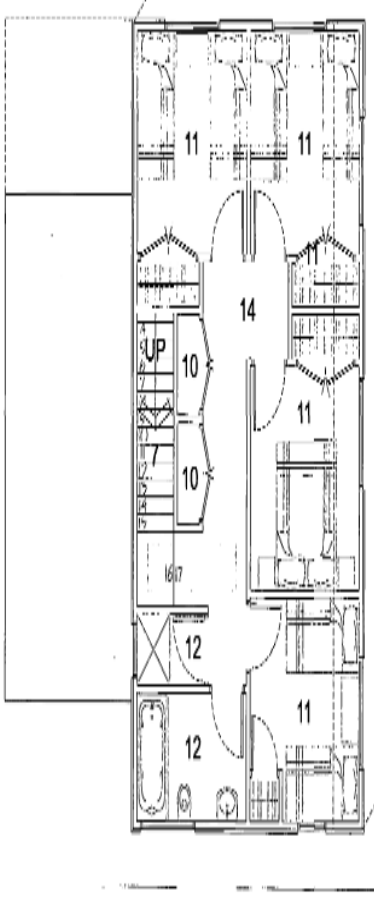
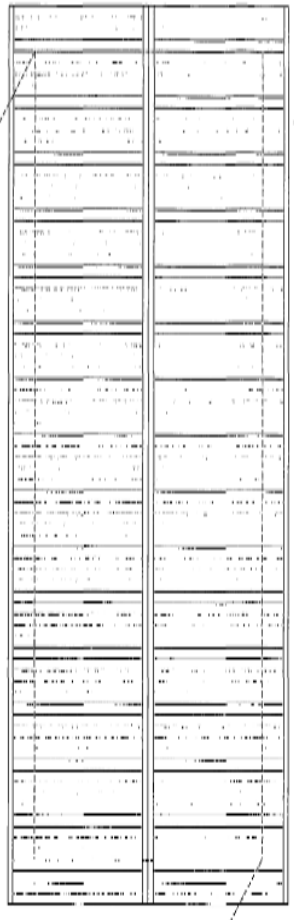


GROUND FLOOR PLAN



UPPER FLOOR PLAN



ROOF PLAN

(optimal orientaion)

PLAN KEY

1	Covered Porch
2	Entry Hall
3	Dining
4	Kitchen
5	Living
6	WC
7	Stairs
8	Laundry
9	Garage
10	Storage
11	Bedroom
12	Bathroom
13	Ensuite
14	Hallway

Babbage CONSULTANTS

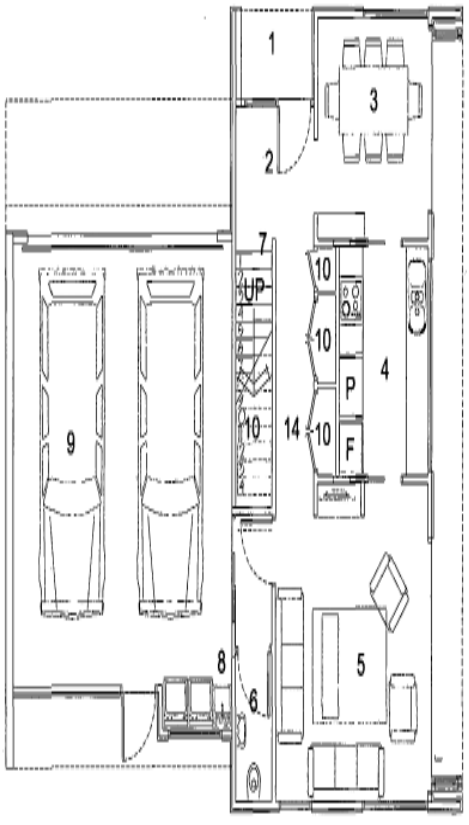
42608

WEST COAST RD HOUSING DEVELOPMENT

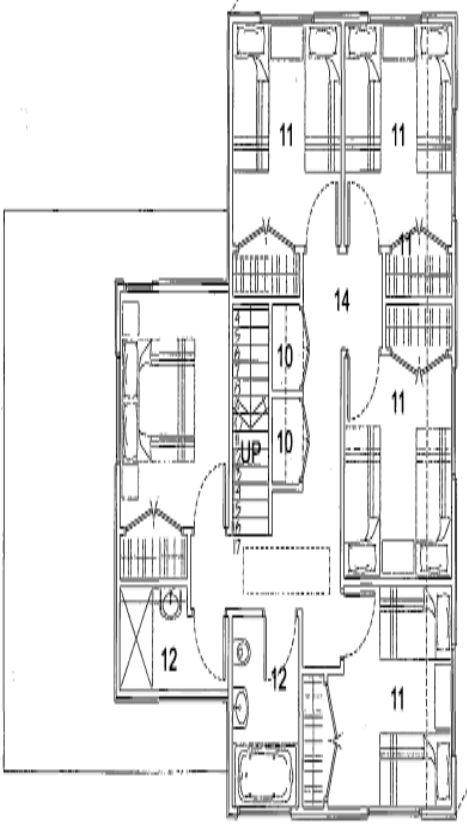
TYPE 4C HOUSE - 4 BEDROOM / SINGLE GARAGE

FLOOR PLAN

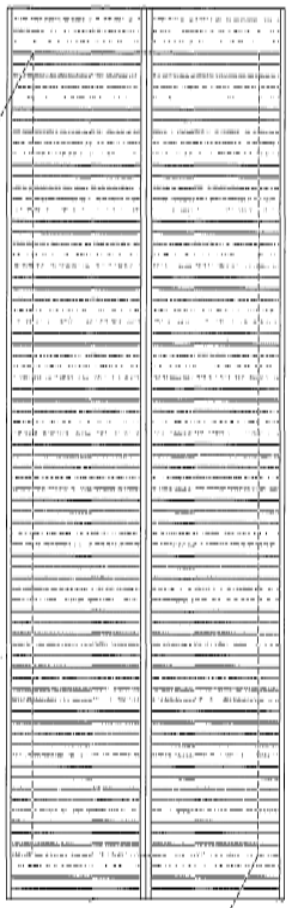
A108



GROUND FLOOR PLAN

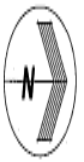


UPPER FLOOR PLAN



ROOF PLAN

(optimal orientaion)



PLAN KEY

1	Covered Porch
2	Entry Hall
3	Dining
4	Kitchen
5	Living
6	WC
7	Stairs
8	Laundry
9	Garage
10	Storage
11	Bedroom
12	Bathroom
13	Ensuite
14	Hallway

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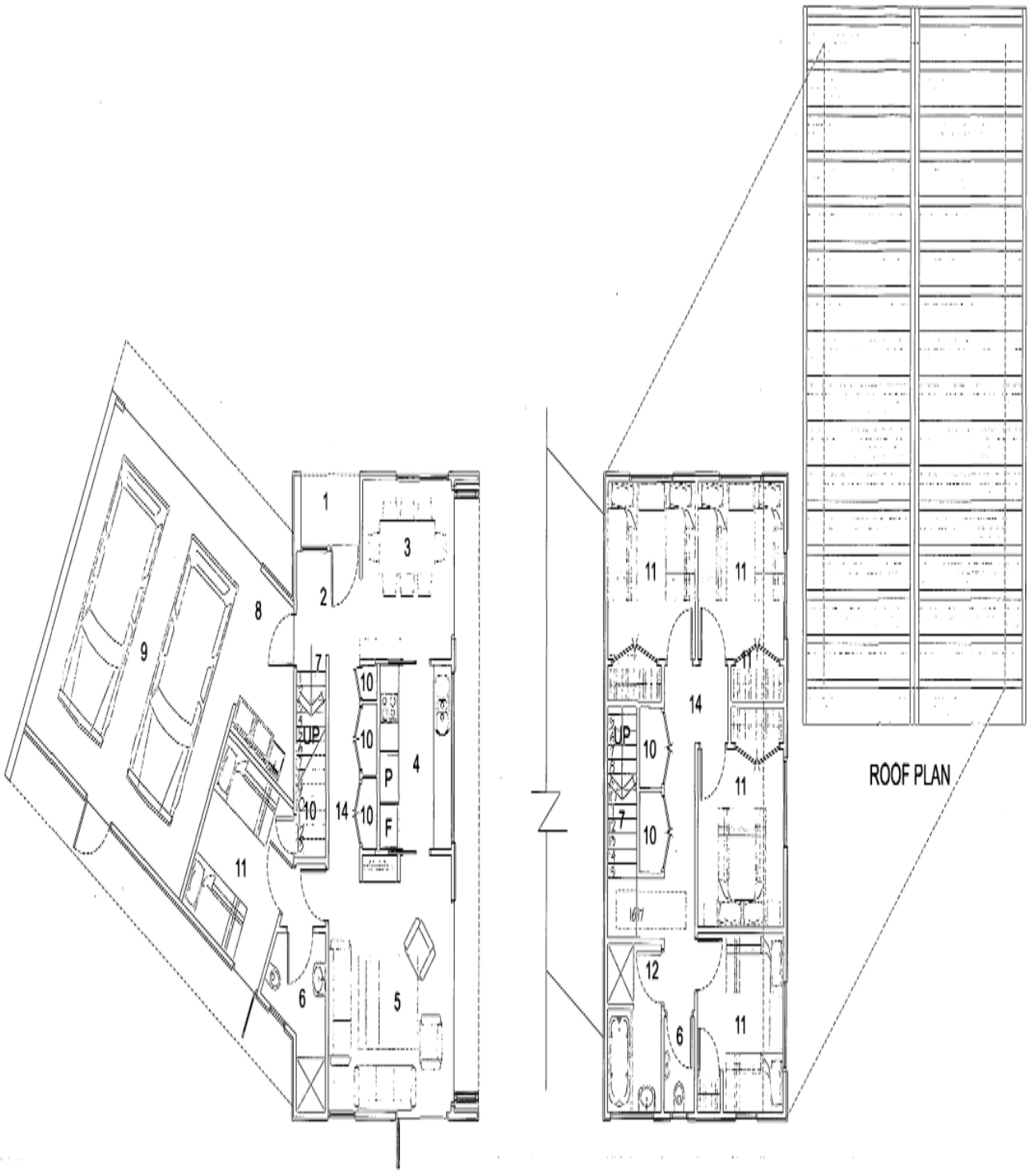
WEST COAST RD HOUSING DEVELOPMENT

TYPE 5A HOUSE - 5 BEDROOM / DOUBLE GARAGE

FLOOR PLAN

A109

6/23/2006 10:47:39 AM c:\dgn\42600\s\42608 - west coast rd\sheets\sheet\A109_5A.dgn



Babbage CONSULTANTS

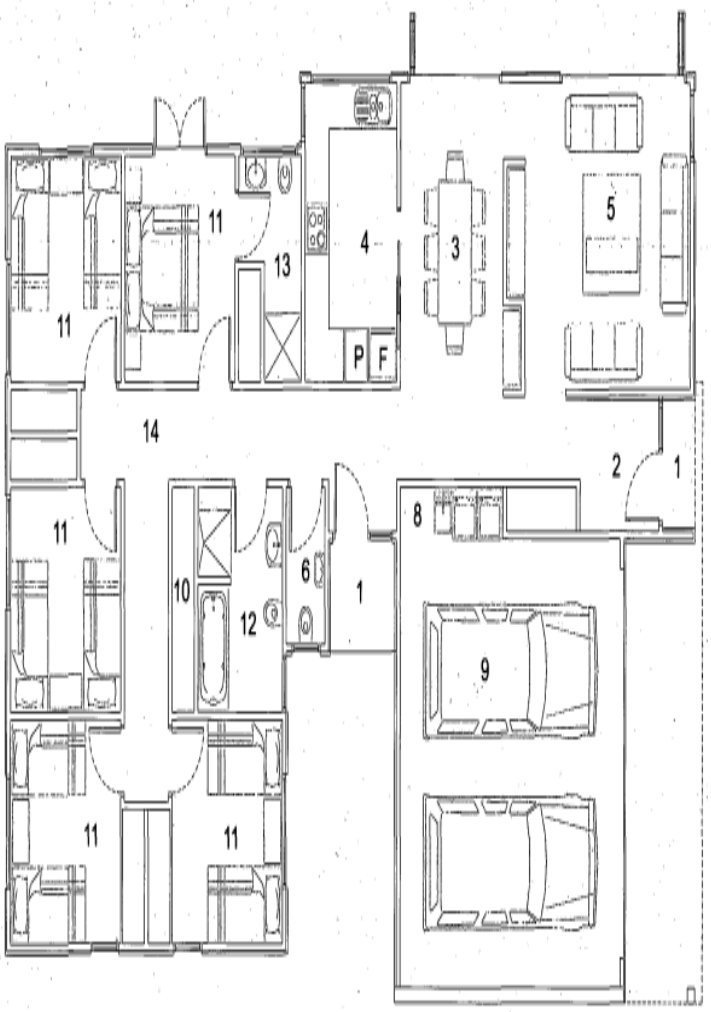
42608

WEST COAST RD HOUSING DEVELOPMENT

TYPE 5B HOUSE - 5 BEDROOM / DOUBLE GARAGE

FLOOR PLAN

A110

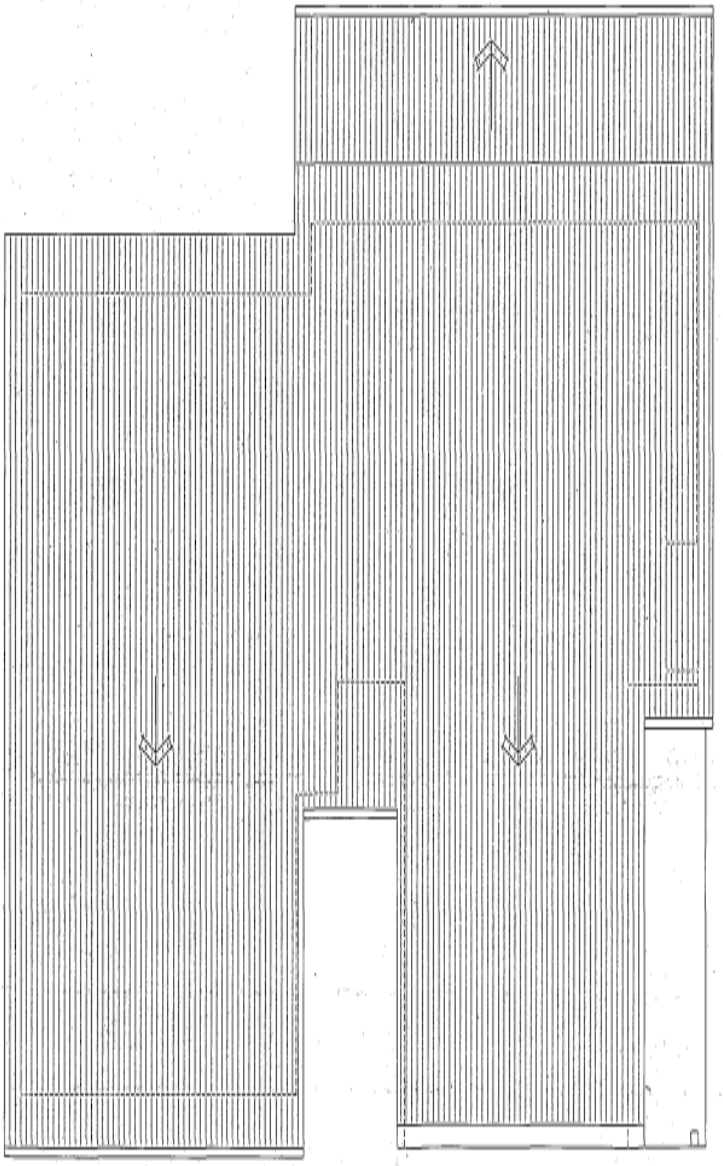


N

PLAN KEY

FLOOR PLAN

1	Covered Porch
2	Entry Hall
3	Dining
4	Kitchen
5	Living
6	WC
7	Stairs
8	Laundry
9	Garage
10	Storage
11	Bedroom
12	Bathroom
13	Ensuite
14	Hallway



ROOF PLAN

Babbage CONSULTANTS

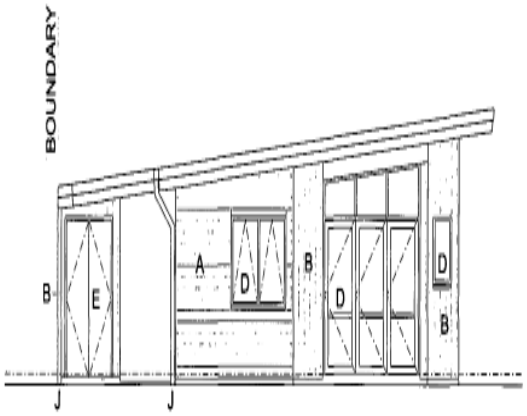
42608

WEST COAST RD HOUSING DEVELOPMENT

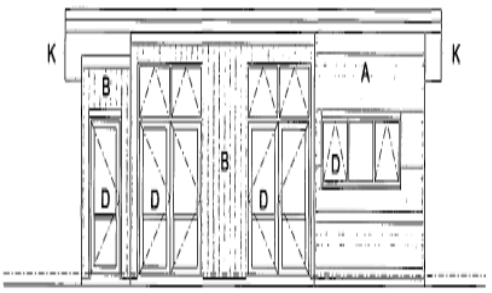
TYPE 5C HOUSE - 5 BEDROOM / DOUBLE GARAGE

FLOOR PLAN

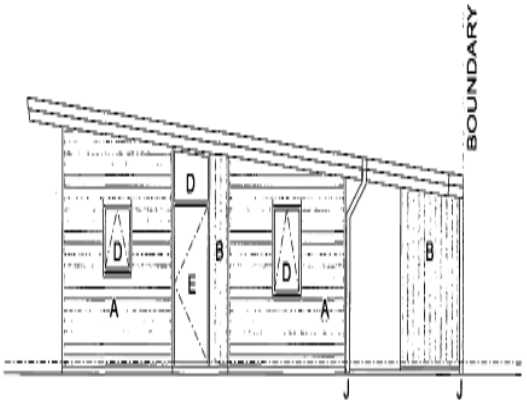
A111



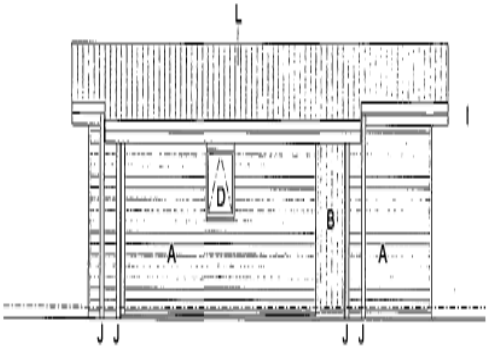
EAST ELEVATION



NORTH ELEVATION



WEST ELEVATION



SOUTH ELEVATION

ELEVATION KEY

- A Timber weatherboards on batten & cavity. Shiplap detail, laid horizontally. Paint finish.
- B Timber weatherboards on batten & cavity. Rusticated detail, laid vertically. Paint finish.
- C Architectural masonry veneer.
- D Powder coated aluminium window joinery.
- E Solid core exterior door in aluminium frame. Paint finish.
- F Timber sectional overhead garage door. Paint finish.
- G Galvanised and powder coated balustrades/handrails. Pressed flashings to suit.
- H Glazed-front balconies. Powder coated aluminium fixings.
- I Colorsteel gutter and fascia
- J UPVC down pipe. Paint finish
- K Fibre cement panel soffit. Paint finish.
- L Longrun colorsteel roof, corrugate profile
- M Optional timber pergola. Paint finish.
- N Solid masonry wall.

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WEST COAST RD HOUSING DEVELOPMENT

TYPE 1 HOUSE - 2 BEDROOM SENIOR / CARPORT

ELEVATIONS

scale @A3 1:100
@A1 1:50
JUN 2008

A201

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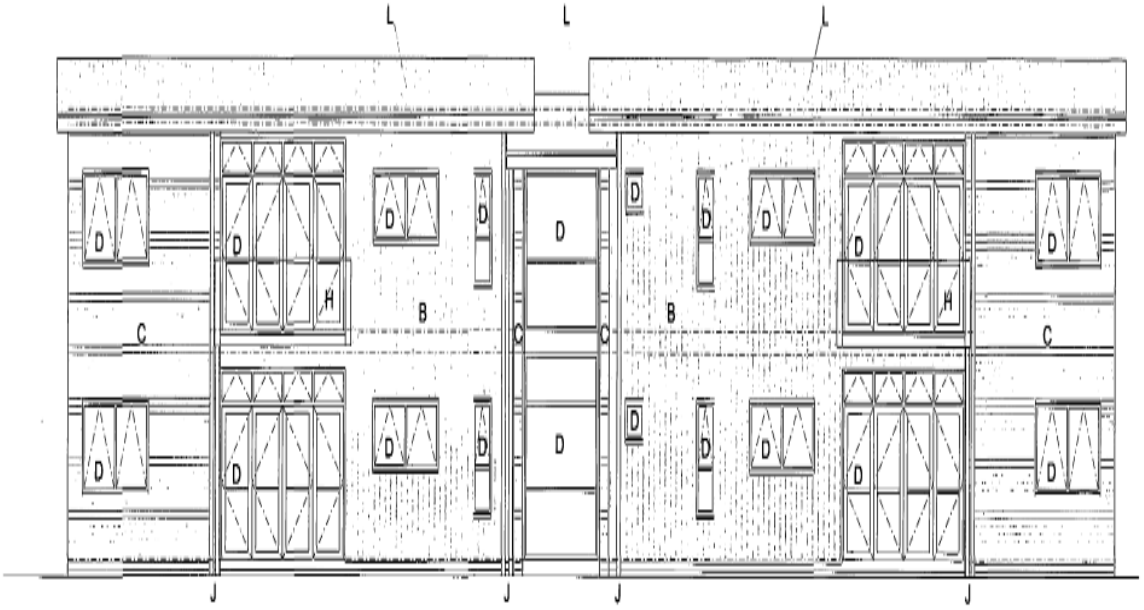
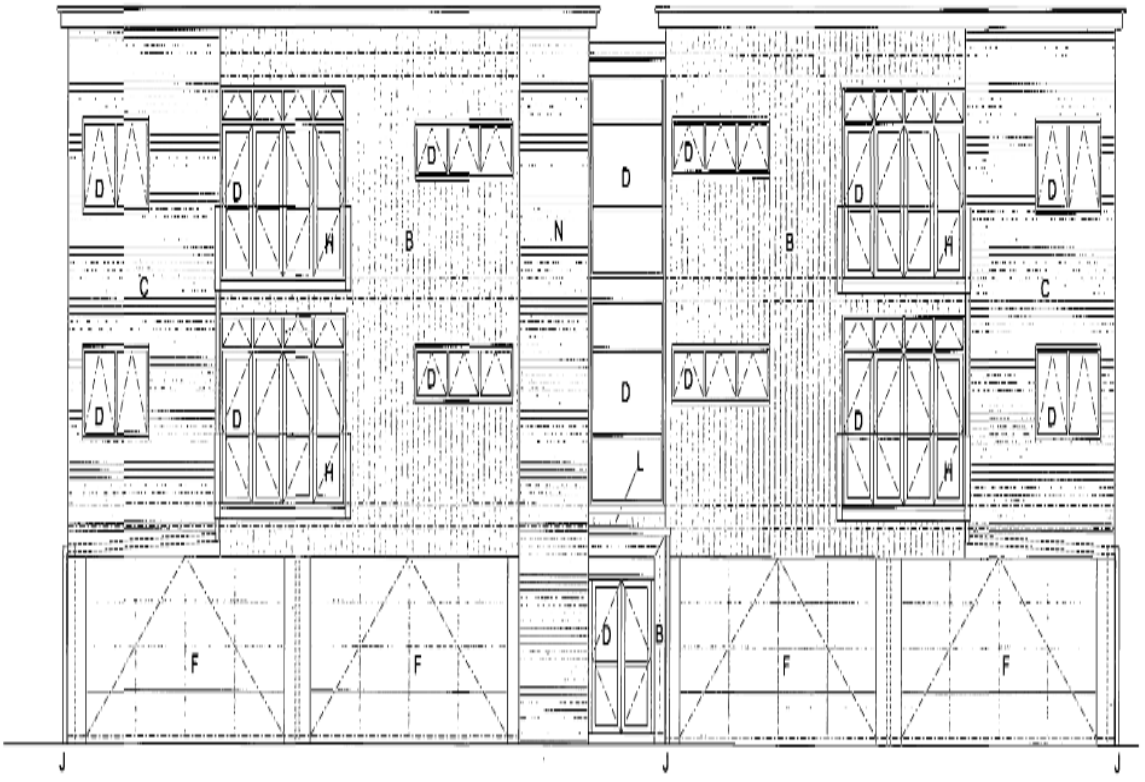


WEST ELEVATION



EAST ELEVATION

ELEVATION KEY

- A Timber weatherboards on batten & cavity. Shiplap detail, laid horizontally. Paint finish.
- B Timber weatherboards on batten & cavity. Rusticated detail, laid vertically. Paint finish.
- C Architectural masonry veneer.
- D Powder coated aluminium window joinery.
- E Solid core exterior door in aluminium frame. Paint finish.
- F Timber sectional overhead garage door. Paint finish.
- G Galvanised and powder coated balustrades/handrails. Pressed flashings to suit.
- H Glazed-front balconies. Powder coated aluminium fixings.
- I Colorsteel gutter and fascia
- J UPVC down pipe. Paint finish
- K Fibre cement panel soffit. Paint finish.
- L Longrun colorsteel roof, corrugate profile
- M Optional timber pergola. Paint finish.
- N Solid masonry wall.

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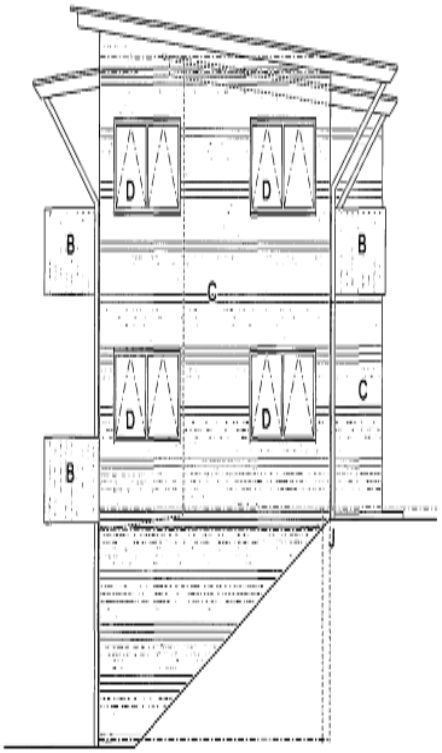
WEST COAST RD HOUSING DEVELOPMENT

TYPE 2A HOUSE - 2 BEDROOM APARTMENT / DOUBLE GARAGE

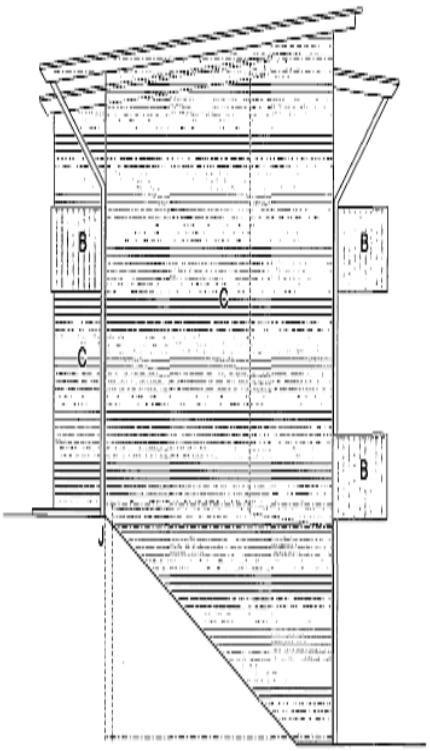
ELEVATIONS

A202-1

6/23/2006 10:47:28 AM s:\dgn\42600\42608 - west coast rd\sketch\sheet\A202-1_2A.dgn



NORTH ELEVATION



SOUTH ELEVATION

ELEVATION KEY

A Timber weatherboards on batten & cavity. Shiplap detail, laid horizontally. Paint finish.

B Timber weatherboards on batten & cavity. Rusticated detail, laid vertically. Paint finish.

C Architectural masonry veneer.

D Powder coated aluminium window joinery.

E Solid core exterior door in aluminium frame. Paint finish.

F Timber sectional overhead garage door. Paint finish.

G Galvanised and powder coated balustrades/handrails. Pressed flashings to suit.

H Glazed-front balconies. Powder coated aluminium fixings.

I Colorsteel gutter and fascia

J UPVC down pipe. Paint finish

K Fibre cement panel soffit. Paint finish.

L Longrun colorsteel roof, corrugate profile

M Optional timber pergola. Paint finish.

N Solid masonry wall.

Babbage CONSULTANTS

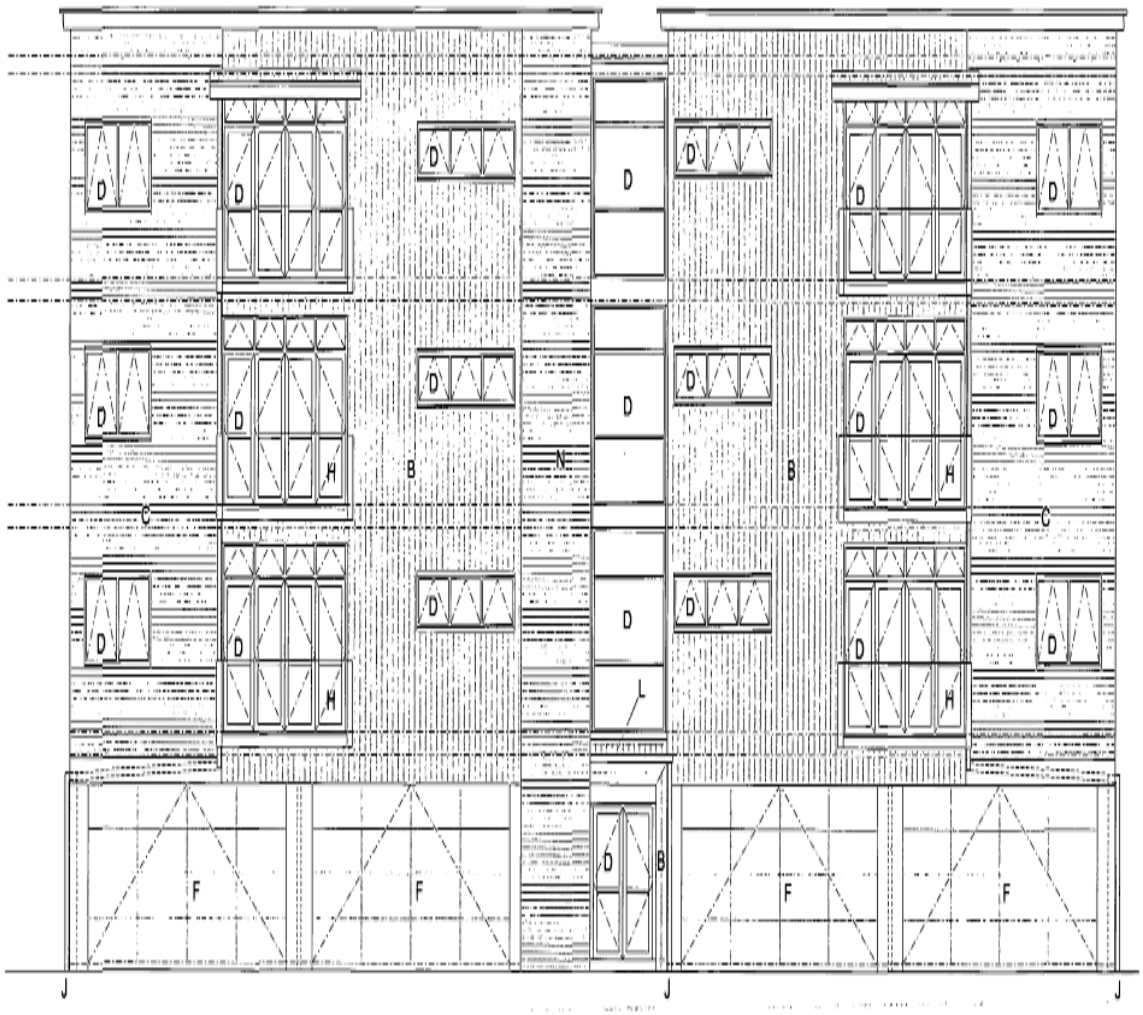
42608

WEST COAST RD HOUSING DEVELOPMENT

TYPE 2A HOUSE - 2 BEDROOM APARTMENT / DOUBLE GARAGE

ELEVATIONS

A202-2



EAST ELEVATION

ELEVATION KEY

- A Timber weatherboards on batten & cavity. Shiplap detail, laid horizontally. Paint finish.
- B Timber weatherboards on batten & cavity. Rusticated detail, laid vertically. Paint finish.
- C Architectural masonry veneer.
- D Powder coated aluminium window joinery.
- E Solid core exterior door in aluminium frame. Paint finish.
- F Timber sectional overhead garage door. Paint finish.
- G Galvanised and powder coated balustrades/handrails. Pressed flashings to suit.
- H Glazed-front balconies. Powder coated aluminium fixings.
- I Colorsteel gutter and fascia
- J UPVC down pipe. Paint finish
- K Fibre cement panel soffit. Paint finish.
- L Longrun colorsteel roof, corrugate profile
- M Optional timber pergola. Paint finish.
- N Solid masonry wall.

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WEST COAST RD HOUSING DEVELOPMENT

TYPE 2B HOUSE - 2 BEDROOM APARTMENT / GARAGE

ELEVATIONS

scale @A3 1:100
date @A3 1:100
10 JUN 2008

A203-1

6/23/2008 10:47:38 AM s:\dgn\#42600's\#42608 - west coast rd\sketch\sheet\A203-1_2B.dgn

ELEVATION KEY

A Timber weatherboards on batten & cavity. Shiplap detail, laid horizontally. Paint finish.

B Timber weatherboards on batten & cavity. Rusticated detail, laid vertically. Paint finish.

C Architectural masonry veneer.

D Powder coated aluminium window joinery.

E Solid core exterior door in aluminium frame. Paint finish.

F Timber sectional overhead garage door. Paint finish.

G Galvanised and powder coated balustrades/handrails. Pressed flashings to suit.

H Glazed-front balconies. Powder coated aluminium fixings.

I Colorsteel gutter and fascia

J UPVC down pipe. Paint finish

K Fibre cement panel soffit. Paint finish.

L Longrun colorsteel roof, corrugate profile

M Optional timber pergola. Paint finish.

N Solid masonry wall.

Babbage CONSULTANTS

42608

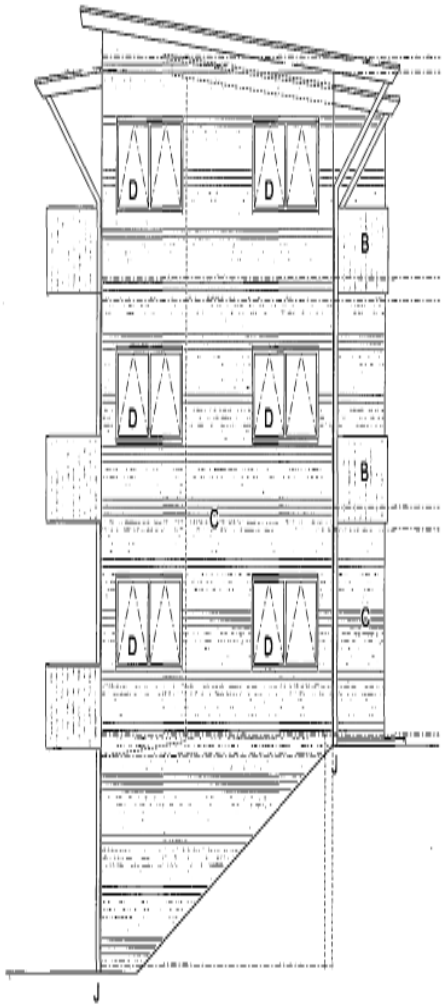
WEST COAST RD HOUSING DEVELOPMENT

TYPE 2B HOUSE - 2 BEDROOM APARTMENT / GARAGE

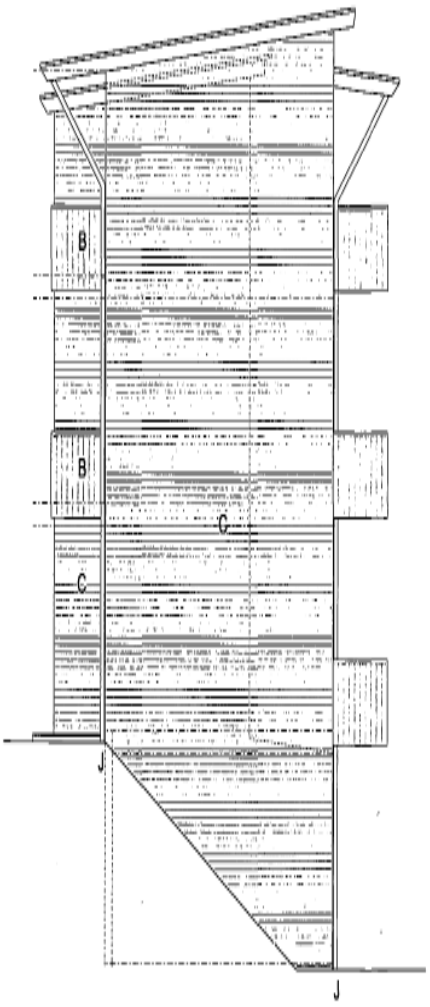
ELEVATIONS

A203-2

6/23/2008 10:47:42 AM c:\dgn\42608\sht2608 - west coast rd\sketchsheet\A203-2_2B.dgn



NORTH ELEVATION



SOUTH ELEVATION

ELEVATION KEY

- A Timber weatherboards on batten & cavity. Shiplap detail, laid horizontally. Paint finish.
- B Timber weatherboards on batten & cavity. Rusticated detail, laid vertically. Paint finish.
- C Architectural masonry veneer.
- D Powder coated aluminium window joinery.
- E Solid core exterior door in aluminium frame. Paint finish.
- F Timber sectional overhead garage door. Paint finish.
- G Galvanised and powder coated balustrades/handrails. Pressed flashings to suit.
- H Glazed-front balconies. Powder coated aluminium fixings.
- I Colorsteel gutter and fascia
- J UPVC down pipe. Paint finish
- K Fibre cement panel soffit. Paint finish.
- L Longrun colorsteel roof, corrugate profile
- M Optional timber pergola. Paint finish.
- N Solid masonry wall.

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42608

WEST COAST RD HOUSING DEVELOPMENT

TYPE 2B HOUSE - 2 BEDROOM APARTMENT / GARAGE

ELEVATIONS

A203-3

NORTH ELEVATION

ELEVATION KEY

A Timber weatherboards on batten & cavity. Shiplap detail, laid horizontally. Paint finish.

B Timber weatherboards on batten & cavity. Rusticated detail, laid vertically. Paint finish.

C Architectural masonry veneer.

D Powder coated aluminium window joinery.

E Solid core exterior door in aluminium frame. Paint finish.

F Timber sectional overhead garage door. Paint finish.

G Galvanised and powder coated balustrades/handrails. Pressed flashings to suit.

H Glazed-front balconies. Powder coated aluminium fixings.

I Colorsteel gutter and fascia

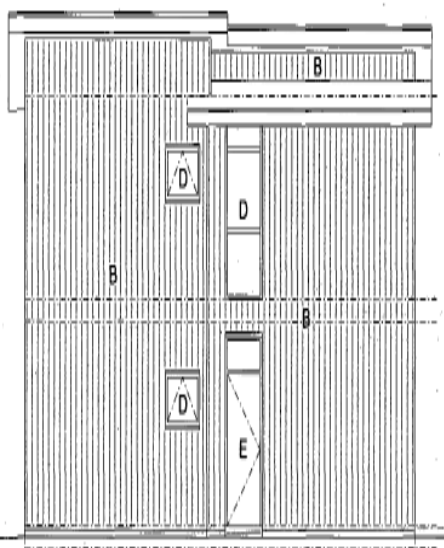
J UPVC down pipe. Paint finish

K Fibre cement panel soffit. Paint finish.

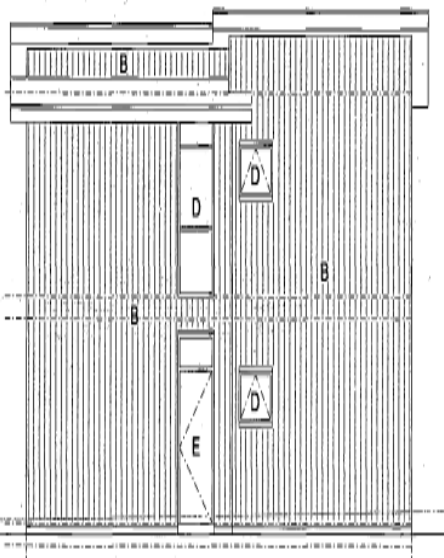
L Longrun colorsteel roof, corrugate profile

M Optional timber pergola. Paint finish.

N Solid masonry wall.



SOUTH ELEVATION



SOUTH ELEVATION

Babbage CONSULTANTS

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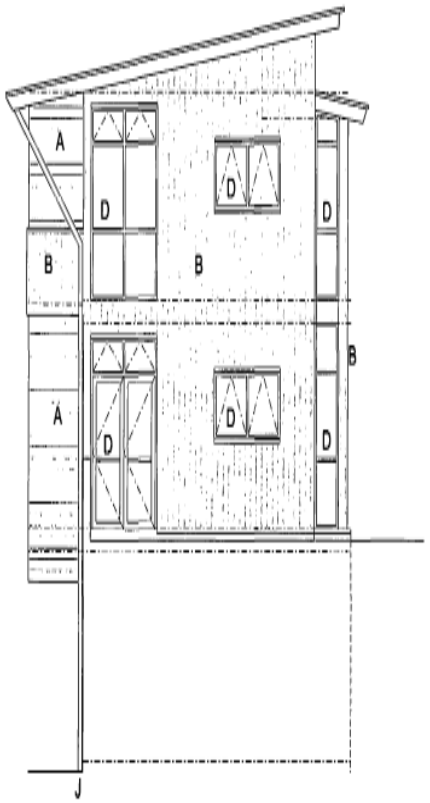
WEST COAST RD HOUSING DEVELOPMENT

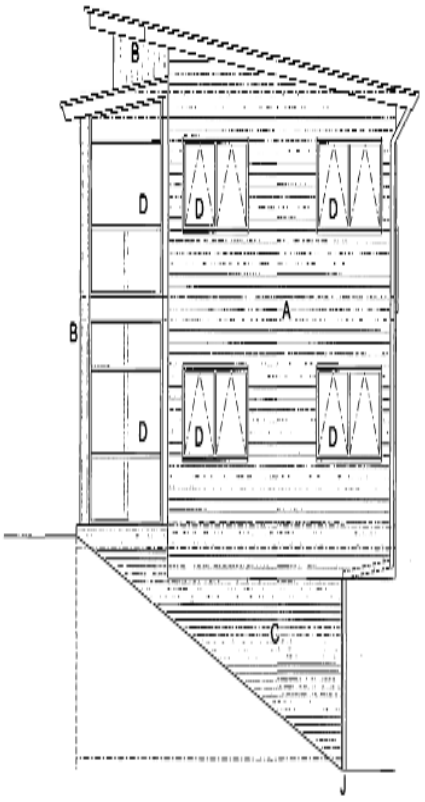
TYPE 2C HOUSE - 2 BEDROOM APARTMENT / SEPARATE CARPORT

ELEVATIONS

A204-1



WEST ELEVATION



EAST ELEVATION

ELEVATION KEY

- A Timber weatherboards on batten & cavity. Shiplap detail, laid horizontally. Paint finish.
- B Timber weatherboards on batten & cavity. Rusticated detail, laid vertically. Paint finish.
- C Architectural masonry veneer.
- D Powder coated aluminium window joinery.
- E Solid core exterior door in aluminium frame. Paint finish.
- F Timber sectional overhead garage door. Paint finish.
- G Galvanised and powder coated balustrades/handrails. Pressed flashings to suit.
- H Glazed-front balconies. Powder coated aluminium fixings.
- I Colorsteel gutter and fascia
- J UPVC down pipe. Paint finish
- K Fibre cement panel soffit. Paint finish.
- L Longrun colorsteel roof, corrugate profile
- M Optional timber pergola. Paint finish.
- N Solid masonry wall.

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42608

WEST COAST RD HOUSING DEVELOPMENT

TYPE 2C HOUSE - 2 BEDROOM APARTMENT / SEPARATE CARPORT

ELEVATIONS

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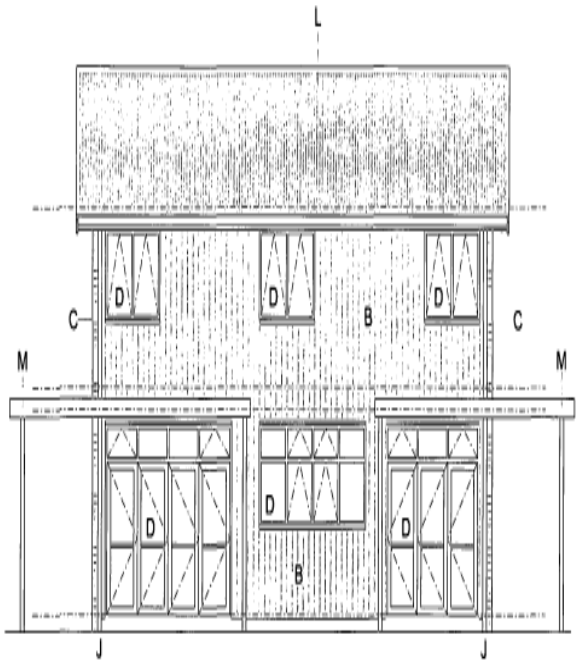
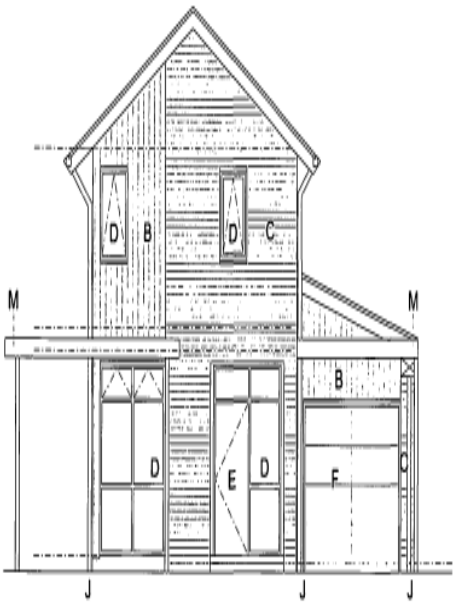
scale @A1 1:50
6/08/2008

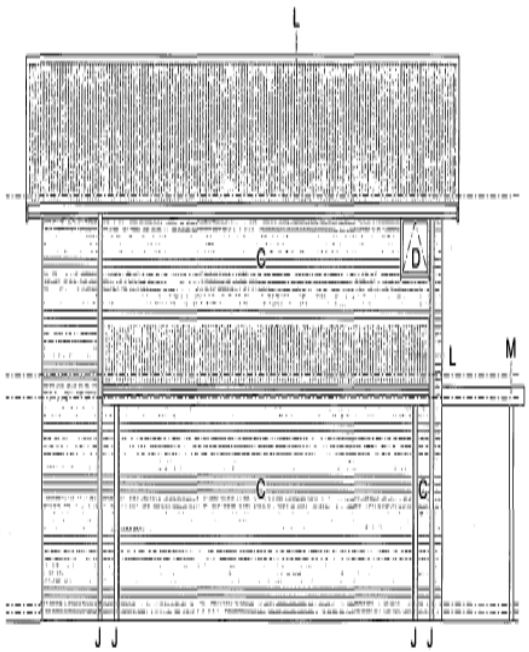
A204-2



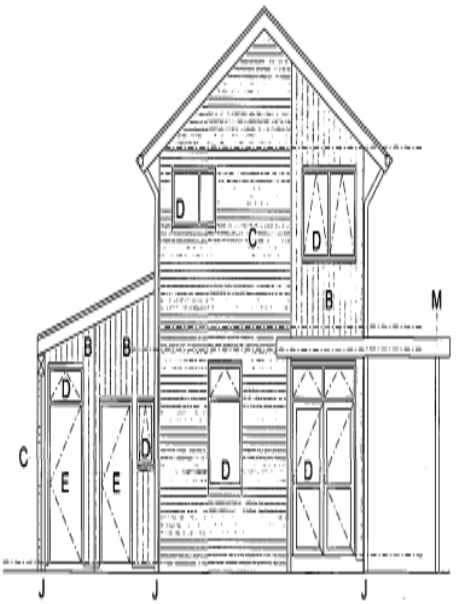
NORTH ELEVATION



WEST ELEVATION



SOUTH ELEVATION



EAST ELEVATION

ELEVATION KEY

- A Timber weatherboards on batten & cavity. Shiplap detail, laid horizontally. Paint finish.
- B Timber weatherboards on batten & cavity. Rusticated detail, laid vertically. Paint finish.
- C Architectural masonry veneer.
- D Powder coated aluminium window joinery.
- E Solid core exterior door in aluminium frame. Paint finish.
- F Timber sectional overhead garage door. Paint finish.
- G Galvanised and powder coated balustrades/handrails. Pressed flashings to suit.
- H Glazed-front balconies. Powder coated aluminium fixings.
- I Colorsteel gutter and fascia
- J UPVC down pipe. Paint finish
- K Fibre cement panel soffit. Paint finish.
- L Longrun colorsteel roof, corrugate profile
- M Optional timber pergola. Paint finish.
- N Solid masonry wall.

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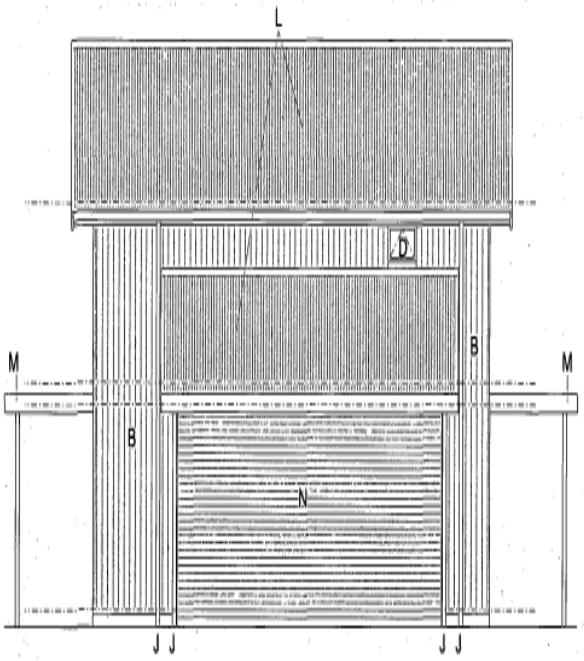
WEST COAST RD HOUSING DEVELOPMENT

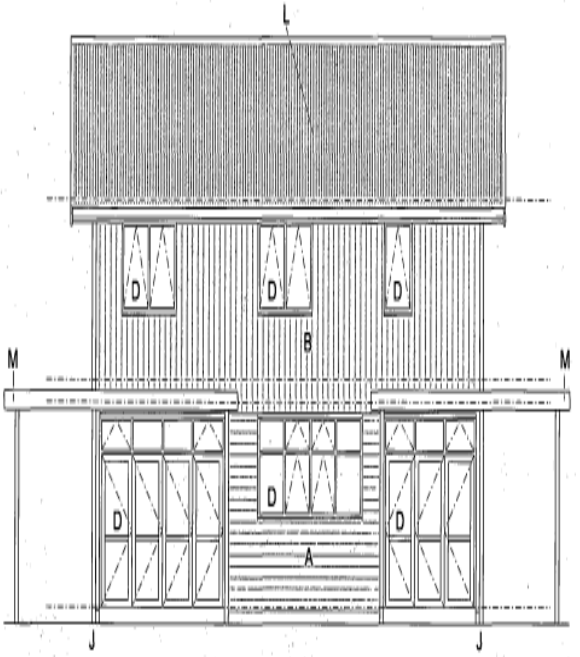
TYPE 3 HOUSE - 3 BEDROOM / DOUBLE GARAGE

ELEVATIONS

A205



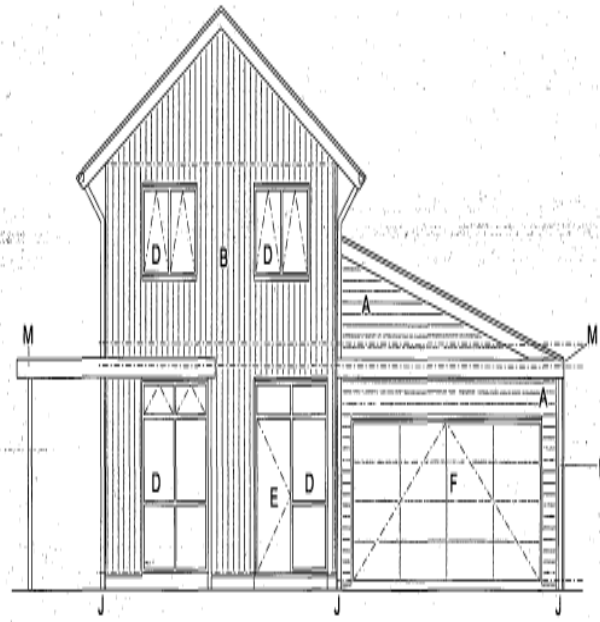
SOUTH ELEVATION

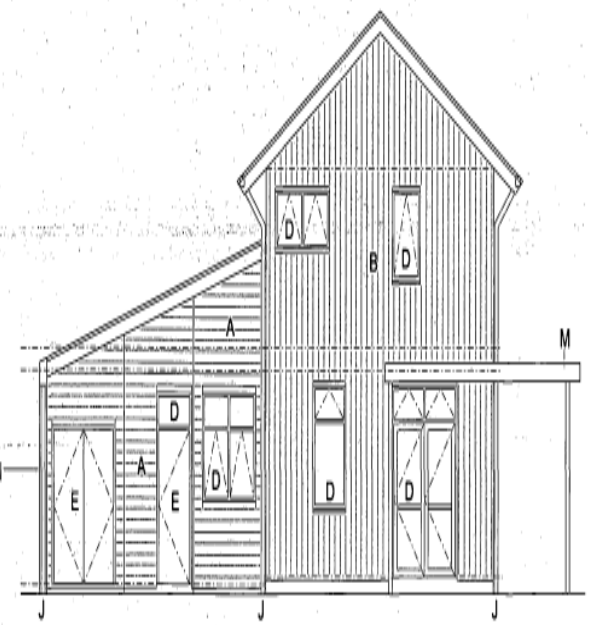


NORTH ELEVATION

ELEVATION KEY

- A Timber weatherboards on batten & cavity. Shiplap detail, laid horizontally. Paint finish.
- B Timber weatherboards on batten & cavity. Rusticated detail, laid vertically. Paint finish.
- C Architectural masonry veneer.
- D Powder coated aluminium window joinery.
- E Solid core exterior door in aluminium frame. Paint finish.
- F Timber sectional overhead garage door. Paint finish.
- G Galvanised and powder coated balustrades/handrails. Pressed flashings to suit.
- H Glazed-front balconies. Powder coated aluminium fixings.
- I Colorsteel gutter and fascia
- J UPVC down pipe. Paint finish
- K Fibre cement panel soffit. Paint finish.
- L Longrun colorsteel roof, corrugate profile
- M Optional timber pergola. Paint finish.
- N Solid masonry wall.





N

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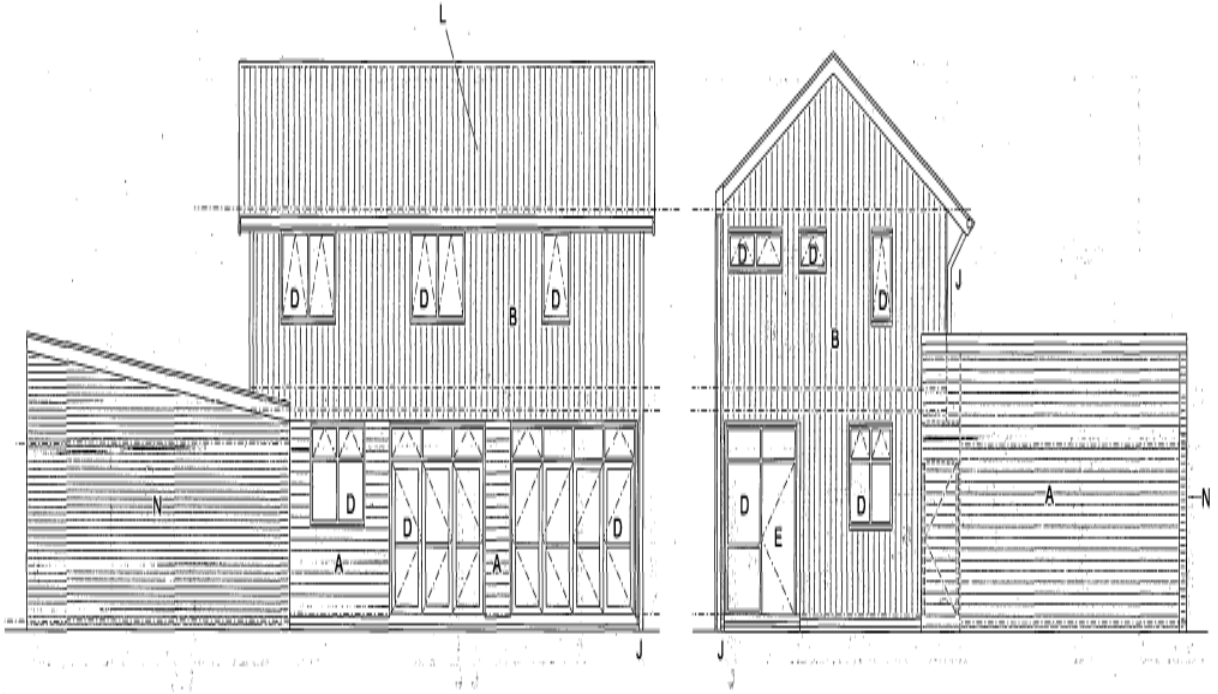
WEST COAST RD HOUSING DEVELOPMENT

TYPE 4A HOUSE - 4 BEDROOM / DOUBLE GARAGE

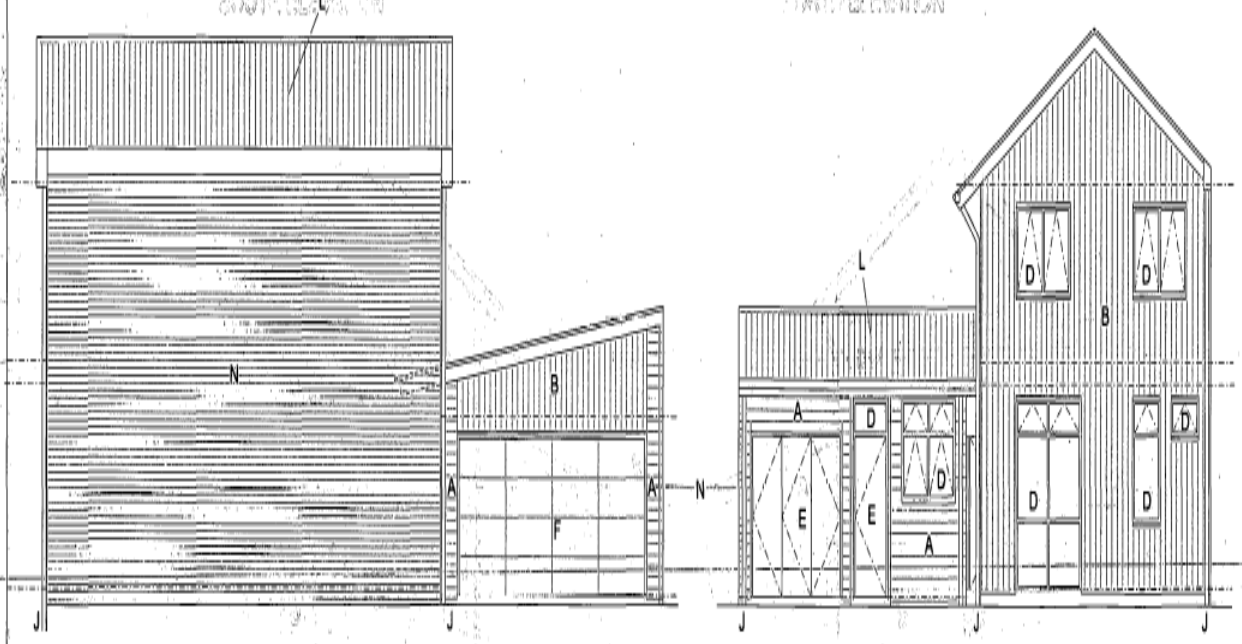
ELEVATIONS

A206



NORTH ELEVATION

EAST ELEVATION



SOUTH ELEVATION

WEST ELEVATION

ELEVATION KEY

- A Timber weatherboards on batten & cavity. Shiplap detail, laid horizontally. Paint finish.
- B Timber weatherboards on batten & cavity. Rusticated detail, laid vertically. Paint finish.
- C Architectural masonry veneer.
- D Powder coated aluminium window joinery.
- E Solid core exterior door in aluminium frame. Paint finish.
- F Timber sectional overhead garage door. Paint finish.
- G Galvanised and powder coated balustrades/handrails. Pressed flashings to suit.
- H Glazed-front balconies. Powder coated aluminium fixings.
- I Colorsteel gutter and fascia
- J UPVC down pipe. Paint finish
- K Fibre cement panel soffit. Paint finish.
- L Longrun colorsteel roof, corrugate profile
- M Optional timber pergola. Paint finish.
- N Solid masonry wall.

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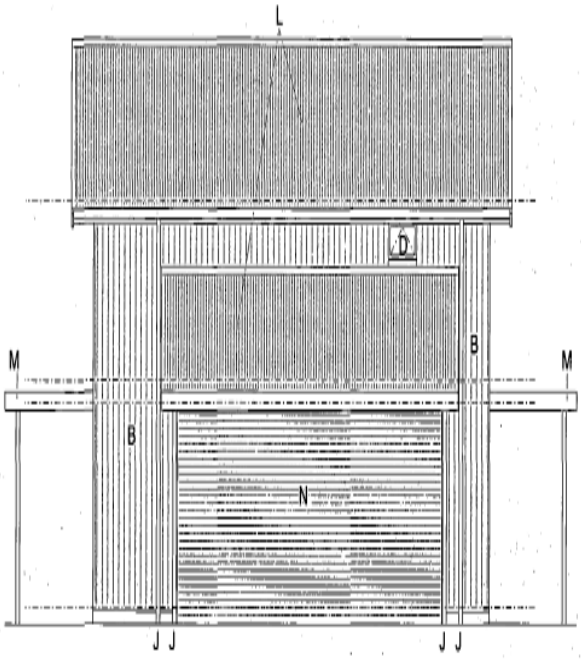
WEST COAST RD HOUSING DEVELOPMENT

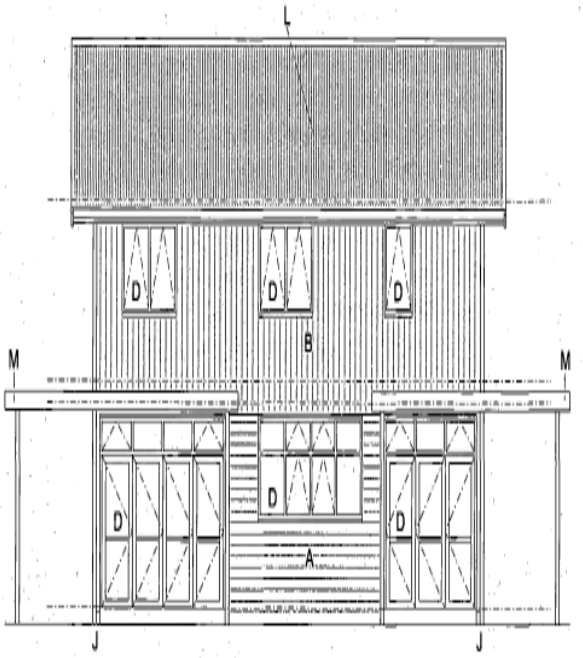
TYPE 4B HOUSE - 4 BEDROOM / DOUBLE GARAGE

ELEVATIONS

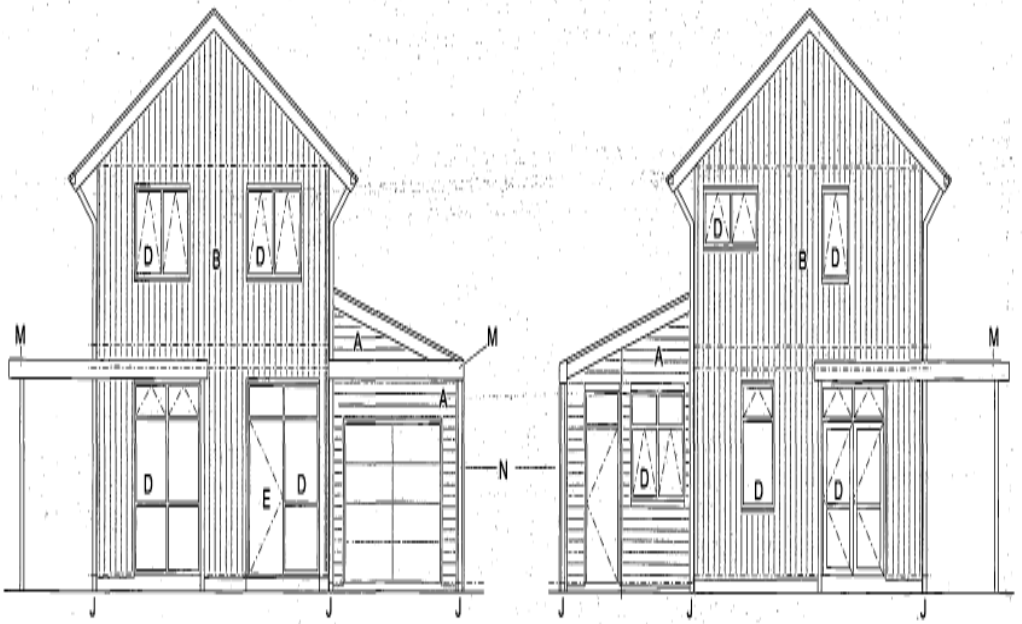
A207



SOUTH ELEVATION



NORTH ELEVATION



ELEVATION KEY

- A Timber weatherboards on batten & cavity. Shiplap detail, laid horizontally. Paint finish.
- B Timber weatherboards on batten & cavity. Rusticated detail, laid vertically. Paint finish.
- C Architectural masonry veneer.
- D Powder coated aluminium window joinery.
- E Solid core exterior door in aluminium frame. Paint finish.
- F Timber sectional overhead garage door. Paint finish.
- G Galvanised and powder coated balustrades/handrails. Pressed flashings to suit.
- H Glazed-front balconies. Powder coated aluminium fixings.
- I Colorsteel gutter and fascia
- J UPVC down pipe. Paint finish
- K Fibre cement panel soffit. Paint finish.
- L Longrun colorsteel roof, corrugate profile
- M Optional timber pergola. Paint finish.
- N Solid masonry wall.

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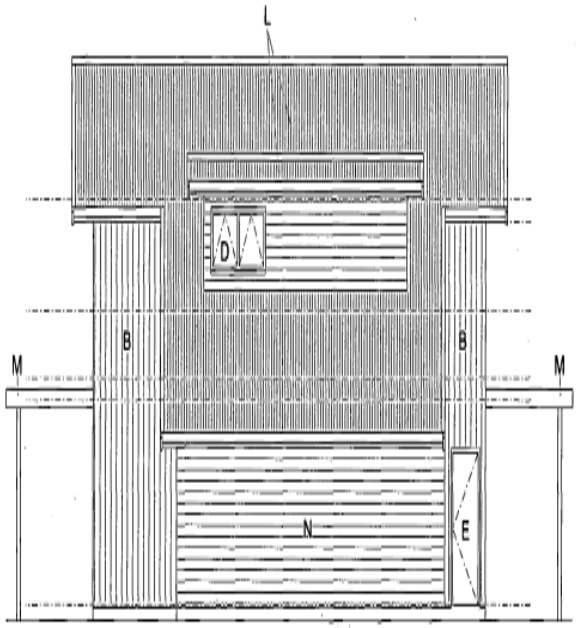
WEST COAST RD HOUSING DEVELOPMENT

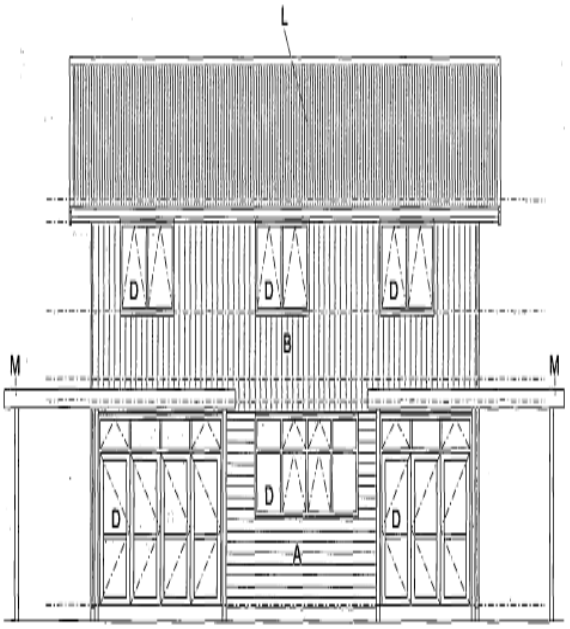
TYPE 4C HOUSE - 4 BEDROOM / DOUBLE GARAGE

ELEVATIONS

A208



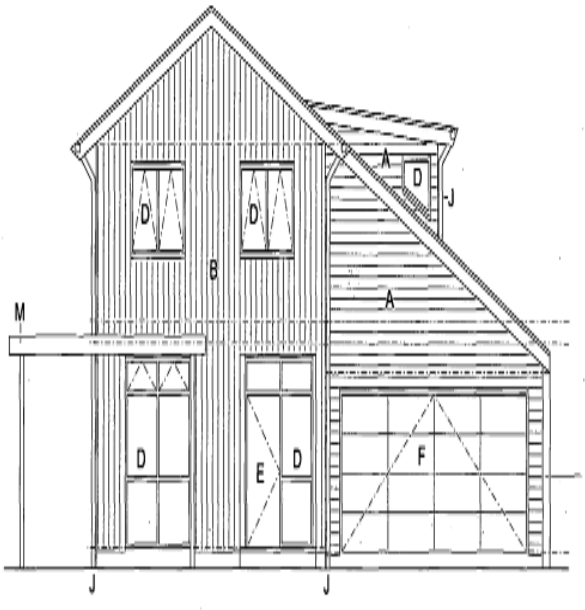
SOUTH ELEVATION



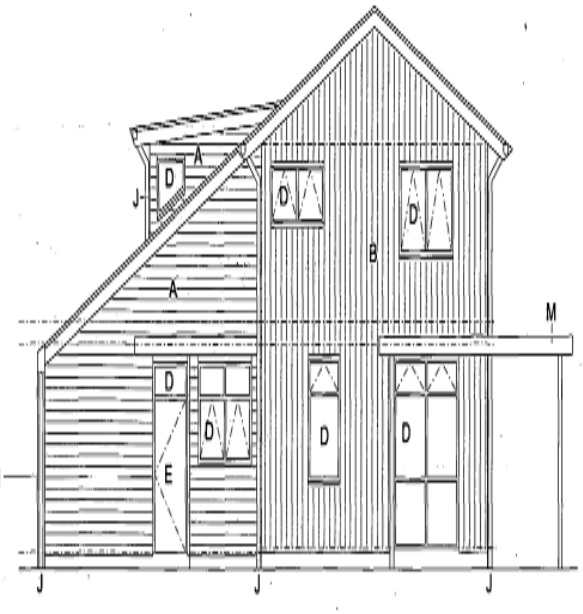
NORTH ELEVATION

ELEVATION KEY

- A Timber weatherboards on batten & cavity. Shiplap detail, laid horizontally. Paint finish.
- B Timber weatherboards on batten & cavity. Rusticated detail, laid vertically. Paint finish.
- C Architectural masonry veneer.
- D Powder coated aluminium window joinery.
- E Solid core exterior door in aluminium frame. Paint finish.
- F Timber sectional overhead garage door. Paint finish.
- G Galvanised and powder coated balustrades/handrails. Pressed flashings to suit.
- H Glazed-front balconies. Powder coated aluminium fixings.
- I Colorsteel gutter and fascia
- J UPVC down pipe. Paint finish
- K Fibre cement panel soffit. Paint finish.
- L Longrun colorsteel roof, corrugate profile
- M Optional timber pergola. Paint finish.
- N Solid masonry wall.



WEST ELEVATION



EAST ELEVATION

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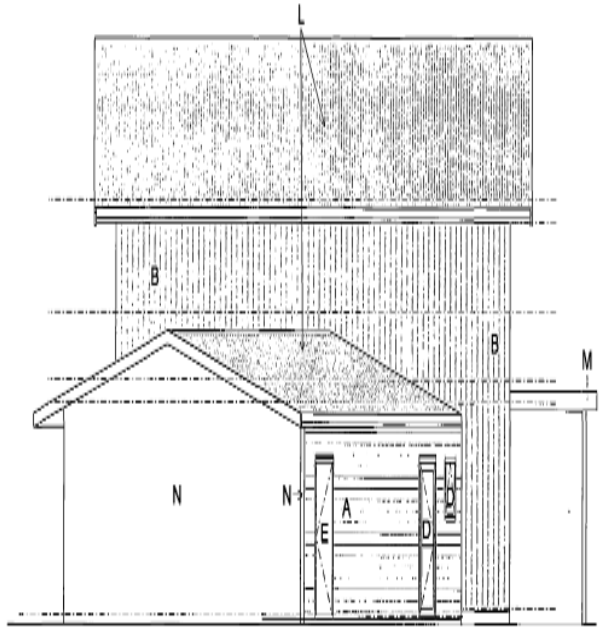
WEST COAST RD HOUSING DEVELOPMENT

TYPE 5A HOUSE - 5 BEDROOM / DOUBLE GARAGE

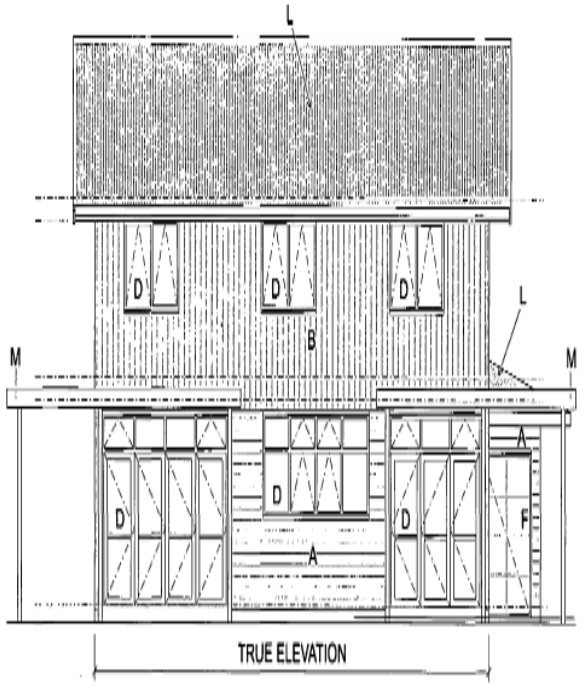
ELEVATIONS

A209

6/23/2008 10:48:18 AM x:\dgn\42600's\42608 - west coast rd\sketch\sheet\A209_5A.dgn



SOUTH ELEVATION



NORTH ELEVATION

ELEVATION KEY

- A Timber weatherboards on batten & cavity. Shiplap detail, laid horizontally. Paint finish.
- B Timber weatherboards on batten & cavity. Rusticated detail, laid vertically. Paint finish.
- C Architectural masonry veneer.
- D Powder coated aluminium window joinery.
- E Solid core exterior door in aluminium frame. Paint finish.
- F Timber sectional overhead garage door. Paint finish.
- G Galvanised and powder coated balustrades/handrails. Pressed fleshings to suit.
- H Glazed-front balconies. Powder coated aluminium fixings.
- I Colorsteel gutter and fascia
- J UPVC down pipe. Paint finish
- K Fibre cement panel soffit. Paint finish.
- L Longrun colorsteel roof, corrugate profile
- M Optional timber pergola. Paint finish.
- N Solid masonry wall.

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WEST COAST RD HOUSING DEVELOPMENT

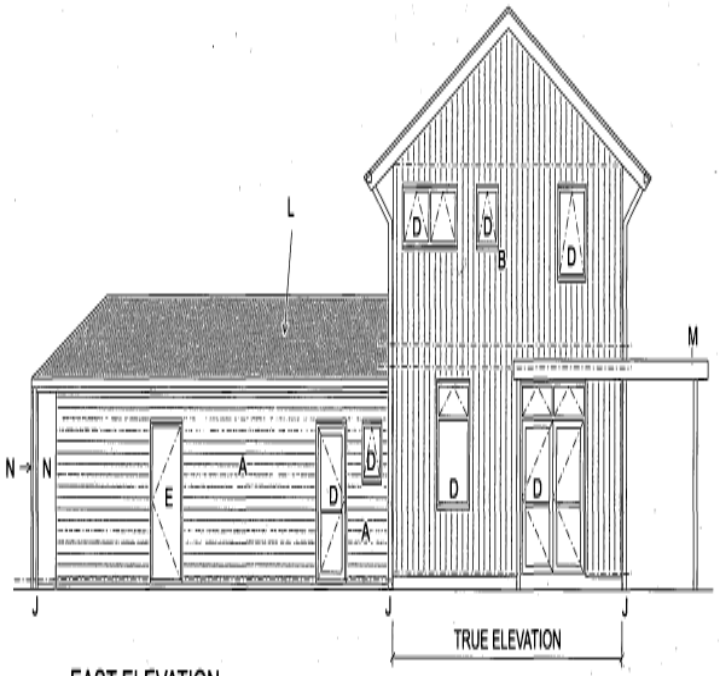
TYPE 5B HOUSE - 5 BEDROOM / DOUBLE GARAGE

ELEVATIONS

scale @A3 1:100
scale @A1 1:50
10 JUN 2008

A210-1

6/23/2006 10:49:23 AM s:\dgn\42600's\42608 - west coast rd\sketch\sheet\A210-1_5B.dgn



EAST ELEVATION

WEST ELEVATION

ELEVATION KEY

- A Timber weatherboards on batten & cavity. Shiplap detail, laid horizontally. Paint finish.
- B Timber weatherboards on batten & cavity. Rusticated detail, laid vertically. Paint finish.
- C Architectural masonry veneer.
- D Powder coated aluminium window joinery.
- E Solid core exterior door in aluminium frame. Paint finish.
- F Timber sectional overhead garage door. Paint finish.
- G Galvanised and powder coated balustrades/handrails. Pressed flashings to suit.
- H Glazed-front balconies. Powder coated aluminium fixings.
- I Colorsteel gutter and fascia
- J UPVC down pipe. Paint finish
- K Fibre cement panel soffit. Paint finish.
- L Longrun colorsteel roof, corrugate profile
- M Optional timber pergola. Paint finish.
- N Solid masonry wall.

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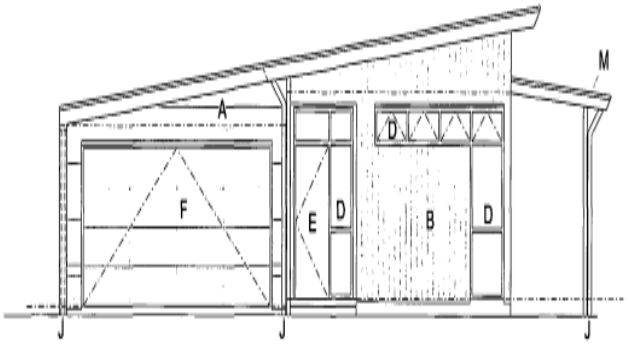
WEST COAST RD HOUSING DEVELOPMENT

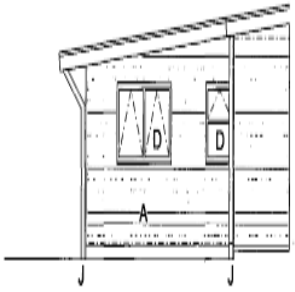
TYPE 5B HOUSE - 5 BEDROOM / DOUBLE GARAGE

ELEVATIONS

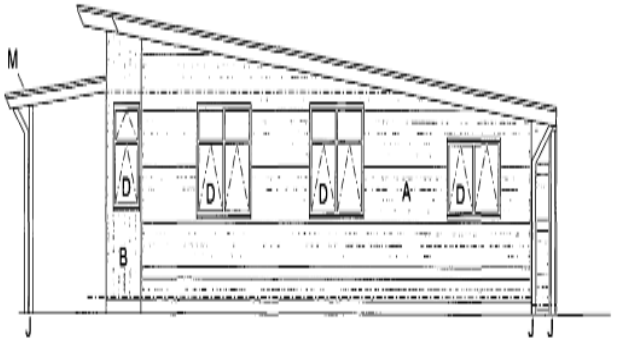
A210-2



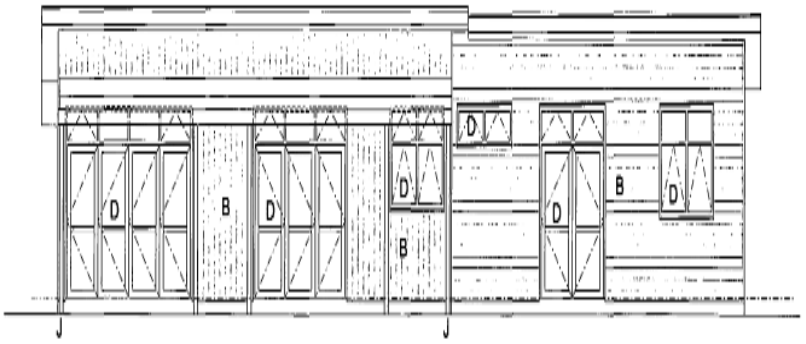
NORTH ELEVATION



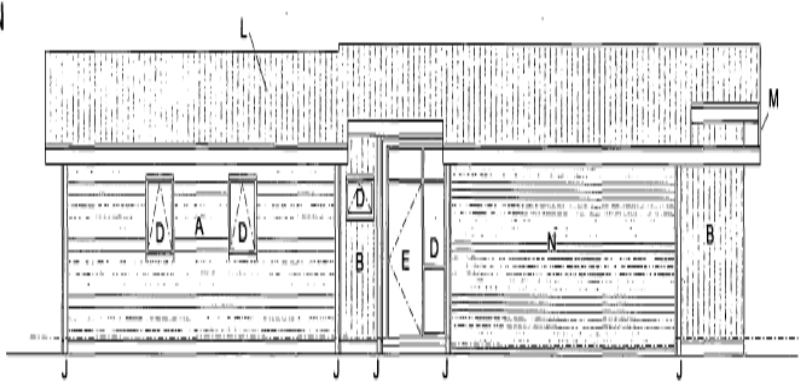
NORTH ELEVATION (COURTYARD)



SOUTH ELEVATION



WEST ELEVATION



ELEVATION KEY

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- H Glazed-front balconies. Powder coated aluminium fixings.
- I Colorsteel gutter and fascia
- J UPVC down pipe. Paint finish
- K Fibre cement panel soffit. Paint finish.
- L Longrun colorsteel roof, corrugate profile
- M Optional timber pergola. Paint finish.
- N Solid masonry wall.

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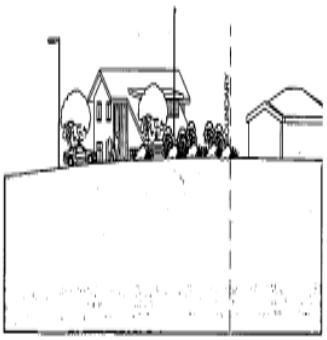
WEST COAST RD HOUSING DEVELOPMENT

TYPE 5C HOUSE - 5 BEDROOM / DOUBLE GARAGE

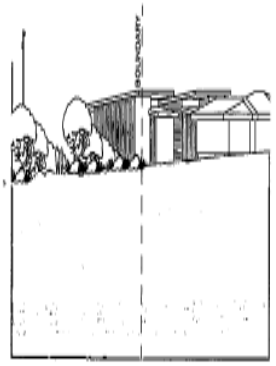
ELEVATIONS

A211-1

1 A301 ELEVATION 01
1 : 500

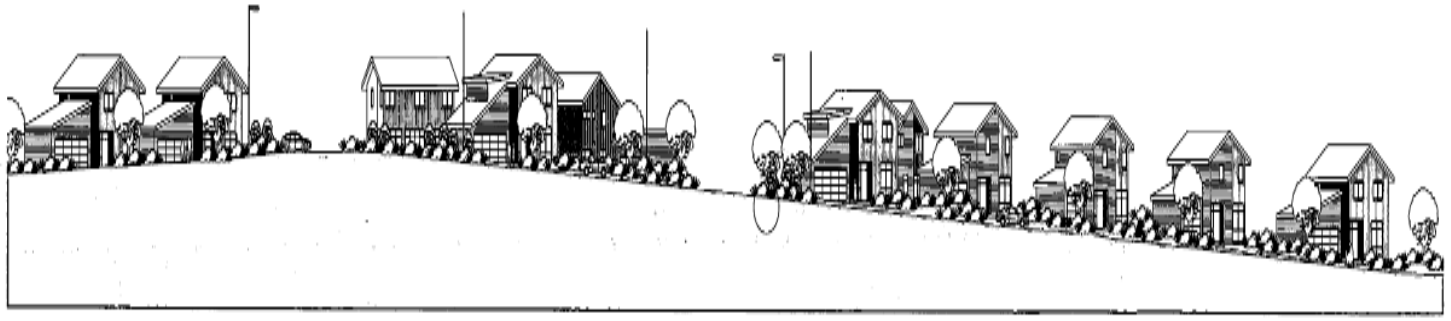


2 A301 ELEVATION 02
1 : 500



3 A301 ELEVATION 03
1 : 500

4 A301 ELEVATION 04
1 : 500



5 A301 ELEVATION 05
1 : 500

Babbage CONSULTANTS

PROJECT No. 42608

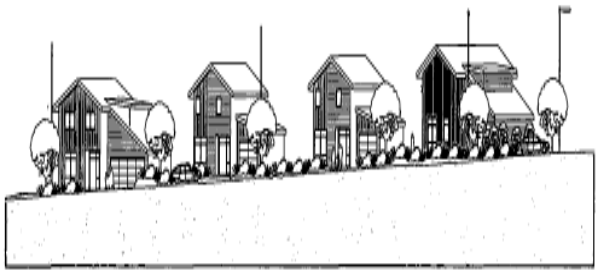
WEST COAST ROAD HOUSING DEVELOPMENT

BULK & LOCATION STUDY

STREET ELEVATION

07 JAN 2008

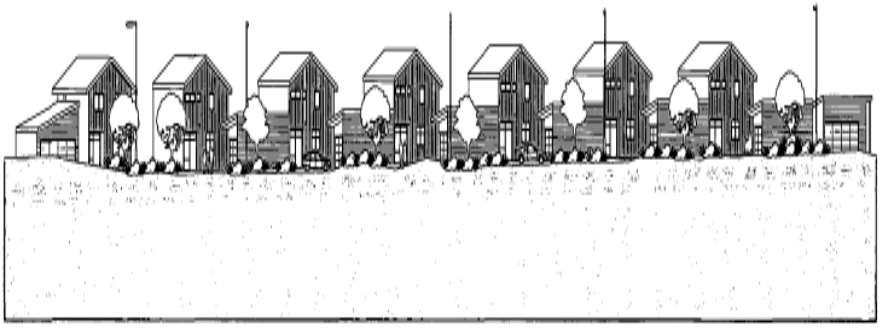
REV. A301



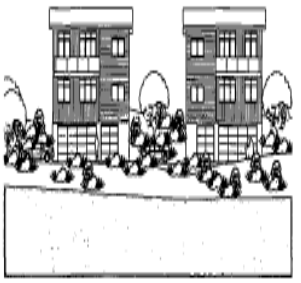
1 A302 ELEVATION 06
1 : 500

2 A302 ELEVATION 07
1 : 500

3 A302 ELEVATION 08
1 : 500



4 A302 ELEVATION 09
1 : 500



5 A302 ELEVATION 10
1 : 500

Babbage CONSULTANTS

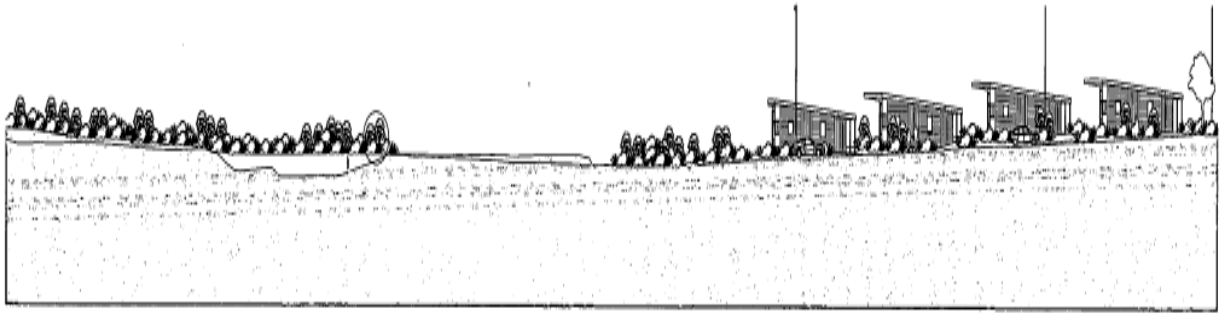
T&T 42608

WEST COAST ROAD HOUSING DEVELOPMENT

BULK & LOCATION STUDY

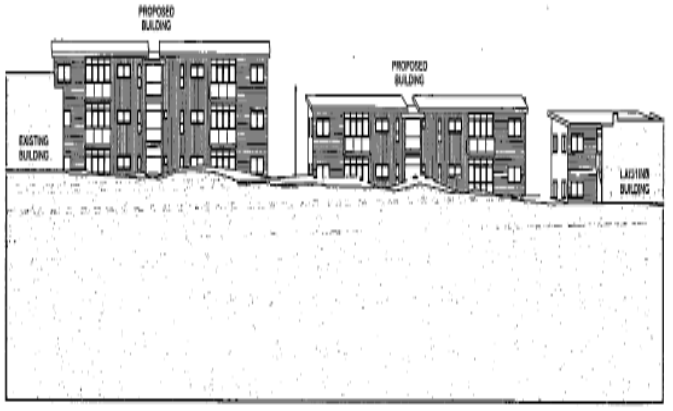
STREET ELEVATION

REV. 05.07.05 A302

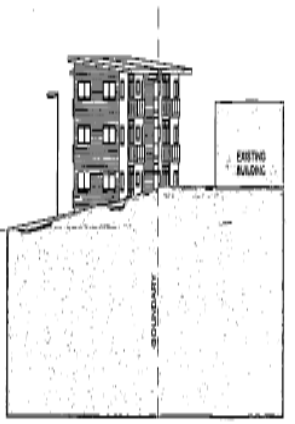


1 A303 ELEVATION 11
1 : 500

2 A303 ELEVATION 12
1 : 500



3 A303 ELEVATION 13
1 : 500



4 A303 ELEVATION 14
1 : 500

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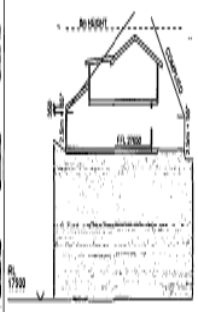
PROJECT No. 42608

WEST COAST ROAD HOUSING DEVELOPMENT

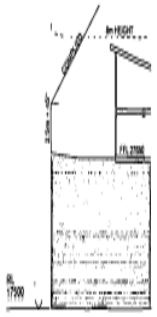
BULK & LOCATION STUDY

STREET ELEVATION

rev. 06/12/05 A303

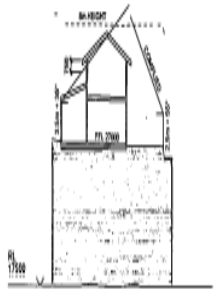


1 A304 LOT 01 - North & South 1 : 500



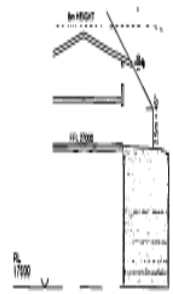
2 A304 LOT 01 - East 1 : 500

3 A304 LOT 01 - West 1 : 500

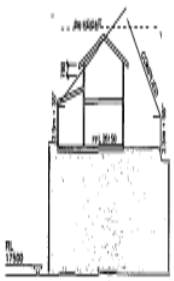


4 A304 LOT 02 - North & South 1 : 500

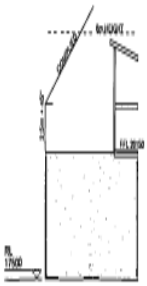
5 A304 LOT 02 - East 1 : 500



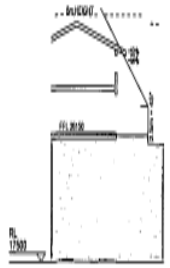
6 A304 LOT 02 - West 1 : 500



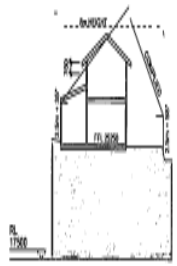
7 A304 LOT 03 - North & South 1 : 500



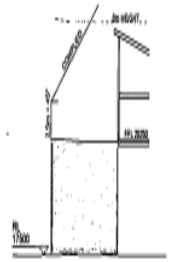
8 A304 LOT 03 - East 1 : 500



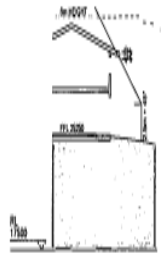
9 A304 LOT 03 - West 1 : 500



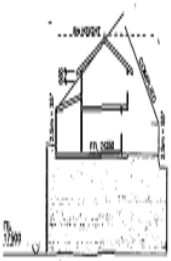
10 A304 LOT 04 - North & South 1 : 500



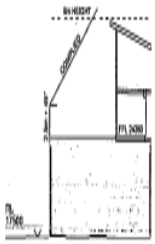
11 A304 LOT 04 - East 1 : 500



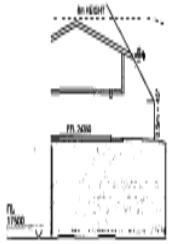
12 A304 LOT 04 - West 1 : 500



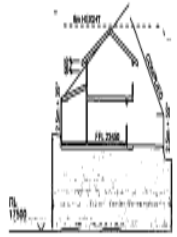
13 A304 LOT 05 - North & South 1 : 500



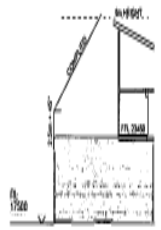
14 A304 LOT 05 - East 1 : 500



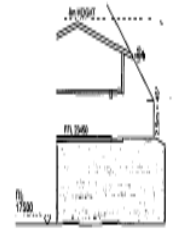
15 A304 LOT 05 - West 1 : 500



16 A304 LOT 06 - North & South 1 : 500



17 A304 LOT 06 - East 1 : 500



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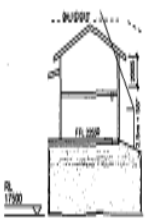

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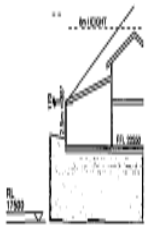

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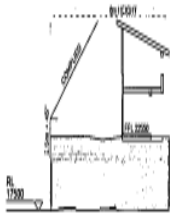

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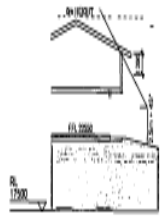

22 A304 LOT 07 - West 1 : 500

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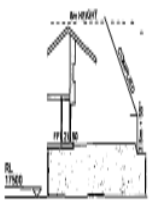
BULK & LOCATION STUDY

SECTIONS STAGE 1A

rev. A304



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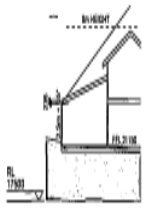
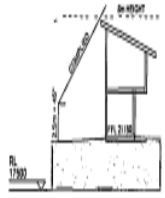
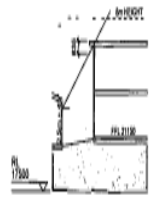


2 A305 LOT 08 - South 1 : 500



3 A305 LOT 08 - East 1 : 500



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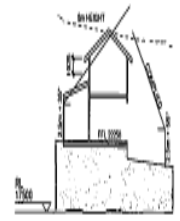
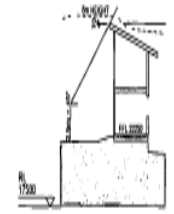
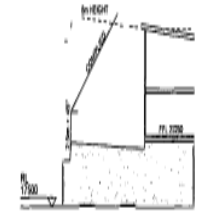


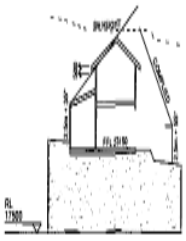
5 A305 LOT 09 - North & South 1 : 500



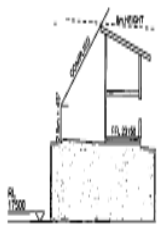
6 A305 LOT 09 - East 1 : 500



7 A305 LOT 09 - West 1 : 500



8 A305 LOT 10 - North & South 1 : 500



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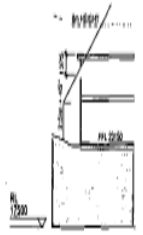

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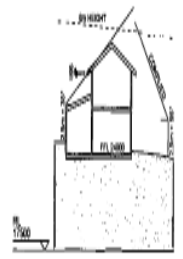
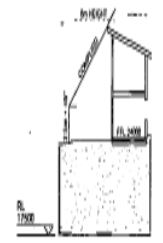


11 A305 LOT 11 - North & South 1 : 500



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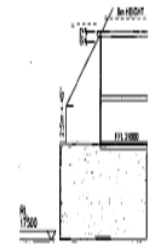

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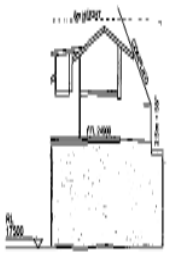

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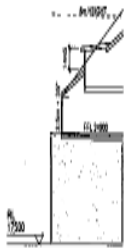

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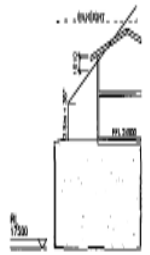

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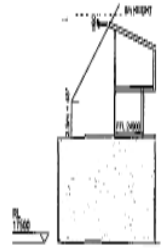
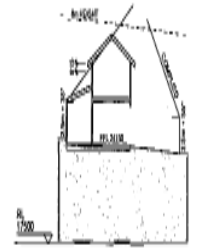
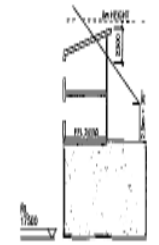


17 A305 LOT 12 - East 1 : 500



18 A305 LOT 13 - North & South 1 1 : 500



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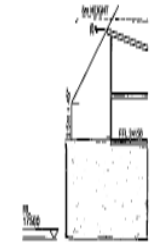

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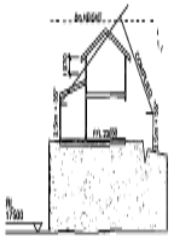

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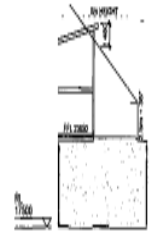
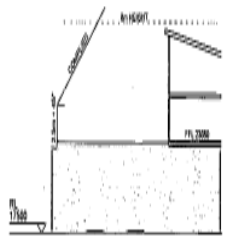
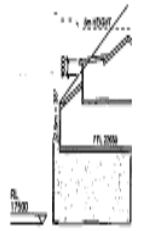


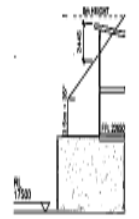
22 A305 LOT 14 - South 2 1 : 500



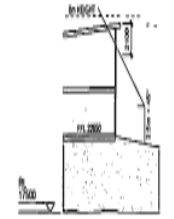
23 A305 LOT 14 - East 1 : 500



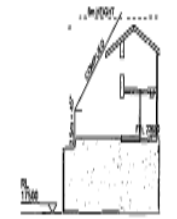
24 A305 LOT 15 - South 1 1 : 500



25 A305 LOT 15 - South 2 1 : 500



26 A305 LOT 15 - East 1 : 500



27 A305 LOT 15 - West 1 : 500

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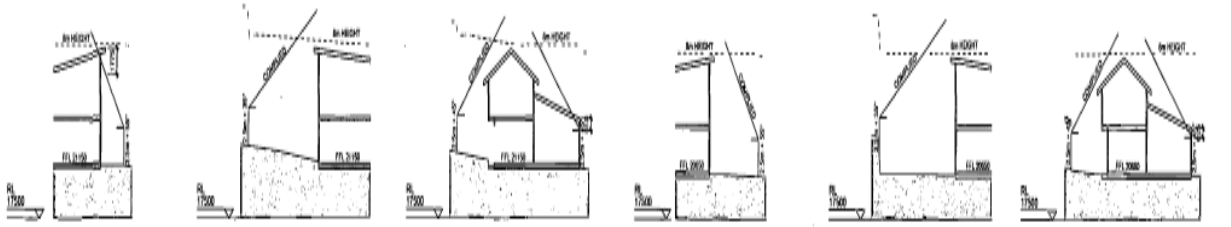
WEST COAST ROAD HOUSING DEVELOPMENT

BULK & LOCATION STUDY

SECTIONS STAGE 1B

08/02/08

rev. A305



1 A306 LOT 16 - North 1 : 500

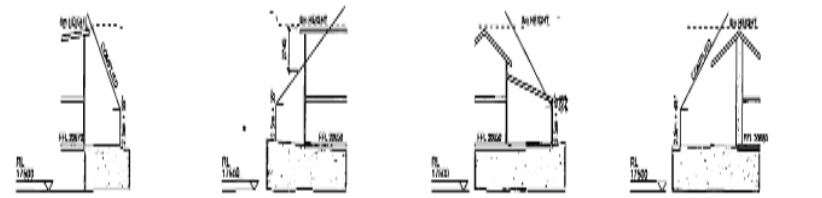
2 A306 LOT 16 - South 1 : 500

3 A306 LOT 16 - East & West 1 : 500

4 A306 LOT 17 - North 1 : 500

5 A306 LOT 17 - South 1 : 500

6 A306 LOT 17 - East & West 1 : 500



7 A306 LOT 18 - North 1 : 500

8 A306 LOT 18 - South 1 : 500

9 A306 LOT 18 - East 1 : 500

10 A306 LOT 18 - West 1 : 500

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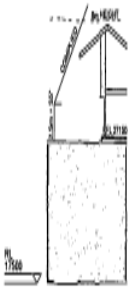
WEST COAST ROAD HOUSING DEVELOPMENT

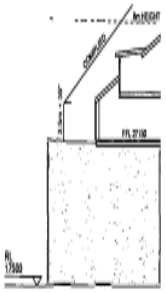
BULK & LOCATION STUDY

SECTIONS STAGE 1B

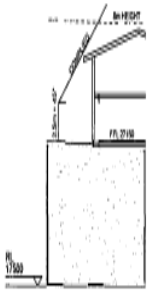
REVISION rev. A306



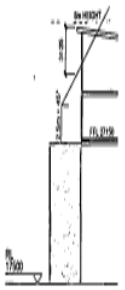
1 A307 LOT 26 - North 1 : 500



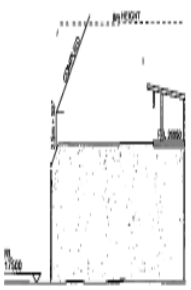
2 A307 LOT 26 - South 1 : 500



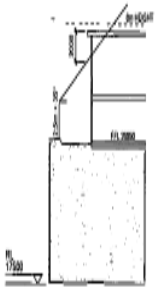
3 A307 LOT 26 - East 1 : 500



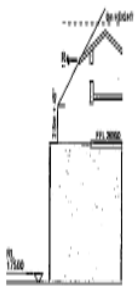
4 A307 LOT 26 - West 1 : 500



5 A307 LOT 27 - North 1 : 500



6 A307 LOT 27 - South 1 : 500



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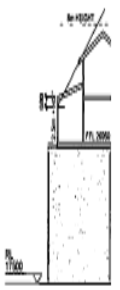
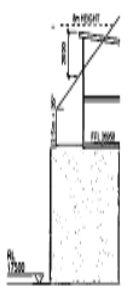
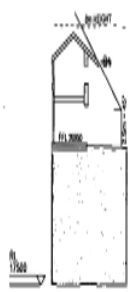


8 A307 LOT 27 - West 1 : 500

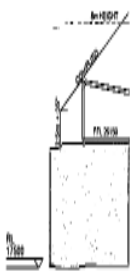


9 A307 LOT 28 - South 1 : 500

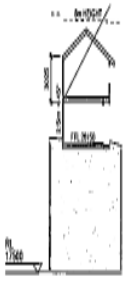
10 A307 LOT 28 - East 1 : 500



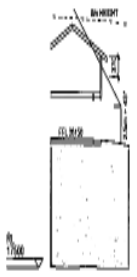
11 A307 LOT 28 - West 1 : 500



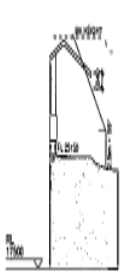
12 A307 LOT 29 - South 1 : 500



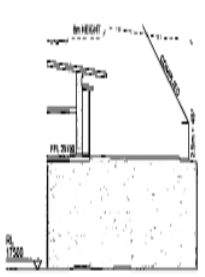
13 A307 LOT 29 - East 1 : 500



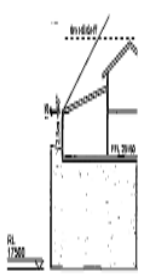
14 A307 LOT 29 - West 1 : 500



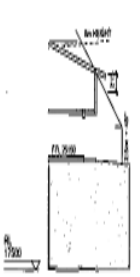
15 A307 LOT 30 - North 1 : 500



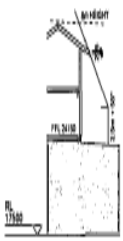
16 A307 LOT 30 - East 1 1 : 500



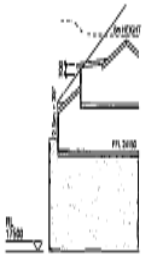
17 A307 LOT 30 - East 2 1 : 500



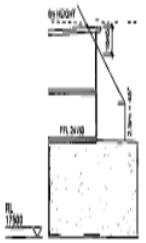
18 A307 LOT 30 - West 1 : 500



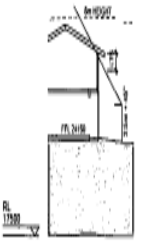
19 A307 LOT 31 - North 1 : 500



20 A307 LOT 31 - South 1 : 500



21 A307 LOT 31 - East 1 : 500



22 A307 LOT 31 - West 1 : 500

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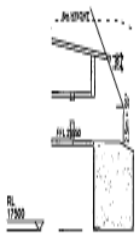
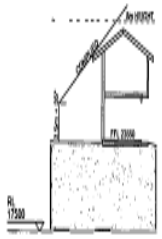
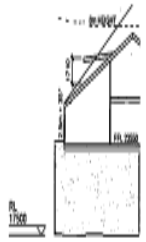
REV. A307



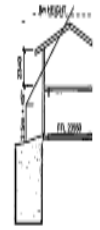
1 A308 LOT 32 - North
1 : 500



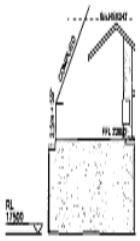
2 A308 LOT 32 - South 1
1 : 500



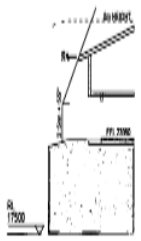
3 A308 LOT 32 - South 2
1 : 500



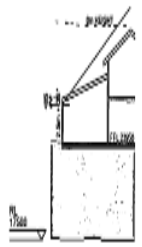
4 A308 LOT 32 - West
1 : 500



5 A308 LOT 33 - North 1
1 : 500

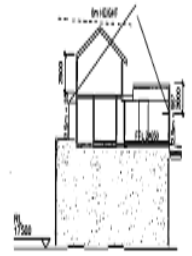


6 A308 LOT 33 - North 2
1 : 500

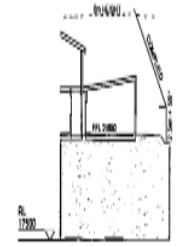


7 A308 LOT 33 - South
1 : 500

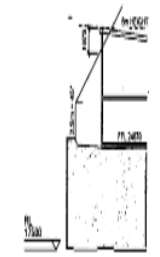
8 A308 LOT 33 - West
1 : 500



9 A308 LOT 34 - North 1 & South
1 : 500

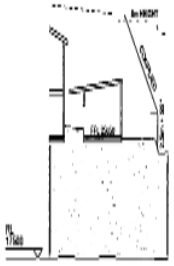


10 A308 LOT 34 - North 2
1 : 500

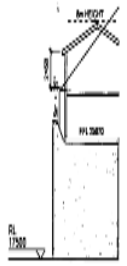


11 A308 LOT 34 - West
1 : 500

12 A308 LOT 35 - North 1 & South 1
1 : 500



13 A308 LOT 35 - North 2
1 : 500



14 A308 LOT 35 - South 2
1 : 500

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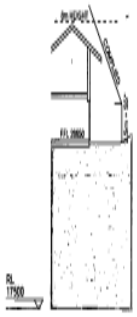
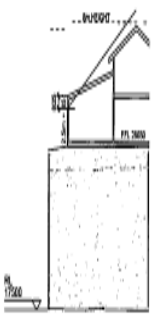
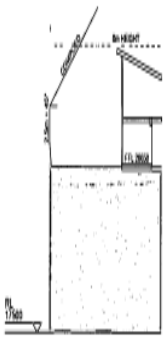


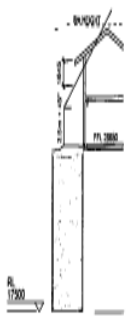
1 A309 LOT 19 - North 1 : 500



2 A309 LOT 19 - South 1 : 500



3 A309 LOT 19 - East 1 : 500



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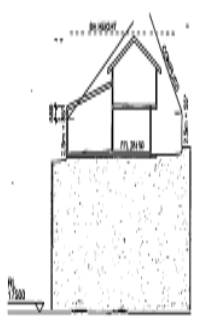
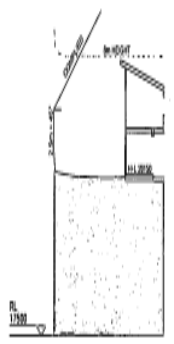
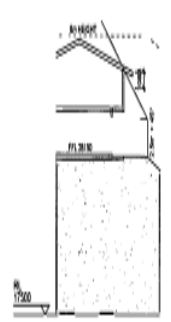


5 A309 LOT 20 - North & South 1 : 500



6 A309 LOT 20 - East 1 : 500



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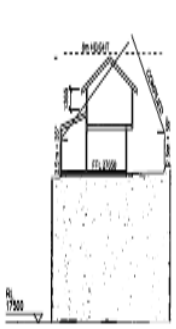
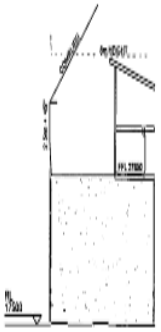
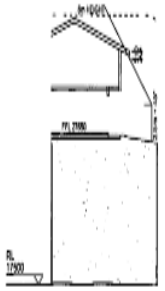


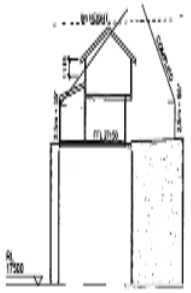
8 A309 LOT 21 - North & South 1 : 500



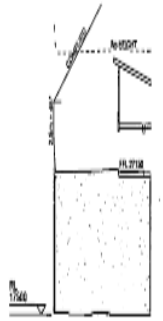
9 A309 LOT 21 - East 1 : 500



10 A309 LOT 21 - West 1 : 500



11 A309 LOT 22 - North & South 1 : 500



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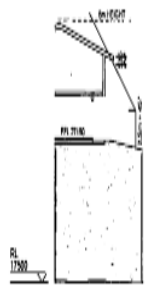

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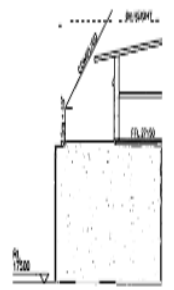

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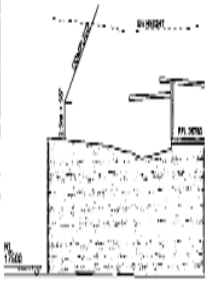

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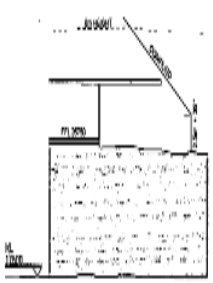
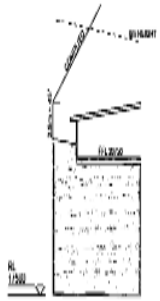
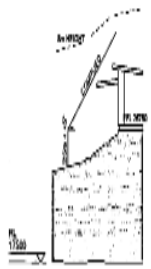


16 A309 LOT 23 - South 1 : 500



17 A309 LOT 23 - East 1 : 500



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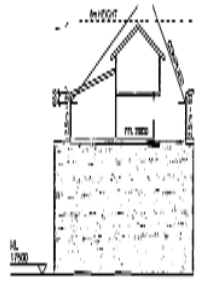

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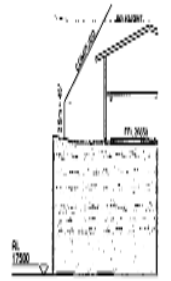

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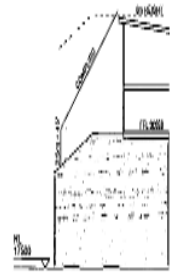

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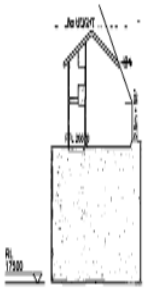

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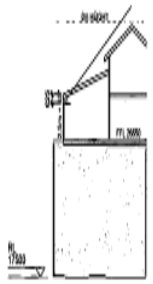
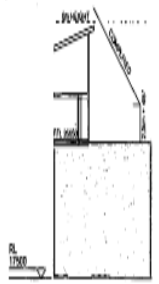
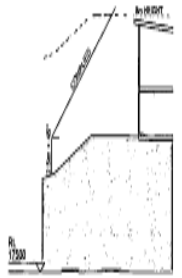


23 A309 LOT 25 - South 1 : 500



24 A309 LOT 25 - East 1 : 500



25 A309 LOT 25 - West 1 : 500

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WEST COAST ROAD HOUSING DEVELOPMENT

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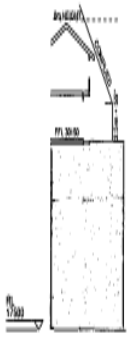
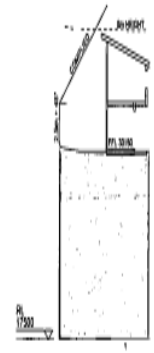
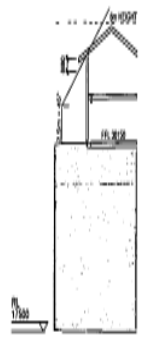


1 A310 LOT 36 - North 1 : 500

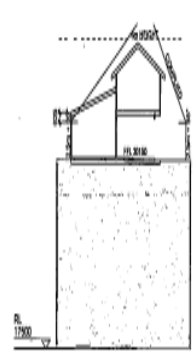
2 A310 LOT 36 - South 1 : 500



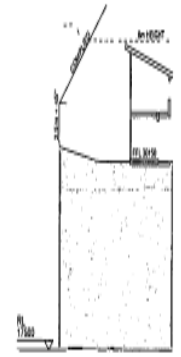
3 A310 LOT 36 - East 1 : 500



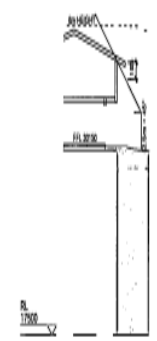
4 A310 LOT 36 - West 1 : 500



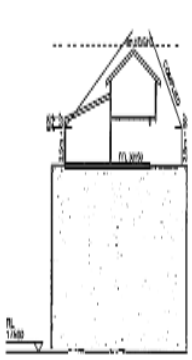
5 A310 LOT 37 - North & South 1 : 500



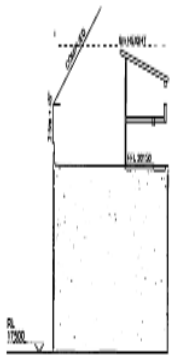
6 A310 LOT 37 - East 1 : 500



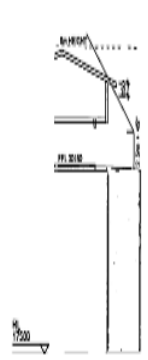
7 A310 LOT 37 - West 1 : 500



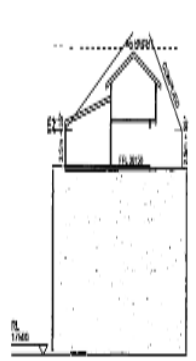
8 A310 LOT 38 - North & South 1 : 500



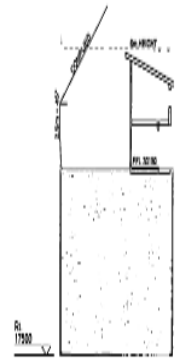
9 A310 LOT 38 - East 1 : 500



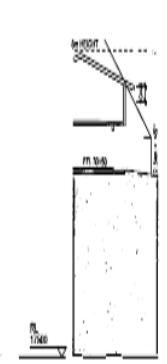
10 A310 LOT 38 - West 1 : 500



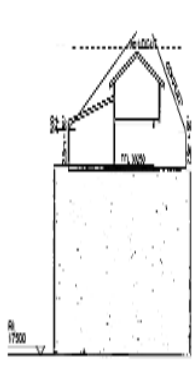
11 A310 LOT 39 - North & South 1 : 500



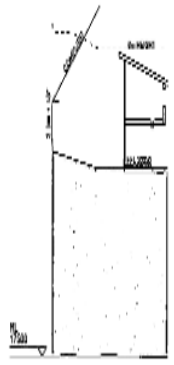
12 A310 LOT 39 - East 1 : 500



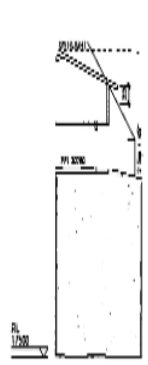
13 A310 LOT 39 - West 1 : 500



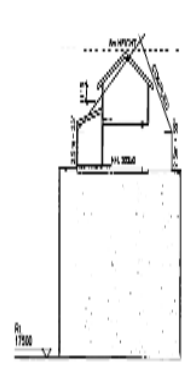
14 A310 LOT 40 - North & South 1 : 500



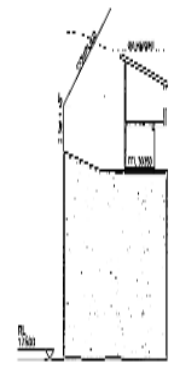
15 A310 LOT 40 - East 1 : 500



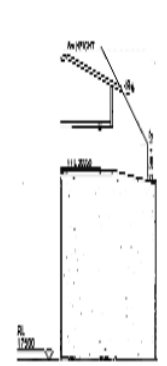
16 A310 LOT 40 - West 1 : 500



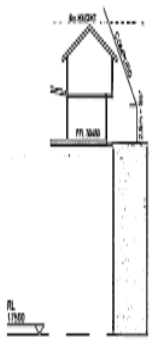
17 A310 LOT 41 - North & South 1 : 500



18 A310 LOT 41 - East 1 : 500



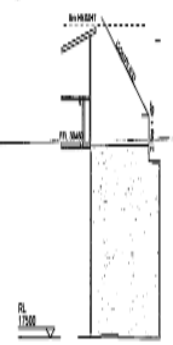
19 A310 LOT 41 - West 1 : 500



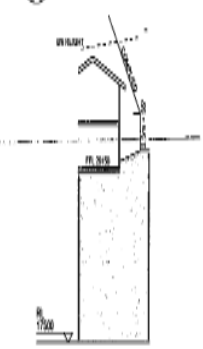
23 A310 LOT 42 - North 1 : 500

24 A310 LOT 42 - South 1 : 500

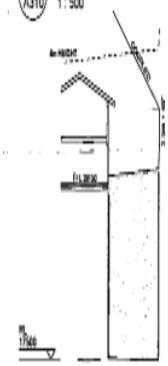
25 A310 LOT 42 - East 1 : 500



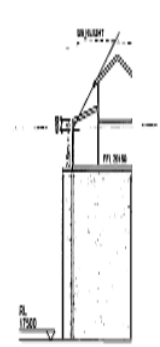
26 A310 LOT 42 - West 1 : 500



20 A310 LOT 43 - North 1 : 500



21 A310 LOT 43 - East 1 : 500



22 A310 LOT 43 - West 1 : 500

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WEST COAST ROAD HOUSING DEVELOPMENT

BULK & LOCATION STUDY

SECTIONS STAGE 2A

05 JUN 2006

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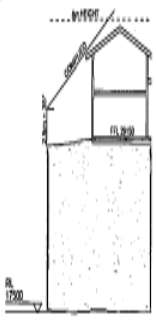
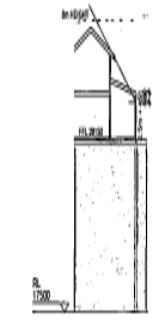
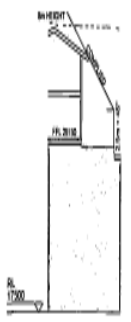


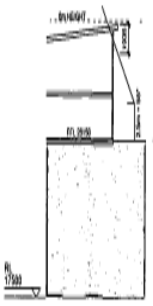
1 A311 LOT 44 - South 1 : 500



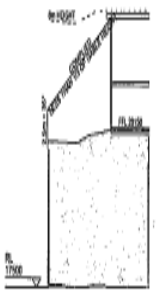
2 A311 LOT 44 - East 1 : 500



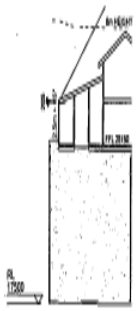
3 A311 LOT 44 - West 1 : 500



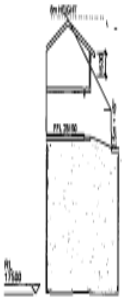
4 A311 LOT 45 - North 1 : 500



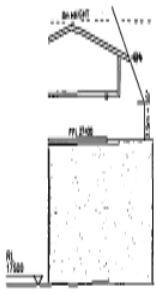
5 A311 LOT 45 - South 1 : 500



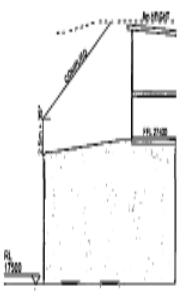
6 A311 LOT 45 - East 1 : 500



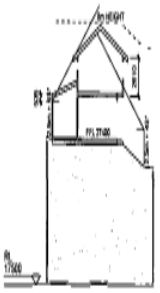
7 A311 LOT 45 - West 1 : 500



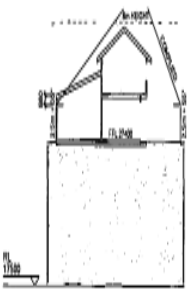
8 A311 LOT 46 - North 1 : 500



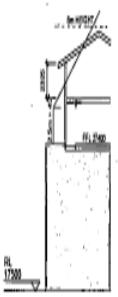
9 A311 LOT 46 - South 1 : 500



10 A311 LOT 46 - East & West 1 : 500



11 A311 LOT 47 - North & South 1 : 500



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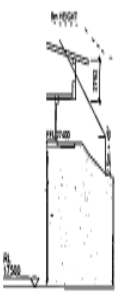
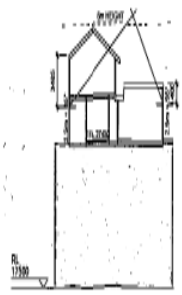
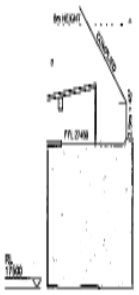


13 A311 LOT 47 - West 1 : 500



14 A311 LOT 48 - North & South 1 : 500



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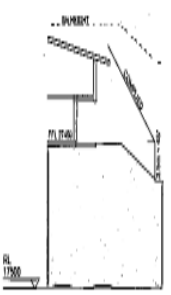
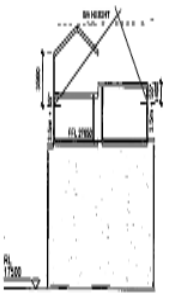
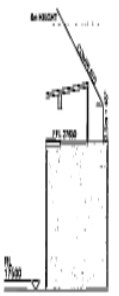


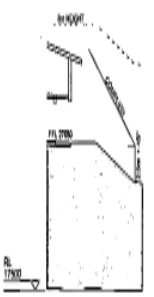
16 A311 LOT 48 - West 1 : 500



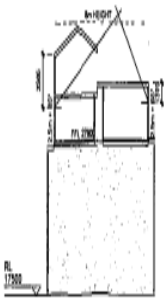
17 A311 LOT 49 - North & South 1 : 500



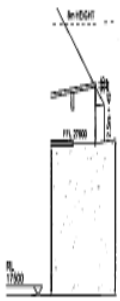
18 A311 LOT 49 - East 1 : 500



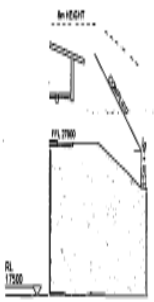
19 A311 LOT 49 - West 1 : 500



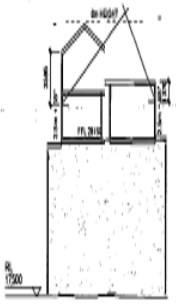
20 A311 LOT 50 - North & South 1 : 500



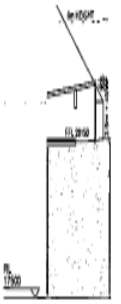
21 A311 LOT 50 - East 1 : 500



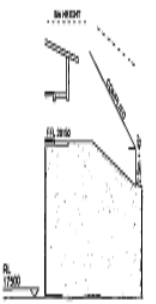
22 A311 LOT 50 - West 1 : 500



23 A311 LOT 51 - North & South 1 : 500



24 A311 LOT 51 - East 1 : 500



25 A311 LOT 51 - West 1 : 500

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WEST COAST ROAD HOUSING DEVELOPMENT

BULK & LOCATION STUDY

SECTIONS STAGE 2A & 2B

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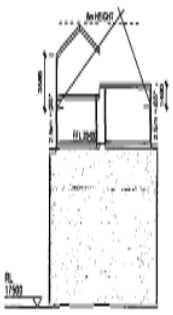
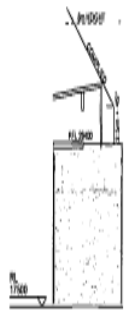
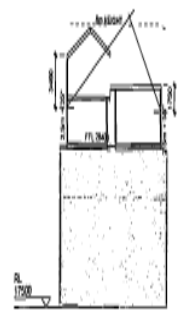


1 A312 LOT 52 - North & South 1 : 500

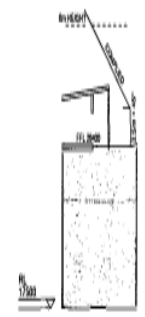


2 A312 LOT 52 - East 1 : 500

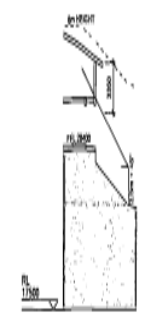
3 A312 LOT 52 - West 1 : 500



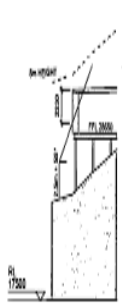
4 A312 LOT 53 - North & South 1 : 500



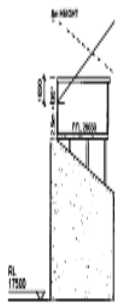
5 A312 LOT 53 - East 1 : 500



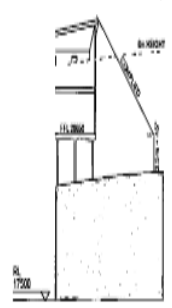
6 A312 LOT 53 - West 1 : 500



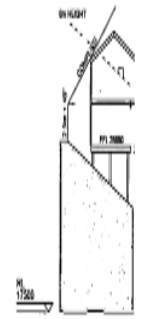
7 A312 LOT 54 - North 1 : 500



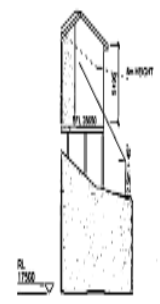
8 A312 LOT 54 - South 1 : 500



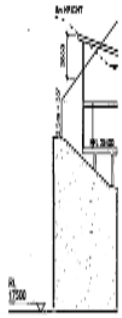
9 A312 LOT 54 - East 1 1 : 500



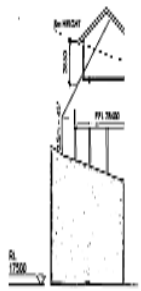
10 A312 LOT 54 - East 2 1 : 500



11 A312 LOT 54 - West 1 : 500



13 A312 LOT 55 - South 1 : 500



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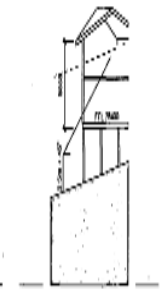

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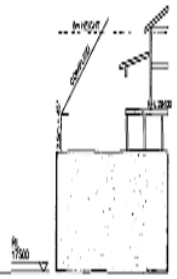

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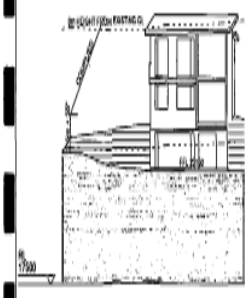
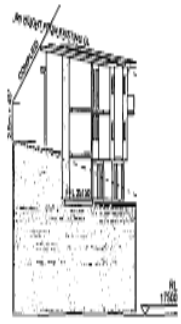


16 A312 LOT 56 - North 1 : 500



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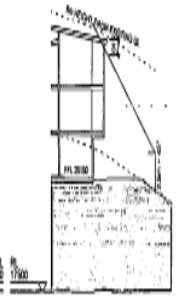

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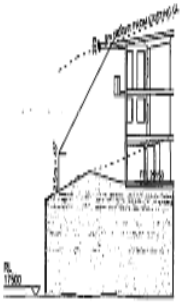

19 A312 LOT 56 - West 2 1 : 500

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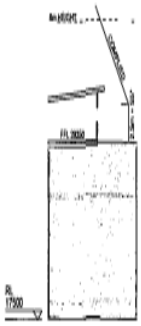
WEST COAST ROAD HOUSING DEVELOPMENT

BULK & LOCATION STUDY

SECTIONS STAGE 2B

DRAWING NO. REV. A312



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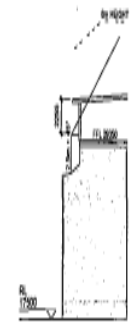
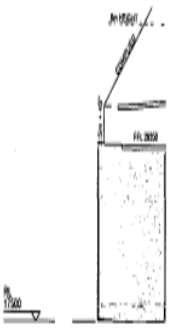


2 A313 LOT 57 - East 1 : 500

3 A313 LOT 57 - West 1 1 : 500



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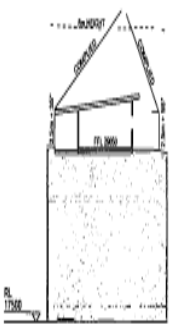
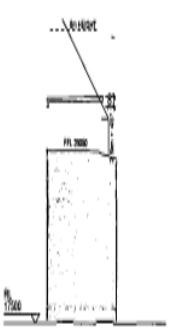
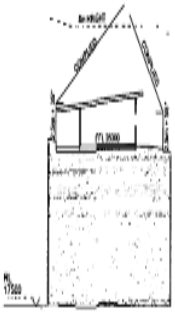


5 A313 LOT 58 - North & South 1 : 500

6 A313 LOT 58 - East 1 : 500



7 A313 LOT 58 - West 1 : 500



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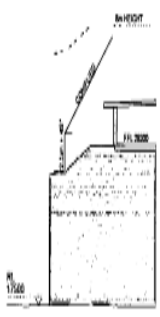

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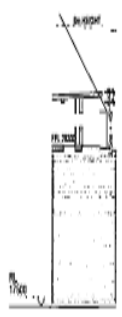

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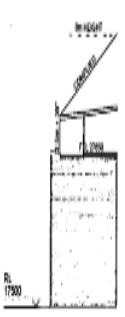
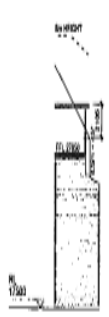


11 A313 LOT 60 - South 1 : 500



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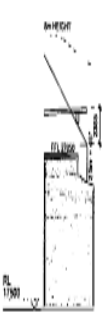
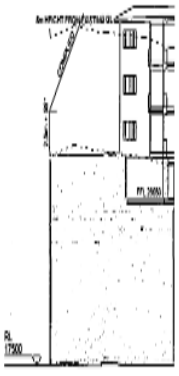


13 A313 LOT 60 - East 2 1 : 500

14 A313 LOT 60 - West 1 : 500



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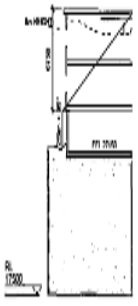

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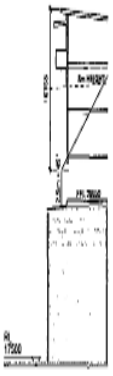

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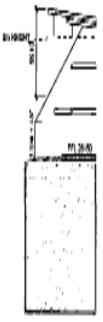

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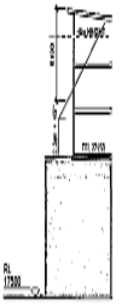

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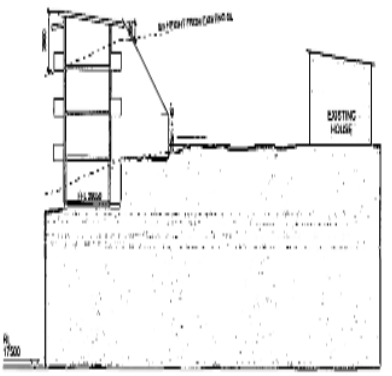

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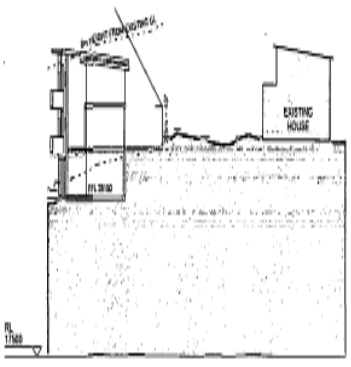

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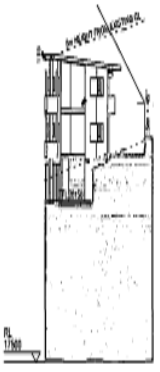

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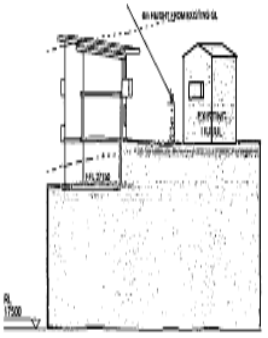

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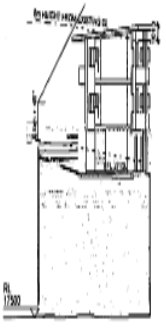

24 A313 LOT 61 - West 5 1 : 500

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WEST COAST ROAD HOUSING DEVELOPMENT

BULK & LOCATION STUDY

SECTION STAGE 3

rev. 08/15/08 A313

STAGE 1A

LOT NO	LOT AREA	BUILDING AREA	%	IMPERMEABLE AREA	%
LOT 01	415 m²	109 m²	26.3%	209 m²	50.4%
LOT 02	380 m²	86 m²	22.6%	154 m²	40.5%
LOT 03	380 m²	86 m²	22.6%	154 m²	40.5%
LOT 04	380 m²	86 m²	30.5%	154 m²	40.5%
LOT 05	380 m²	92 m²	23.9%	164 m²	43.2%
LOT 06	380 m²	92 m²	24.2%	164 m²	43.2%
LOT 07	381 m²	109 m²	28.6%	199 m²	52.2%

STAGE 1B

LOT NO	LOT AREA	BUILDING AREA	%	IMPERMEABLE AREA	%
LOT 08	403 m²	109 m²	27.0%	176 m²	43.7%
LOT 09	402 m²	86 m²	21.4%	143 m²	35.6%
LOT 10	388 m²	86 m²	22.2%	143 m²	36.9%
LOT 11	353 m²	86 m²	24.4%	143 m²	40.5%
LOT 12	374 m²	109 m²	29.1%	171 m²	45.7%
LOT 13	350 m²	86 m²	24.6%	140 m²	40.0%
LOT 14	433 m²	86 m²	19.9%	149 m²	34.4%
LOT 15	363 m²	109 m²	30.0%	176 m²	48.5%
LOT 16	395 m²	109 m²	27.6%	186 m²	47.1%
LOT 17	475 m²	109 m²	22.9%	203 m²	42.9%
LOT 18	353 m²	109 m²	30.9%	191 m²	54.1%

STAGE 1C

LOT NO	LOT AREA	BUILDING AREA	%	IMPERMEABLE AREA	%
LOT 26	451 m²	109 m²	24.2%	172 m²	38.1%
LOT 27	354 m²	86 m²	24.3%	139 m²	39.3%
LOT 28	413 m²	86 m²	20.8%	139 m²	33.7%
LOT 29	412 m²	114 m²	27.7%	217 m²	52.7%
LOT 30	438 m²	109 m²	24.8%	203 m²	46.3%
LOT 31	371 m²	109 m²	29.4%	217 m²	58.5%
LOT 32	349 m²	109 m²	31.2%	193 m²	55.3%
LOT 33	383 m²	109 m²	28.5%	214 m²	55.9%
LOT 34	411 m²	114 m²	35.0%	239 m²	58.2%
LOT 35	415 m²	114 m²	27.5%	248 m²	59.0%

STAGE 1D

LOT NO	LOT AREA	BUILDING AREA	%	IMPERMEABLE AREA	%
LOT 19	405 m²	109 m²	26.9%	201 m²	49.6%
LOT 20	434 m²	109 m²	25.1%	201 m²	46.3%
LOT 21	397 m²	92 m²	23.2%	165 m²	41.6%
LOT 22	405 m²	92 m²	22.7%	157 m²	38.8%
LOT 23	840 m²	191 m²	22.7%	313 m²	37.3%
LOT 24	404 m²	109 m²	27.0%	186 m²	46.0%
LOT 25	506 m²	109 m²	21.5%	209 m²	41.3%

STAGE 2A

LOT NO	LOT AREA	BUILDING AREA	%	IMPERMEABLE AREA	%
LOT 36	457 m²	109 m²	23.9%	223 m²	48.8%
LOT 37	426 m²	109 m²	25.6%	205 m²	48.1%
LOT 38	439 m²	109 m²	24.8%	205 m²	46.7%
LOT 39	439 m²	109 m²	24.8%	205 m²	46.7%
LOT 40	439 m²	109 m²	24.8%	205 m²	46.7%
LOT 41	370 m²	92 m²	24.9%	173 m²	46.8%
LOT 42	431 m²	126 m²	29.2%	229 m²	53.1%
LOT 43	444 m²	86 m²	19.4%	165 m²	37.2%
LOT 44	459 m²	86 m²	18.7%	165 m²	35.9%
LOT 45	370 m²	109 m²	29.5%	188 m²	50.8%
LOT 46	377 m²	92 m²	24.4%	152 m²	40.3%

STAGE 2B

LOT NO	LOT AREA	BUILDING AREA	%	IMPERMEABLE AREA	%
LOT 47	372 m²	109 m²	29.3%	168 m²	45.2%
LOT 48	361 m²	114 m²	31.6%	211 m²	58.4%
LOT 49	369 m²	114 m²	30.9%	199 m²	53.9%
LOT 50	363 m²	114 m²	31.4%	192 m²	52.9%
LOT 51	366 m²	114 m²	31.1%	190 m²	51.9%
LOT 52	364 m²	114 m²	31.3%	193 m²	53.0%
LOT 53	354 m²	114 m²	32.2%	199 m²	56.2%
LOT 54	469 m²	114 m²	24.3%	236 m²	50.3%
LOT 55	370 m²	92 m²	24.9%	166 m²	44.9%
LOT 56	1416 m²	177 m²	12.5%	603 m²	42.6%

STAGE 3

LOT NO	LOT AREA	BUILDING AREA	%	IMPERMEABLE AREA	%
LOT 57	268 m²	81 m²	30.2%	126 m²	47.0%
LOT 58	263 m²	81 m²	30.8%	129 m²	49.0%
LOT 59	273 m²	81 m²	29.7%	131 m²	48.0%
LOT 60	318 m²	81 m²	25.5%	124 m²	39.0%
LOT 61	3743 m²	632 m²	16.9%	2474 m²	66.1%

STAGE 1A, 1B, 1C, 1D, 2A & 2B

SITE AREA	49335 m²	
SUM OFLOT AREA	23828 m²	
SUM OFBUILDING AREA	5926 m²	
SUM OF IMPERMEABLE AREA	10903 m²	
TOTAL IMPERMEABLE AREA (BUILDING COVERAGE + PAVED AREA)	20688 m²	= 41.9% OF SITE AREA

STAGE 3

SITE AREA	7870 m²	
SUM OF LOT AREA	4865 m²	
SUM OF BUILDING AREA	956 m²	
SUM OF IMPERMEABLE AREA	2984 m²	
TOTAL IMPERMEABLE AREA (BUILDING COVERAGE + PAVED AREA)	2984 m²	= 37.9% OF SITE AREA

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WEST COAST ROAD HOUSING DEVELOPMENT

BULK & LOCATION STUDY

AREA SUMMARY

30 MAY 2006

REV. A401

Resource Consent Application Form

(Under Section 88 of the Resource Management Act 1991)

Waitakere City Council
Te Tiriti o Waitakere

WAITAKERE CITY COUNCIL

Send to: The Chief Executive
Waitakere City Council
Private Bag 93109
Henderson
WAITAKERE CITY 1231

For more information:
Civic Centre, Waipareira Avenue,
Henderson
Telephone (09) 839 0400
Facsimile (09) 836 8001

Office use only:
Receipt Date: 26 JUN 2006
Initials:
GEMs Number: 20061077
Date By: 20061078
Deposit Paid: $7785 -

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ons

1. Applicant Details

1.1 Applicant: New Zealand Housing Foundation

Note: Agents acting on behalf of the applicant please do not put your name here.

1.2 Please ✓ tick the appropriate box

I am:
- ☑ The Owner
- ☐ Occupier
- ☐ Lessee
- ☐ Prospective Purchaser of the property

1.3 The type of Resource Consent sought is: (✓ box)

- ☑ Land Use Consent &
- ☑ Subdivision Consent
- ☐ Certificate of Compliance

1.4 Description of proposed activity and reasons for the application. List rules infringed:
(Please note that this is not your assessment of effect as required in Section 4.)

landuse & subdivision consent for a 77 unit residential development.
Refer Page 13 & 14 of AEE for list of rules infringed.

(Please provide a full description of your proposal. Please describe and quantify each infringement of the District Plan rules, e.g. build a new dwelling on a site less than 450 m², infringe the HIRB control from the western boundary.)

If necessary provide further details on an attached sheet or describe fully on the assessment of effects report.

1.5 Names and addresses of owners and occupiers of the property (if other than the applicant):

Owner(s): New Zealand Housing Foundation

Occupier(s):

2.0 Location Details

2.1 Address of property: 423-429 West Coast Road, Glen Eden.

2.2 Legal description: Lot: 2 & 3 DP: 339810 CT: 163628 & 163629

2.3 Type of Human Environment: living environment

2.4 Type of Natural Environment: restoration / riparian margin area.

2.5 Building Consent Application number (if applicable): N/A.

3.0 Additional Consents

3.1 The following additional Resource Consents are / are not (delete one) required and have / have not (delete one) been applied for: (✓ box)

- ☐ Water Permit
- ☐ Discharge Permit
- ☐ Subdivision Consent
- ☐ Land Use Consent (e.g. earthworks)
- ☐ Coastal Permit

WCC-SPW number and RMA number

- ☐ Building Consent
- ☑ ARC Consent

ABA:

Date of application: June 2006 Council:

4.0 Assessment of Effects

Provide an assessment of effects in accordance with the Fourth Schedule of the Act. (Describe the effect of the proposal on the environment (including neighbouring properties) and measures incorporated into the proposed activity to reduce effects to an acceptable level). For guidance on possible effects that may apply to your proposal, see the relevant District Plan Assessment Criteria for Resource Consents. Examples of adverse effects may include location, size and design of buildings, visual impacts, shading, flooding, erosion, instability, changes to contours, removal or alteration of landform and vegetation, traffic generation and parking impacts, noise, odour and contamination, hazardous facilities. You may need to get specialist consultant advice, e.g. geotechnical, flooding engineer, traffic consultant.

Note that for complex applications, specialist reports will be required.

5.0 Attachments

Attach all the additional information required to be included with this application. (Refer to the Resource Consent Application Check Sheet - Land Use and Subdivision, for a guide to the information to be submitted with your application.) List attachments:

Refer Enclosed AEE

6.0 Subdivision Application

* As this is an application for subdivision consent, attach information that is sufficient to adequately define:

(a) the position of all new boundaries; and

(b) † the areas of all new allotments; and

(c) the locations and areas of new reserves to be created, including any esplanade reserves and esplanade strips; and

(d) the locations and areas of any existing esplanade reserves, esplanade strips and access strips; and

(e) the locations and areas of land below mean high water springs of the sea, or of any part of the bed of a river or lake, to be vested in the Crown or local authority under Section 237A of the Resource Management Act 1991; and

(f) the locations and areas of land to be set aside as new roads.

(g) Show existing and new easements.

(h) If the subdivision is to be staged, define the stages.

* Delete if this is not an application for a subdivision consent.
† Delete if the subdivision involves a cross-lease, company lease or unit plan.

7.0 Authorisation

Signature of Applicant/Authorised Agent: _____

Print name of Applicant/Authorised Agent: Matthew Paetz

If the named applicant is a company/trust please state your position/title and contact details: _____

I have authority to bind the company/trust: (Signature) _____
(Please attach a copy of the Authorising Documents for company/trusts)

Agent's (authorised to sign on behalf of Applicant) name and address:

Babbage Consultants Limited
PO Box 2027 Auckland

Phone Number: Business: 09 3799980 Home: _____
Mobile: 027 2838855 Fax: 09 3771170
Email: matthew.paetz

Address for service/correspondence (if different from above):

_____

_____

Phone Number: Business: _____ Home: _____
Mobile: _____ Fax: _____
Email: _____

8.0 Additional Application Requirements (please ✓ box)

8.1 Is the site contaminated or have there been chemical sprays stored or used on the site? (**If yes**, a contamination assessment may be required.) ☐ Yes ☑ No

8.2 Is there hazardous substances on the site? (**If yes**, provide a Hazard Facilities Screening Procedure.) ☐ Yes ☑ No

8.3 Has there been hazardous substances previously on the site? (**If yes**, provide a contamination assessment.) ☐ Yes ☑ No

8.4 Is there a locked gate or security system restricting access by Council staff? ☐ Yes ☑ No

8.5 Do you have a dog on the property that might worry the inspecting Council staff? ☐ Yes ☑ No

8.6 The processing of your Resource Consent will require a visit to the subject site by our planning staff. Please indicate (box) whether you agree to our staff visiting the property or not.

☑ As land owner and with the consent of any occupiers, **I agree** to Council staff visiting the site(s) which is the subject of this application, for the purpose of assessing this application.

Land owner/s signature/s : _____

Note: If our planning staff are unable to carry out a site visit then they will not be able to process your application.

9.0 Fees and Payment Details

9.1 A minimum base and monitoring fee payment is required on lodgement of all applications. Refer to the current Regulatory Fees & Charges Schedule.

9.2 Processing fees additional to the minimum base fee may be incurred if an application requires a hearing and/or any specialist inputs such as those related to drainage, infrastructure, landscape and visual amenity, traffic and parking matters and geotechnical issues. If the application is publicly notified and required a hearing the minimum hearing fee is to be paid before the hearing.

9.3 Such additional fees may be invoiced during or at the end of the application process, in accordance with Section 36 of the Resource Management Act 1991.

9.4 All fees (other than the minimum fee) shall be paid in full without set-off or deduction of any kind within 14 days of the date of the invoice or prior to the issue of the Resource Consent, whichever is the sooner.

9.5 The applicant shall further pay to the Waitakere City Council all costs and expenses (including costs on a solicitor/ client basis and debt collector's cost) incurred in the enforcing or attempting to enforce these terms and conditions or in seeking payment of all fees.

9.6 Where you fail to make payment of any amount on the due date, Waitakere City Council may in addition require you to compensate it by making payment of interest as liquidated damages on the amount due from the due date for payment until the date of actual payment at a rate equal to the current overdraft interest rate Waitakere City Council has with its principal registered bank.

9.7 Applicants name and address for accounts: Matthew Paetz - Babbage Consultants
PO Box 2027 Auckland

Business phone number: 09 3799980 Home phone number: _____

Mobile: 027 283 8855 Fax: 09 377 1170 Email: matthew.paetz@babbage.co.nz

GST number: _____

9.8 Minimum fee $ _____ and monitoring fee $ _____

9.9 Declaration _____
Signed by /for and on behalf of applicant

Name: (print) Matthew Paetz

Position Senior Planner Date: 21-6-06

This application **will not** be accepted by Council unless all the above required and appropriate information is provided (including the completed check sheet).

Please contact the Call Centre 839-0400 with any queries regarding this form.

- please allow adequate time for an initial review and site inspection (approx. 2 weeks) before you make enquiries concerning the progress of the processing of this application.
- please note your application may be rejected by council (within 5 working days) under section 88 of the resource management act if the information provided is inadequate.

Resource Consent Application Check Sheet
Land Use & Subdivision Consent

Waitakere City Council
Te Tiriti o Waitakere

This form is intended as a guide to help you to ensure that all the required information is submitted with your application. Please complete this checklist and submit it with your application. Provide the level of information appropriate to the scale of the proposal.

Address: 423-429 West Coast Road, Glen Eden, Auckland.

Applicant: New Zealand Housing Foundation.

Application number RMA:_____ SPW:_____

1.0 Application form, plans and documentation

The information in this stage 1.1 to 1.8 is mandatory - failure to provide could mean your application is rejected. Other information should be provided relevant to this application.

Tick		(Place a tick ✓ in the box if the item applies and has been addressed in the application)	Reject tick
☐	1.1	Completed Application form, signed, name for Accounts supplied and, in the case of a trust or company, documentation to prove authority to sign provided.	☑
☐	1.2	6 copies* (unbound) of application form, supporting information, assessment of effects, neighbours consents, certificates of title, supplementary reports and plans (refer 1.8 below) provided. *(8 unbound copies required for a subdivision/LUC combo, 4 unbound copies for a Certificate of Compliance application, and only 4 copies of experts reports (eg, Geotech Traffic))	☑
☐	1.3	1 set of plans reduced to A3 or A4.	☑
☐	1.4	Current copy of Certificate of Title (not more than 6 months old).	☑
☐	1.5	Full description of proposed activity.	☑
☐	1.6	Full list of District Plan rules infringed and detail of infringement(s) quantified.	☑
☐	1.7	A further assessment of any effects (AEE) that the proposed activity may have on the environment in accordance with the Fourth Schedule of the Resource Management Act (available from Council on request). (Note: For a Controlled Activity an assessment is not necessary unless specifically required in the District Plan.)	☑
☐	1.8	Accurate plans A2 (A2 preferred size A3 are ok) sized to a recognised metric scale of 1:100 or 1:200. All plans should clearly show the name of the person and company that prepared the plans; address of property; the date that the plans were drawn and a unique plan reference or identification number and/or variation number where relevant. In addition the plans must provide (as appropriate) the following detail:	☑
☐		(a) north point (please orientate your plans so that north is at the top of the page)	☑
☐		(b) boundary dimensions and bearings, adjoining legal descriptions and street numbers, metric scale bar	☑
☐		(c) road boundary and name or names if it is a corner site	☑
☐		(d) location of vehicle crossing and any other street features such as footpaths, bus stops, on-street parking bays, median islands, street trees, street lights, power poles, traffic signals, signs, cesspits, underground services, public drains, edge of road carriageway and any designated road widening, fire hydrants, power and telephone plinths	☑
☐		(e) position and dimensions of existing buildings (including existing floor levels), eaves, height above driveways, floor plans, elevations	☑
☐		(f) position and dimensions of proposed buildings, decks, etc., with dimensions to boundaries	☑
☐		(g) floor plans	☑
☐		(h) full elevations of all building faces (Note: These should show proposed building materials and finished floor roof levels and extend fill width of site where appropriate.)	☑
☐		(i) position of existing and proposed drainage (public and private wastewater and stormwater) and water meters	☑

Tick		(Place a tick ✓ in the box if the item applies and has been addressed in the application)	Reject tick
☐	(j)	position of existing and/or proposed vehicle access drive(s), clearance to the eaves of a building, passing bays, including details of drive construction, gradients, driveway inside turning radius, complying vehicle turning curves and (if the gradient is greater than 20%) also provide long and cross sections of the drive, define the width available between the building and boundary.	☑
☐	(k)	position of existing and/or proposed car parks, including details of car park construction, gradients, dimensions, complying vehicle turning curves.	☑
☐	(l)	any required outdoor space (provide dimensions and area in square metres)	☑
☐	(m)	datum point for contours and/or spot heights (to LINZ Datum where practical)	☑
☐	(n)	datum point, contours and spot heights, contours to extend across boundaries into adjoining sites and to the road.	☑
☐	(o)	show height in relation to boundary planes on each building elevation and if necessary provide calculations (a brochure is available to assist with interpreting the height/boundary rules)	☑
☐	(p)	show any flood plain and/or overland flowpaths, stormwater outlets to kerb	☑
☐	(q)	total site area and/or net unit areas (in square metres)	☑
☐	(r)	total building coverage (in square metres)	☑
☐	(s)	amount and location of impermeable (paved) surfaces	☑
☐	(t)	amount and location of earthworks (show areas of cut and fill plus provide long and cross sections, including for the building platform). Show where the earth is going.	☑
☐	(u)	retaining walls details and finished ground and top of wall levels, slope of battering, identify if load bearing	☑
☐	(v)	location and species of existing trees plus the extent of their driplines and height. Define the boundary/ies of natural areas/trees.	☑
☐	(w)	location of any proposed tree or vegetation clearance, including area of clearance in square metres, identification f any works within dripline of vegetation	☑
☐	(x)	location and type of proposed landscape planting including a planting plan and maintenance schedule	☑
☐	(y)	location and type of existing and proposed fences	☑
☐	(z)	if the site adjoins a water course or body of tidal water, please identify Mean High Water Springs mark and/or the width of the bed of the water course and the extent of any Riparian Margin or Local Purpose (Esplanade) Reserve	☑
☐	(z a)	table of JOAL shares (subdivision only)	☑
☐	(z b)	show existing and proposed easements	☑
☐	1.9	For any tree/vegetation clearance or works which would affect any protected vegetation, please provide a report from an appropriately qualified and recognised Arborist or tree specialist.	☑
☐	1.10	For any residential development within a Community or Working Environment please provide a report from a suitably qualified acoustic engineer to show that the part of the building to be used for the residential activity would be constructed to achieve a noise level inside any habitable room not exceeding 35 dBA L10 between the hours of 10 pm - 7 am.	☑
☐	1.11	Optional photographs supporting the application, e.g. of the site, dwellings and buildings.	☑
☐	1.12	Colour photographs and second-hand building inspection report for relocated building application.	☑
☐	1.13	Written consent of affected parties (e.g. neighbours), this includes both owners and occupiers of properties and buildings where this is required. (Note: Where a property is in joint ownership, such as husband and wife, all landowners must sign. A copy of the plans shall also be signed by the owners and occupiers.)	☑
☐	1.14	Copy of Transit NZ approval when site has access from a State Highway or Limited Access Road (eg SH16 or Hobsonville Road)	☑
☐	1.15	Base application processing fee and monitoring fees.	☑

2.0 City Wide Rules

In addition to the above please check whether any of the following City Wide Rules also apply to the application and if they do apply ensure that they are addressed in the application and appropriate detail is provided.

☐	2.1	Natural Hazards - does the site contain unconsolidated fill or is it subject to inundation or in a stability sensitive area? If yes please provide stormwater catchment analysis reports, flood report and/or geotechnical assessment reports from appropriately qualified engineers. Provide proposed mitigation.	☑
☐	2.2	Hazardous facilities screening - does the proposal involve a process, use, transportation or storage of chemicals or other hazardous materials? If the answer is yes then please complete the Hazardous Facilities checklists and screening procedure.	☑

Tick	(Place a tick ✓ in the box if the item applies and has been addressed in the application)		Reject tick
☐	2.3	Contaminated sites - is the site contaminated or have chemicals and sprays been used or stored on the site? E.g. has the site been used for an orchard, market garden, vineyard, glasshouse, service station or industrial site? If so please provide a report from an appropriately qualified consultant. This report should provide an assessment of the levels of contamination plus recommendations about remediation.	☑
☐	2.4	General noise - is the site on a high noise route or within the Airbase noise control area? If yes, provide an acoustic report.	☑
☐	2.5	Heritage - does the proposal involve alterations, additions, relocation or the destruction of a heritage item?	☑

3.0 Natural Area Rules

In addition to the above please check whether any of the following Natural Area Rules also apply to the application and if they do apply ensure that they are addressed in the application and appropriate detail is provided.

☐	3.1	Any tree clearance/alteration/works within the dripline of protected vegetation.	☑
☐	3.2	Any earthworks (provide details as specified in 1.8(r) above).	☑
☐	3.3	Impermeable surfaces – reticulated site.	☑
☐	3.4	Impermeable surfaces – non-reticulated site – provide a stormwater report from a suitably experienced engineer.	☑
☐	3.5	Development/Building within a riparian margin – may require an ecologist report and landscape mitigation report/plan.	☑

4.0 Human Environment Rules

In addition to the above please check whether any of the following Human Environment Rules also apply to the application and if they do apply ensure that they are addressed in the application and appropriate detail is provided.

☐	4.1	Sensitive ridge – visual assessment.	☑
☐	4.2	Density – visual assessment, infrastructure, traffic.	☑
☐	4.3	Maximum height – provide visual assessment and shading diagram.	☑
☐	4.4	Height/boundary – shading diagrams showing impact on adjoining properties.	☑
☐	4.5	Yards.	☑
☐	4.6	Building Coverage.	☑
☐	4.7	Privacy/outlook – show position of adjoining houses.	☑
☐	4.8	Outdoor space.	☑
☐	4.9	Parking and access – potential traffic, show vehicle tracking curves.	☑
☐	4.10	Shared drive – driveway details.	☑
☐	4.11	New vehicle crossing in Waitakere Ranges, Bush Living or Coastal Villages.	☑
☐	4.12	Second vehicle crossing.	☑
☐	4.13	Non-residential activity.	☑
☐	4.14	Traffic generation – traffic consultant report.	☑
☐	4.15	Noise – acoustic report.	☑
☐	4.16	Air discharge.	☑
☐	4.17	Odour/glare – lighting expert's assessment.	☑
☐	4.18	Signs – visual assessment.	☑
☐	4.19	Relocated building – second-hand building report.	☑
☐	4.20	Infrastructure – engineering report.	☑
☐	4.21	Community Environment Building design rules.	☑
☐	4.22	Landscaping – land plan.	☑
☐	4.23	Residential Activities in Working or Community Environments.	☑
☐	4.24	Medium Density Housing – traffic, visual, planners reports, landscaping, etc.	☑

BABBAGE CONSULTANTS LIMITED
109 FANSHAWE STREET, AUCKLAND
PO BOX 2027, AUCKLAND 1, NEW ZEALAND
PHONE: 0-9-379 9980, FAX: 0-9-377 1170
EMAIL: admin@babbage.co.nz

Waitakere City Council
Private Bag 93 109
Henderson

Job Number: 42608
MP
26 June 2006

Attention: Felicitas Dhliwayo

Dear Felicitas

West Coast Rd (No. 423-429) – Land Use and Subdivision Consent application

Please find enclosed an application for land use and subdivision consent at 423-429 West Coast Road, Glen Eden. The application is made by the New Zealand Housing Foundation for a 77 unit residential development.

Enclosed is the following information:

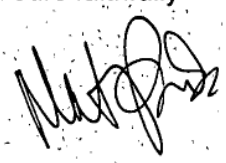
- Completed Resource Consent application form
- Cheque made out to Waitakere City Council for the advised deposit fee being $7785.00
- Eight hard copies of the Assessment of Environmental Effects, which includes Certificates of title, Plans and expert reports

We trust that all the Council's information requirements have been met by this comprehensive application.

Should you require any clarification or further information, please contact the undersigned in the first instance on 027 283 8855, or by email on matthew.paetz@babbage.co.nz.

We look forward to working together with you in a positive fashion to achieve a positive outcome.

Yours faithfully



Matthew Paetz
Senior Planner
Babbage Consultants Limited

Babbage®
CONSULTANTS

WEST COAST ROAD DEVELOPMENT

RESOURCE CONSENT APPLICATION

FOR

NEW ZEALAND HOUSING FOUNDATION

ASSESSMENT OF ENVIRONMENTAL EFFECTS

Report Prepared by:
Matthew Paetz, Senior Planner
Bachelor of Arts / Bachelor of Planning (Honours)
Full Member New Zealand Planning Institute

Ref: 42608
June 2006

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1.0 INTRODUCTION

The New Zealand Housing Foundation (NZHF) proposes to develop the subject site, 423-429 West Coast Road, in a medium density residential configuration, comprising 77 units in detached, semi-detached, and apartment building forms.

Resource consent approval (land use and subdivision) is required from Waitakere City Council ("The Council"), for a **discretionary activity**.

This report provides an Assessment of Environmental Effects as required by the Fourth Schedule of the Resource Management Act 1991 (RMA).

The report is structured around:

- a description of NZHF's role;
- a description of the site and locality;
- a description of the proposed development;
- an assessment of the proposal against the Council's District Plan Provisions;
- an assessment of the environmental effects of the development; and
- a statutory assessment against Part II, Sections 93, 94 and 104 of the RMA

A number of additional supporting reports and plans form part of this application. These are listed in this report's table of contents and should be read in conjunction with this report.

2.0 NEW ZEALAND HOUSING FOUNDATION's ROLE AND THE PROPOSED DEVELOPMENT

The New Zealand Housing Foundation (NZHF) is a charitable trust which provides support and empowers communities. Established in 2002, the Foundation was set up in response to the extremely limited community-based social housing sector and to address issues emerging in the New Zealand housing system around an aging population who have very few affordable housing options, and low income affordable home ownership. Additionally The Foundation enables low income families, some with special needs, the chance to own their own home or secure longer term tenure. The Foundation is supported by the Tindall Foundation and receives funding from Housing New Zealand Corporation and ASB Bank.

NZHF leverages housing outcomes through shaping policy, forming partnerships with community housing providers (both in the Public and Private sectors), and supporting projects that specifically target people on low to moderate incomes and those that are under housing stress. Promotion of community ownership of the projects inspires and empowers communities resulting in the development of neighbourhoods that are healthy places in which to live and where people take responsibility for themselves and others in the community. NZHF acknowledges that community development and renewal initiatives are especially important in Iwi communities and public housing estates that have become dysfunctional and through partnerships and leveraging creates 'real' housing outcomes which benefit these communities.

To date, The Foundation has achieved a number of successful projects including:

- Housing for the elderly eg. Abbeyfield programmes
- The provision of a home ownership programme for Pacific Island people in Wellington
- A new shared equity home ownership programme has commenced in South Auckland with 4 homes occupied
- Large community homes (x5) have been developed in Auckland for community group service providers catering for the disabled, street kids and those with mental health problems
- Trusts in Tauranga, North Shore, Coromandel and Nelson have been assisted to become housing providers

Many New Zealander's still aspire to own their own homes however home ownership rates are projected to continue to fall due to reduced affordability in face of rapidly appreciating house prices. Targeted at households wanting to achieve home ownership but lacking the deposit, the home equity programme creates affordable entry level home ownership and changes home ownership from a dream into a reality for families.

3.0 THE WEST COAST ROAD PROJECT

The project is an Integrated Community Housing Development on NZHF-owned land, with the following objectives:

Create a housing environment that provides:

- Affordable entry level home ownership
- Rental housing dispersed to meet diverse range of needs
- Sustainable and eco / environmental features
- Conventional construction / quality housing / low building cost

Participation of Key Stakeholders:

- NZHF Home Equity Programme
- Community Housing Providers (Habitat For Humanity plus others)
- WCC plus other regulatory authorities
- Beacon
- Funders (HNZC /ASB)

Demonstration Project that delivers:

- Public/Private/Community Partnership
- Affordable housing options for low income people
- Efficient regulatory and consent approval process

4.0 SITE DESCRIPTION

4.1 LOCALITY

The neighbourhood character is varied containing a mix of land use activities within 400 metres of the site, including developed and undeveloped residential land, open space developed for active and passive recreation, undeveloped open space, Marae, school, dairy and fruit and vegetable shops, commercial use. This range of services and amenities provides an excellent location within which a medium density development such as proposed should be situated.

The surrounding neighbourhood contains a mix of housing styles, including medium density terraced housing, free-standing town houses on sites generally ranging between 350m² and 450m² (i.e. Woodbank Drive development), and conventional house and garden development where the site areas are in excess of 600m² (i.e. West Coast Road).

A **Locality Plan** of the site is attached as **Appendix 1**.

4.2 DEVELOPMENT SITE

The development site is located on West Coast Road, Glen Eden, in close proximity to the intersection of that road with Woodbank Drive. The site has legal frontage to four roads – West Coast Road, Pyramid Place, Titch Place and Woodbank Drive. The official street address for the site is "423-429 West Coast Road".

The site comprises Lots 2 and 3 DP 339810. **Certificates of Title** for the site are attached in **Appendix 2**.

The site is an area of 5.7348 hectares, and is of an irregular shape, which is largely a result of the topographical characteristics of the locality, in particular the location and route of the watercourse (Parrs Stream) running through the site roughly in a meandering north-south direction. To the south of Pyramid Road there is a row of mature pine trees running from east to west.

In the southern portions of the site the land is gently sloping downwards from east to west, towards the stream channel and associated riparian margins, before sloping upwards from the stream channel to the western site boundary. The land to the north of Pyramid Place on the site becomes steeper as part of the site drops quite steeply into a gully towards the stream. The west side of the site is moderately steep.

The larger area at the north end of the site is relatively flat with a gentle slope down to the stream.

The site is presently covered in overgrown grass, weeds, gorse and trees. There is a mixture of native and exotic trees, predominantly located around the edge of the stream and at the northern boundary.

The area has a new subdivision on its western boundary which has the roading network laid and the construction of some houses has commenced. A more mature subdivision borders the site on the eastern side.

There are no structures currently on the site.

Photos depicting the character of the site and surrounding area are attached as **Appendix 3**.

5.0 PROPOSAL

5.1 BUILDING DESIGNS

The proposal comprises the construction of 77 new units, as shown in the **plans** attached as **Appendix 4.**

A range of building typologies are proposed. This ensures a diverse housing mix.

These typologies are summarised as follows:

- Four 2-bed units, in a detached form, with single carports
- Eighteen 2-bed apartment units
- Thirteen 3-bedroom detached houses with single garages
- Twenty- eight 4-bedroom detached houses with double garages
- Six 4-bedroom houses with single garages
- Eight 5-bedroom houses with double garages

Key internal features of the designs include:

- Twinned living areas with double aspect, allowing for flexible use, which takes into account Pacific and Maori cultural needs.
- Good internal and external storage facilities
- The ability to create open plan spaces
- Good wheelchair access with flush thresholds
- Ground floor shower / bathroom
- Indoor / outdoor spaces well connected through the use of external hard and soft landscaping

5.2 ALLOTMENT SIZES / CONFIGURATIONS

The proposal is to create 61 residential allotments in conjunction with joint owned access lots, and road and drainage reserve to vest in Waitakere City Council. Over the 61 allotments, 77 units are proposed, with 14 apartment units on Lot 61 in Stage 3 being unit titled; as well as 4 apartment units on Lot 56 being unit titled.

All allotments have been designed to comply with Council's subdivision standards.

Refer to the **subdivision plans** attached as **Appendix 5**.

5.3 ARCHITECT'S DESIGN STATEMENT

Jane Arnott, Senior Architect at Babbage, provides the following design statement:

The Foundation is looking to develop cost effective, simple, two storey housing types on small sections, with medium-to-long term joint ownership with the home buyer. This means long term maintenance, and later resale value are important to the success of the development. For this reason sustainability and energy efficiency measures are being investigated and priced as part of the project.

The site plan is long and thin, following the course of a feeder stream from the Waikumete approximately orientated south to north axis. As a consequence the main feature of the site is the natural reserve (riparian margin) of the stream.

At present, this reserve contains some valuable native trees and many weed species. It is proposed (refer to the Landscape Designer's assessment) to renovate and enhance this area with appropriate planting, a pathway and bridge crossing to create neighbourhood links and an esplanade effect throughout the site. This creates a very pleasant green backdrop and outlook for our proposed residential development, with most houses oriented to take advantage of both views and sun.

The site has been divided into three stages according to the natural breaks in the landscape. Stages 1 and 2 are on the east side of the stream, backing onto an existing low level residential development to the east. These two stages are separated by a narrow pinch point in the site.

Stage 3 is on the opposite (west) side of the stream from Stage 2. It affords a view of the stream reserve and storm water pond to the east, and backs on to a relatively intensively developed group of town houses to the west – some three and four storey. Stage 3 is therefore a more intensive development in response, with two and three levels of apartments with undercroft car parking.

All three stages have a significant natural contour difference running on the east-west axis to the lowest point in the stream bed. This means that even houses at the furthest distance from the stream should get a view of the larger feature trees, or the north end wetland planting in the reserve.

The materials of the houses will be mainly concrete slab foundations (where grade permits), timber weatherboard, masonry cladding, powder coated aluminium windows, and colorsteel roofs. The investigation is still on-going into services such as water and space heating, but wherever possible the houses are oriented to maximise useful solar exposure to living spaces and roofs.

The above factors have all contributed to the type, mix and inter-relationship of the houses. The layout has been further influenced by urban design and streetscape issues.

Each house has a hierarchy of private to public spaces defined by walls, sun & street orientation, landscape contour and landscape planting. Generally house

platforms are maintained at one level with any change of level happening at the boundaries. Level changes are kept as short as possible, 1.2m being the target maximum. In the case of Stage 2, the roadway has been split into two levels to achieve the short steps. The apartment buildings are sited on the steeper gradients, where they are set into the hillside with car parking underneath and usable outdoor living space on the upper ground level.

Wherever possible there is good oversight of the street from the kitchen or living area. Street trees (approximately one per house) create soft edges and screening from the western sun. Street edge walls are masonry and low, and where used, provide a good public/private threshold. Garages are usually set back slightly from the main house, with optional pergolas providing a further screen. Where house boundaries adjoin the stream reserve, oversight and privacy are in balance. A planted out open fence and a level difference (bank) will allow oversight of the path with a level of screening for privacy.

The style of the housing is very simple (as it needs to be for cost reasons), relying on simple detailing and good materials to update traditional gable and skillion roof form silhouettes, which is in keeping with much of the old housing stock in the area - though not the parapet style or hip roofs of the newer adjoining properties. This is a deliberate departure.

In most houses, living areas are on grade with access to the yard, bedrooms are upstairs with views to the neighbourhood. The footprint is minimised to maximise yard space, as most of these houses will be family homes.

Cut-outs in the building forms provide porch shelter and shelter for some living area doors. The palette is mostly natural greys, browns and greens with the occasion splash of colour to liven things up.

This development is a mix of apartments, senior units and houses and is intended to produce a mixed community with a well developed streetscape which allows good aesthetic values and security/oversight.

5.4 SUSTAINABLE DESIGN

5.4.1 Introduction

A sustainable future relies on reducing CO2 emissions. At West Coast Road this means maximizing energy efficiency, considering the use of renewable and sustainable building materials and making provision for water conservation.

5.4.2 Energy efficiency and passive solar design

Buildings are orientated North for maximum solar gain, good day-lighting and heat storage. Good natural daylight is essential for reducing the need for artificial light and reducing energy consumption. To prevent overheating in the summer months shading is provided by pergolas, eaves overhangs and planting. Energy efficiency is achieved, by using energy efficient light fittings, appliances, good levels of insulation [to exceed current Building Code] and good quality aluminium windows with the provision of upgraded glass specifications, with the possibility of double glazing being utilised. Provision within the design has also been made for the introduction of passive ventilation. This is achieved through background ventilation via window air vents, and the

use of a roof 'Wirly' vent which will expel moisture and unwanted heat, whilst drawing in fresh air.

Hot water and space heating are the biggest uses of energy in the home. Solar radiation is free, non -polluting and renewable. It is proposed to make provision for solar water heating, which consists of a solar collector and a hot water cylinder which can be accommodated on the roof of each dwelling. These systems have an electrical or gas back up when the sun is intermittent. Standard solar water heaters can produce around 75% of a household's water supply in the summer and between 25% - 45% in winter.

5.4.3 Construction materials

Materials have been selected to ensure durability, and where possible from sustainable sources. Identifying and selecting ecological materials involves detailed research in order to establish 'best selection' each product can be selected by considering the following:

- Recycled or recyclable
- Sourced locally
- Long lasting
- Non-toxic
- From renewable source

For West Coast Road we have prepared a building material matrix to assist the developer in making the best choice, to achieve the best value.

5.4.4 Water Conservation

To reduce water use and stormwater run off the following provisions have been proposed:

- Rainwater harvesting from roof areas, with on site storage
- No in-sink waste disposal unit to kitchen
- Low flow shower heads and low volume flush toilets
- Native and low water planting with no built in irrigation system
- Option for Grey water recycling for use in toilets and gardens

5.4.5 Land Use

The scheme development plan also integrates the existing stream to the North and the introduction of a new wetland to the North-East. This combination of water, plant and animal life together with the natural characteristics of the landscape lends itself to a sustainable habitat.

The key principals are to:

- Create positive relationships between all elements in the localised environment
- Allow rainwater to replenish the water table
- Introduce elements such as trees to perform multi functions such as shading, habitat etc.
- Use local native plants that need little care and maintenance
- Create useful microclimates
- Companion planting to reduce need for spraying

- Omit use of pesticides

5.5 EARTHWORKS

Earthworks to accommodate the proposed dwellings have been designed and are shown on the enclosed drawings in **Appendix 6**. Some retaining walls are required to produce usable building platforms, generally less than 1.5 metres in height. Earthworks embankments are proposed at the interface with the existing stream to accommodate both usable building platforms and necessary elevation separation for the 100 year flood level of the stream.

Earthworks operations are to be generally cut to fill operations with some retaining wall structures required between the residential lots.

Cut to fill operations are generally between Stages 1 and 2 with Stage 1 providing the majority of cut material to be carted into Stage 2 to create fill platforms and embankments. Stripping of topsoil and vegetation removal from the earthwork areas is required and it is anticipated that removal from site of excess topsoil and organic unsuitable material will also be required. Limited earthworks within the 100 year flood plain is required for construction of the wetland stormwater treatment facilities on the northern portion of the site. The volume of earthworks (cut to fill) operations is estimated to be in the order of 40,000 cubic metres. Earthwork operations on Stage 3 of the development is anticipated to be a balanced cut fill dependant on the volume of unsuitable material encountered.

There are two main types of retaining walls for the construction. The retaining walls proposed on the property boundaries are anticipated to be timber pole type walls. The low walls, typically 0.5 metres high on the boundary between the properties and the road frontage are to be of a key stone variety.

The timber retaining walls are generally positioned between individual residential lots or on the existing property boundary to create the necessary building platforms. Where the proposed dwelling is a unit title type dwelling there will be internal retaining to facilitate the elevation difference between floors.

All retaining structures greater than 1 metre in height will have appropriate safety measures installed.

5.6 SITE LAYOUT AND ACCESS

The proposed site plan is structure around four access connections – via West Coast Road, Pyramid Place, Titch Place and Woodbank Drive

Cul-de-sacs are proposed off West Coast Road and Pyramid Place, whilst the accessways coming off Titch Place and Woodbank Drive are connected allowing for circulation around the northern portions of the development.

The roading, where possible, has been designed to work "with" the contours rather than "against" the contours.

The access roads to Stages 1 and 2 are generally to local subdivision standards with carriageway widths between 6 metres and 7.5 metres with associated services berms and footpaths. The roading network for the development contains residential roads with a general carriageway width of 5.5 metres with some sections of road accommodating parallel parking bays of 2.50 metre widths. All roads within the development have footpaths adjacent to the kerbline of 1.50 metres width and a service berm of 2.0 metres. The roads within the development have been sized in accordance with Waitakere City Council's "Developers Design Guide for Residential Subdivision and Medium Density Housing".

Visitor carparking is proposed at various locations within the road reserve. In total, 40 visitor parking spaces are proposed, which is in excess of the Council's standards.

Other elements of the proposal include:

- All streets are well overlooked from kitchens or living areas with direct access to front doors.
- All houses have road frontage, with no rear lot development.
- A range of housing typologies are provided, with bigger houses on larger sites.
- Large amounts of secure, private open space are provided.
- The dwellings have been orientated, as much as practical, to face towards the north, maximising daylight/sunlight admission.

5.7 CONSTRUCTION

Construction

The table below sets out the External Specification for the units.

Item	Description/Specification
Super-Structure	• Timber frame, Kiln dried timber framing H3.2 boric treated radiate pine
External Cladding Envelope	▪ Timber weatherboard radiata pine H3.2, shiplap detail, laid horizontally and vertical rusticated boards on batten/cavity ▪ Architectural masonry veneer split face, fair face.
Insulation	▪ Woolbloc or pink batts to achieve R 2.6

Roof Cladding Insulation	▪ Long run steel roof with Colorsteel finish. Profile to be corrugated or Trimdek. ▪ Woolbloc or pink batts to achieve R 3.6
Ground Floor System	▪ Ribraft or similar to approval
Windows	▪ Aluminium frames with powder coated finish. Windows to be thermally separated and have vent grills, for background ventilation. ▪ Window hardware – Satin aluminium
External entry door Other external doors Garage Doors	▪ Aluminium frame with timber door. External quality timber required for door. ▪ Aluminium frames with single glazing 6.38mm laminate and 4mm float. ▪ Hardware to be in stainless steel. ▪ Pre-painted galvanised steel/timber sectional overhead type.
External balustrades/ handrails	▪ Galvanised powder coated steel with pressed steel flashings to suit.
Guttering and Facsia	▪ Pre-finished steel. ▪ Colorflo rainwater system box gutter 125mmx125mm in colorsteel finish, with matching fascia
Soffits	▪ Fibre cement panel
Downpipes	▪ UPVC
Mowing strip	▪ Concrete pavers
Fencing	▪ 1.8m high close boarded fencing and pool type fencing.
Driveway and patio	▪ Concrete with exposed aggregate
Planting	▪ Natives common to local area

Provision for sustainable features

Rainwater tanks	▪ Rotational moulded plastic
Solar hot water heating system	▪ Roof mounted solar panels with mains pressure cylinder
Double Glazing	
Low flow reticulation devices	

5.8 TREE / VEGETATION REMOVAL

The Arborist's Report attached in **Appendix 7** specifically identifies the trees and vegetation that requires removal to facilitate the proposed development. It also identifies trees and vegetation to be retained.

5.9 PROPOSED LANDSCAPING

A **Landscape Plan** is attached as **Appendix 7**.

There will be substantial new tree planting to streets, reserves and front gardens. In reserve areas, particularly along the margins of the stream, this will be native re-vegetation. In streets and private gardens exotic ornamentals and deciduous street trees will be planted, in keeping with the suburban character.

In all, there will be a substantial increase in the vegetation especially trees and shrubs on the site although this will be concentrated along the stream in the reserve and to the street frontage of the houses.

5.10 FENCING

The rear yards and gardens will be fully fenced to 1.8m for "stand up" privacy. Side boundary fences will be 1.35m tall for "sit down" privacy and the front boundaries will be defined either by retaining walls and planting, or by 0.8m fencing and low planting. These fences will be of a sturdy "trellis type" combined with vines to give privacy for outdoor living areas.

The fencing adjacent to the reserve and stormwater ponds will be standard metal "pool type" fencing combined with planting for visual amelioration. This fencing will allow visual surveillance of adjacent reserve areas from houses and gardens. At the same time low to medium planting around the fences will integrate them into the landscape.

5.11 Sanitary Sewer Reticulation

All properties will be connected to the primary wastewater reticulation pipelines, as shown on the enclosed drawings in **Appendix 8**.

All the development's wastewater will gravitate to connection points on the existing Waitakere City Council pipeline. As the surrounding properties consist of new residential development already connected to the public wastewater network, and considering the site will be a stand-alone comprehensive development, it is not anticipated that any future connection to the proposed reticulation network will be necessary. Therefore the reticulation network will be sized for the wastewater flow generation from this development only. The minimum approved diameter for public wastewater pipelines will be adequate to convey these flows.

Pipe materials and connections to individual properties for the proposed wastewater reticulation will be specified to Waitakere City Council design standards.

As shown on the drawings, portions of the Waitakere City Council existing reticulation will require realignment. Approval in principle for realignment of the sewer has been given by Ecowater with the new alignment to be approved at the time of Engineering Approval.

5.12 Water Supply

Water supply connection for the development will be sourced from adjacent reticulation layout in West Coast Road, Woodbank Drive, Titch Place and Pyramid Place.

A fire main laid within the subdivision roading network will provide fire fighting services with hydrants to be space according to Waitakere City Council standards.

All water supply construction materials and fittings will be to approved Waitakere City Council standards.

5.13 Utility Services

Confirmation has been received from Vector Energy that there is adequate existing electricity supply for the proposed development from the surrounding residential reticulation.

Telecommunication services will be extended from the existing services off West Coast Road, Woodbank Drive, Titch Place and Pyramid Place. Final details for the reticulation and connection points will be agreed with the service provider on detailed design.

There is existing gas reticulation within the area. Allowance for gas reticulation has been made within the development as shown on the drawings.

5.14 FOOTBRIDGE

A footbridge is proposed to allow pedestrian access from the adjacent Albionvale Road subdivision to the West Coast Road Housing Development.

The access point in the West Coast Road Housing Development will be to the stream edge pathway in the vicinity of the northern end of Road 3 crossing to the reserve on the other side of the stream.

The bridge will be based upon a Waitakere City Council preferred design of appropriately treated glulam supporting beams with galvanised steel handrails.

The bridge will span seven metres with no need for intermediate supports within the watercourse. Detail design will be provided at engineering approval stage.

5.15 LIGHTING

Street and amenity lighting will be provided for the development to Council standards and approval. The lighting forms used will be in keeping and complimentary to the development's modern architecture.

6.0 WAITAKERE CITY DISTRICT PLAN

6.1 RULES

The subject site is zoned:

- Living Environment
- General Natural Area
- Restoration Natural Area
- Riparian Margin Natural Area
- Non-Riparian Stream

under the Operative Waitakere City District Plan.

The following consents are required:

- Discretionary Activity consent for the establishment of a 77 unit medium density housing development not meeting the District Plan limited discretionary location criteria (Rule 2.3 - Living Environment).

- Discretionary Activity consent for the infringement of the height in relation to boundary control between sites within the development (Rule 5.3 - Living Environment). The extent of these infringements are shown visually in Appendix 4.

- Discretionary Activity consent for the infringement to the maximum building height control on the apartments demarcated as Building types "2B" and "2A" on the site plan (Rule 4.1 – Living Environment). The extent of these infringements are as follows:

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- 4 level apartment Type "2B"
  Maximum extent of infringement = 3.960m (eastern façade)
  Minimum extent of infringement = 1.095m (western façade)

- Northern-most 3 level apartment Type "2A"
  Maximum extent of infringement = 115mm (eastern façade)

- Southern-most 3 level apartment Type "2A"
  Maximum extent of infringement = 1.010m (eastern façade)

- Limited Discretionary Activity consent for the infringement of the impermeable surface control on all Lots (Rule 4.2 - General Natural Area: 15% maximum impermeable surface control where a site does not have connections to a reticulated system).

- Discretionary Activity consent for earthworks associated with a subdivision classified as a Discretionary Activity in the Subdivision Rules, not meeting the earthworks standards in Rule 3.1, 3.2 or 3.3 of the General Natural Area (Rule 3.4 - General Natural Area).

- Controlled Activity consent for the clearance of exotic and native vegetation less than 6 metres in height and/or 600mm in girth and vegetation listed within the Removable Vegetation Appendix and Environmentally Damaging Plants Appendix, to a total cleared area greater than 500m² within the General Natural Area (Rule 2.2 - General Natural Area).

- Limited Discretionary Activity consent for the clearance of exotic and native vegetation in excess of 6 metres in height and/or 600mm in girth within the General Natural Area (Rule 2.3 - General Natural Area).

Overall, the application is a **discretionary activity**.

6.2 Objectives And Policies

A range of broad policies and objectives are contained within the District Plan and provide a statement of the Plan's approach to the management of the effects on natural and physical resources. The Policy Section of the District Plan identifies the significant resource management issues of the District; the objectives sought by the Plan and the policy direction chosen in response to these issues and objectives.

The objectives and policies identified within the District Plan as having particular relevance to the development proposal are as follows:

- Residential Activities/Density
  Objectives: 1-4, 10, 11
  Policies 1.1, 1.2, 1.14, 2.1, 3.1, 4.2, 10.17, 10.27, 11.1, 11.2, 11.27, 11.28

- Height in Relation to Boundary
  Objectives: 1, 10, 11
  Policies: 1.15, 10.5, 10.6, 11.3

- Impermeable Surfaces
  Objectives: 1, 2, 5, 7-10
  Policies: 1.5, 1.6, 1.7, 1.10, 2.10, 5.1, 7.2, 7.3, 8.4, 9.6, 9.7, 9.12, 9.14, 10.27

- Subdivision
  Objectives: 1-12
  Policies: 1.1, 1.10, 1.14, 1.15, 1.20, 2.1, 2.3, 2.13, 3.1, 3.4, 3.5, 4.2, 4.3, 4.4, 5.2, 5.4, 6.1, 6.4, 7.1, 7.2, 7.3, 8.3, 8.5, 9.1, 9.3, 9.6, 9.7, 9.14, 10.4, 10.7, 10.8, 10.9, 10.13, 10.15, 10.16, 10.17, 10.18, 10.20, 10.22, 10.23, 10.27, 11.1, 11.2, 11.4, 11.5, 11.6, 11.9, 12.4, 12.8

- Earthworks
  Objectives: 1-3, 5-11
  Policies: 1.1, 1.5, 1.6, 1.7, 1.8, 1.9, 1.11, 1.12, 1.14, 1.16, 1.19, 1.20, 2.4, 2.8, 2.10, 3.2, 3.4, 3.5, 5.1, 5.4, 6.2, 6.3, 7.2, 7.3, 7.5, 7.7, 8.1, 8.4, 8.6, 8.7, 9.6, 9.7, 9.10, 9.11, 9.12, 9.14, 10.13, 10.27, 11.2, 11.4, 11.7

- Vegetation Alteration
  Objectives: 1-3, 5-12
  Policies: 1.1, 1.5, 1.6, 1.7, 1.8, 1.9, 1.11, 1.16, 1.19, 1.20, 2.3, 2.4, 2.11, 2.12, 2.13, 3.2, 5.1, 5.2, 5.3, 5.4, 5.7, 6.2, 7.3, 7.4, 7.7, 8.1, 8.2, 8.4, 8.8, 9.9, 9.10, 9.11, 9.13, 9.14, 10.27, 11.2, 11.4, 11.7, 12.1, 12.6, 12.7

The proposal is considered to be generally consistent with the policy framework provided in the above quoted provisions.

In summary:

- The proposal adheres to the principles of good urban design and contributes to housing diversity and choice

- Good amenity will be provided for the future residents of the development, in terms of private and useable open space, and adequate access to daylight

- The amenity of neighbouring properties will be maintained and even enhanced, by converting a presently neglected and messy site into an integrated, architecturally designed residential development with substantial revegetation.

- The proposal seeks to minimise impacts on the natural environment through the use of appropriate sediment and erosion control measures during construction, and stormwater treatment measures such as swales and stormwater treatment ponds

- Removal of vegetation is minimised

- A comprehensive landscaping plan is proposed which will help soften and "ground" the new built development, whilst enhancing the riparian margins of the natural environment alongside the stream

- Sustainability and energy efficiency has formed a central consideration in the progression of the design

6.3 Assessment Criteria

General assessment criteria are specified in Section 13.14 of the District Plan. Given the generality of these criteria, and the fact that these matters have been dealt with elsewhere in this assessment, for brevity the assessment criteria are not listed here.

However as demonstrated elsewhere in this report, the proposal is considered to satisfy and even exceed these criteria.

6.4 Medium Density Housing Criteria

Reference has been made to the Council's Medium Density Housing Criteria in the District Plan. Whilst these criteria are specifically designed to be utilised in the assessment of applications qualifying as "medium density developments", it is considered that these criteria are also relevant to a development of the scale and intensity proposed herein.

The criteria are grouped into the following Design Elements, with brief commentaries:

Neighbourhood Character

Relationship of the development to the surrounding neighbourhood and streetscape.

Comment: The density of the proposed development is generally consistent with that of the surrounding neighbourhood. The higher density element of the proposal in Stage 3, comprising apartment blocks, is located closer to the western boundary, which adjoins a recent medium density development which utilises terrace housing as a predominant built form. The location of these buildings helps ensure a transition occurs between the higher density development on this neighbouring site, and the subject site "proper".

Site Layout

Overall design, character and landscape treatment, including such things as orientation, site access, location and function of outdoor spaces, topography and views.

Comment: The design of the development has been undertaken comprehensively, to ensure integration in design between the various building stages. Such a comprehensive approach also ensures consistency and unity in architectural design and style, notwithstanding the objective of allowing for variety.

Building orientations are generally north / north-west-facing to maximise sunlight. At the same time, this also allows for maximisation of views and outlook towards the stream area of the site.

Building Location
Relationship to adjacent buildings, site boundaries and height of the proposed development to ensure satisfactory amenity is maintained.

Comment: Relationships between proposed buildings in the development have been carefully considered to ensure critical issues such as daylight admission, outlook and privacy are addressed. This has been achieved through placement of units within allotments, orientation of buildings, and placement of windows.

Also of note is the fact that the lower density development is generally located towards the eastern boundary of the site, which adjoins existing low density suburban development, whilst the higher density apartment development is located towards the western boundary of the site which adjoins a higher density residential subdivision.

The majority of the proposed development is single or double storied, of typical suburban scale. The exception is the apartment buildings in stage 3, which comprise 3 and 4 level buildings. However, importantly, as the ground level parking in these buildings is cut into the slope, these buildings will present as 2 and 3 storied structures to the neighbouring properties to the west.

Visual and Acoustic Privacy
Layout, and screening to enable privacy from overlooking or unwanted noise.

Comment: Zero-lot boundaries are generally provided on the southern boundaries, where the southern elevations of the dwellings present a largely "windowless" façade. This protects the privacy of the north facing outdoor yards of the adjoining properties to the south. Such design techniques also help provide for acoustic privacy, by physically separating the internal and outdoor living areas of adjoining units.

Carparking and Vehicle Access
Design and layout of driveways for resident and visitor car parking to achieve convenient, safe and attractive vehicle access.

Comment: All access and parking areas have been designed in accordance with Council standards, so ensure safe, convenient and efficient access. To enhance urban design outcomes, driveways from dwellings to the road have been "tapered" to reduce width of vehicle crossings at the street frontage.

Visitor parking has been provided which exceeds Council requirements.

On-site Outdoor Space
Relationship of outdoor space to houses to enable appropriate levels of privacy, outlook, sunlight and landscape treatment, while also considering maintenance, management, and security.

Comment: Outdoor yards are generally provided on the northern sides of the dwellings. Privacy between units has been addressed above.

Entries to Buildings
Design and layout to achieve identity and visibility, shelter, security and potential for disabled persons access.

Comment: Front doors have been designed and located to ensure maximisation of the above qualities. For most dwellings, entrances are clearly visible from the street. This is achieved through placement of the front doors generally to the front of dwellings, together with the provision of low (0.8m) fencing and landscaping on the front boundary.

Site Facilities
Appropriate location and design of shared facilities for rubbish collection, service connection points, storage and the like.

Comment: Rubbish will be collected from individual properties rather than from a shared facility.

Landscape Treatment
Potential for landscape design to enhance and integrate the development into the surrounding neighbourhood, and create a quality living environment.

Comment: A comprehensive landscape design has been completed by a designer with significant expertise and experience in Waitakere City. The design is fully cognisant of Council's requirements, particularly with regard to the requirements for riparian planting.

7.0 AUCKLAND REGIONAL COUNCIL

7.1 REGIONAL PLANS

The earthworks proposed necessitate resource consent approvals under the Auckland Regional Plan: Sediment Control 2001.

Applications to that Council have been made concurrently.

7.2 AUCKLAND REGIONAL POLICY STATEMENT (ARPS)

Following the passing of the Local Government (Auckland) Amendment Act 2004, the ARPS was amended to reinforce urban growth management in the Auckland Region and the integration of land use planning and transport infrastructure.

Revised Section 2.3 of the ARPS states:

"Key features of the "Growth Concept" are that :

- *growth will be managed by promoting* ***quality, compact urban environments (intensification)****.*
- *most growth is* ***contained*** *within the existing metropolitan area with development outside current urban limits only where environmental, accessibility and community principles can be met;*
- *most urban growth is focused* ***around town centres and major transport routes*** *(refer Schedule 1) to create higher density communities, with a variety of housing, jobs, services, recreational and other activities (mixed use);*
- *there is much less emphasis on accommodating growth through general infill in suburban areas.*

The proposed development is generally consistent with these principles, as it represents a well planned, comprehensive development of a compact nature located within the existing metropolitan area.

8.0 ASSESSMENT OF ENVIRONMENTAL EFFECTS

8.1 VISUAL IMPACT AND CHARACTER

The majority of the subject site will be developed with low-medium density detached housing, generally consistent with the intensity anticipated by the District Plan. Stage 3 of the project is characterised by medium density apartment accommodation.

A visual impact assessment has been prepared by SOUL Landscape Architects and is attached as **Appendix 7.**

The assessment concludes:

The landscape of suburban living areas in such as this part of Waitakere is presently changing to accommodate medium density infill housing and create a landscape that is more urban in character. The proposed re-development of the site is in keeping with this trend and is in character with the surrounding areas. Little of specific visual merit will be lost from the site and the gains of new planting and public access and habitat restoration will be significant.

The modest but thoughtful quality of the architectural design will offer visual benefits by comparison with the present rather run-down site character.

Overall, the change in visual character and habitat value will be beneficial to the site and its environs.

8.2 URBAN DESIGN

Addressed in Section 6.4 of this report.

8.3 TRAFFIC IMPACT

Traffic Design Group have undertaken a **traffic assessment**, attached as **Appendix 9**.

That report concludes:

On the basis of this transportation assessment, it is concluded that the proposed residential development can be established with no more than minor effects to the function, capacity or safety of the surrounding traffic environment.

Specifically, the operation of the West Coast Road/Woodbank Drive and West Coast Road/Parrs Wood Road intersections will not be adversely affected as a result of this proposal with the development having only a minor effect.

Furthermore, there is nothing about the proposed new roads and intended development that should adversely affect the existing road safety record.

Accordingly, it is found there is no traffic planning reason to preclude the acceptance of the development proposal as presented.

8.4 EARTHWORKS – SEDIMENT AND EROSION CONTROL

Erosion and sediment control facilities as shown on the enclosed drawings in **Appendix 10** will be required for the earthworks operations and will be constructed and maintained in accordance with Auckland Regional Council's Technical publication 90 (TP90).

The erosion control measures on site are generally determined by the existing topography of the site with Stages 2 and 3 being narrow strips of land bordered by the existing stream. As the actual area of Stages 2 and 3 is lower than Stage 1, combined with the difficulty in constructing a major sediment control facility i.e. sediment pond, it is proposed to control sediment from these areas with a combination of silt fence and decanting earth bunds.

With the area of Stage 1 being the largest of the site a conventional sediment control pond is proposed to treat sediment laden runoff from the majority of Stage 1 with silt fence along the lower portions of the site adjacent to the existing stream where construction of diversion bunds is not practical. This sediment pond is to be constructed as part of the permanent stormwater detention basin as detailed later in this report with the pond bunds, outlet and internal slopes constructed to the permanent facilities dimensions and the sediment from the earthworks construction being removed to the area rehabilitated for it's final use as a stormwater detention area.

All runoff diversion bunds are to be a minimum of 0.6 metres high and will convey sediment laden runoff into the sediment control ponds. The height of

these bunds has been calculated to contain and convey the 5% AEP storm event with appropriate freeboard.

The calculated sediment yield during the earthworks construction phase, as detailed in the USLE calculations contained in Appendices, is in the order of 5.6 tonnes. These calculations allow for the sediment retention pond to have chemical treatment facilities installed, therefore increasing the pond efficiency from 75% to approximately 95%. The use of alternative erosion control facilities such as silt fences producing a much lower control efficiency, which in this case contributes the majority of the calculated sediment yield.

All sediment control facilities will be constructed prior to topsoil stripping commencing. All sediment control facilities will be monitored during works with inspections during periods of rainfall. Any damage to these facilities will be immediately rectified.

8.5 STORMWATER DISCHARGE

From correspondence with the Auckland Regional Council we have been advised that the subject site area is covered by an existing **Comprehensive Discharge Consent**, No. 23006, a copy of which is enclosed in **Appendix 11**. This consent is held and controlled by Waitakere City Council.

It is our understanding that any new development within the catchment under the approval of Waitakere City Council is to comply with the Parrs Stream Stormwater Management Plan (CMP), dated 6 March 2003. As such if developments within the catchment comply with the existing consent, i.e. not require a variation to the existing consent, then consent to divert and discharge stormwater will not be required from the Auckland Regional Council.

It is proposed to control and treat the stormwater discharge from the development to the standards described in Auckland Regional Councils Technical Publication 10 (TP10). Following discussions with Ecowater it is also proposed to achieve hydraulic neutrality to pre-development levels up to a 10 year storm event. Details of the stormwater treatment and attenuation and treatment facilities are described later in this report.

All properties will be connected to the primary stormwater reticulation pipelines. Preliminary stormwater reticulation design layout is shown on the enclosed drawings.

The percentage of impermeable area for the current proposal is calculated at approximately 38%. This figure allows for all sealed and concreted hardstand areas, footpaths, vehicle crossings and individual unit landscape paving areas. **Calculations for the permeable/impermeable percentage** are contained in **Appendix 12**.

Pipe materials for the proposed stormwater reticulation will generally be rubber ring jointed, reinforced concrete (RCRRJ), in accordance with Waitakere City Council design standards. Connection for individual subdivision units will be to Waitakere City Council standards, usually by online 'Y' junctions and ramped risers if required, or by direct connection into the manhole. Catchpits are to be constructed generally in the positions shown.

Both the roading and accessway networks are utilized for the control and conveyance for overland flows. Preliminary design catchments, design flows and overland flow paths are shown the enclosed drawings.

8.5.1 Stage 1

As shown on the enclosed drawings and recommended by Waitakere City Council representatives, it is proposed to construct a wetland treatment facility within the northern portion of Stage 1. There are existing physical constraints in this area by way of the existing oil and gas easement, as well as the existing Waitakere City Council and Watercare sewer lines. To achieve a best quality solution to the constraints it is proposed to construct separate wetland water quality and detention facilities to either side of the existing services. The purpose of the wetland facility shown on the drawings is to provide water quality treatment for the equivalent Stage 1 area by way of a banded bathymetry wetland pond design to TP10 standards and landscaped accordingly. The detention basin shown on the drawings to the north of the wetland is to provide slow release erosion control of the initial 34.5mm as well as routing of the 2 and 10 year storm events to pre-development levels for an area equivalent to both Stages 1,2 and 3.

8.5.2 Stage 2

The development area contained within Stage 2 is constrained somewhat by the existing topography. This topography essentially excludes the ability to construct a quality stormwater attenuation facility for the Stage 2 catchment area. As this is the case, it is proposed to provide water quality treatment for the road carriageway area within Stage 2 by way of a swale or filtration facility within the road reserve and pro-rata attenuate the equivalent area of Stage 2 within the detention facility on the northern boundary of Stage 1.

8.5.3 Stage 3

An existing stormwater treatment facility in the location of Stage 3 of the development is constructed on the site and accommodates stormwater treatment for an existing residential development adjacent to the western boundary of Stage 3. This facility has a contributing catchment of 1.756 hectares according to the pond maintenance manual submitted to Ecowater.

As this existing facility is within the construction area of Stage 3, it is proposed to relocate and upgrade this facility, as shown on the enclosed drawings. It is proposed to accomodate treatment from the roading and hardstand areas within a grassed swale, approximately 30 metres long which discharges into the existing stream. Attenuation for the increased impermeable areas within Stage 3 will be on a pro-rata basis with the equivalent area of Stage 3 attenuated within a detention facility on the northern boundary of Stage 1..

8.6 Geotechnical Matters

A **Geotechnical Engineering Assessment** is attached in **Appendix 13.**

Although the assessment reveals several areas of instability, it proposes engineering solutions which will mitigate against these constraints.

8.7 Trees And Vegetation

The Arborist assessment of the site is attached as **Appendix 7.**

8.8 Potential Site Contamination

Council records indicate that the site is not subject to contamination.

9.0 STATUTORY ASSESSMENT

9.1 Part II - Section 5: Purpose and Principles of the Resource Management Act 1991

Section 5 of the Resource Management Act sets out the purpose and principles of the statute, which is "to promote the sustainable management of natural and physical resources." The Act goes on to define "sustainable management" as meaning:

"managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural wellbeing and for their health and safety while —

(a) Sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and

(b) Safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and

(c) *Avoiding, remedying, or mitigating any adverse effects of activities on the environment.*"

It is considered that the proposed development is consistent with the purpose and principles of the Act as:

- The development will help provide residential accommodation for those members of society who cannot provide for themselves in terms of the free market residential sector ; and

- As a result, the development will contribute to the social and cultural wellbeing of society; and

- At the same time, adverse effects can be avoided, remedied or mitigated.

9.2 SECTIONS 93 AND 94 OF THE RESOURCE MANAGEMENT ACT 1991

Section 93 (1) states that:

"A consent authority must notify an application for a resource consent unless:

(a) the application is for a controlled activity; or
(b) *the consent authority is satisfied that the adverse effects of the activity on the environment will be minor."*

As outlined in this report, we consider that adverse effects resulting from the development will be no more than minor.

Furthermore, it is considered that no persons are adversely affected by the proposed development.

In pre-application meetings with Council, the following areas of the site were identified as areas where potentially neighbour's written approvals of neighbouring sites would be required:

- Lot 56: 4 apartment units
- Lot 61: 14 apartment units

These two specific areas, and the wider development, are addressed specifically below.

Lot 56

In earlier plans, the area of this lot, which contains 4 units, was approximately 1200m^2. Council indicated that because the net unit area of 350m^2 per unit could not be provided, the potential for Council to request the written approvals of neighbouring property owners / occupiers existed.

Since that time, the site plan has been reconfigured so that the area of Lot 56 is greater than 1400m^2, therefore ensuring more than 350m^2 is associated with each of the units.

As all bulk and location controls are complied with in relation to the external boundary, we consider that there are now no grounds for neighbours to be adversely affected.

Lot 61

The discretionary element of the application relates to the higher density apartments in Stage 3, which do not comply with the requirement of 350m^2 net unit area and the maximum height control. These units should be viewed as an element quite distinct to the lower density nature of the balance of the development.

With respect to this higher density development, it is considered that the owners and occupiers of sites on the neighbouring land to the north-west are not affected for the following reasons:

- The proposed apartments are located on lower contours.

- Although the apartments comprise three or four levels, the basement level is excavated below the existing ground level, which essentially means a two-storey or at worst three-storey building face will be presented to the neighbouring properties to the west. Refer to sheet A303, Elevation 13 contained within Appendix 4 (the buildings will present as 3 and 4 level structures when viewed from *within* the subject site – refer Elevation 12).

- A significant buffer of between 20 - 25 metres will exist between the face of the apartment units and the face of the units on the neighbouring property to the west. Therefore the separation distance will be equivalent to that between homes separated by public road reserve. This buffer distance will help to mitigate any potential impacts on privacy or dominance.

- The units are located a significant distance to the east of the neighbouring properties, and have been designed to comply with the height in relation to boundary controls. Therefore there will be no impact in terms of shading.

- Comprehensive landscaping is proposed to soften the building development, in addition to the existing landscaping adjacent to the boundary on the adjoining site.

- The apartments will not be significantly divergent in character from the built form character of the neighbouring sites, characterised as they are by attached terrace housing building typology. The apartments represent an appropriate transition in built form between the medium density development on the neighbouring sites and the lower density development within the subject site. Elevation 13 on Sheet A303 shows the bulk of the proposed apartment buildings in relation to the corresponding buildings on the neighbouring site. As can be seen from this elevation, the bulk and scale of the proposed buildings is similar to the bulk and scale of the existing built form on neighbouring properties.

- A visual impact assessment has been undertaken by SOUL Landscape Architects and is attached as Appendix 7. That report concludes that: "*Overall, the change in visual character and habitat value will be beneficial to the site and its environs*". **Therefore it is considered that any visual impact will be positive in nature rather than generating any adverse effects.**

Wider site development

In relation to the majority of the development, the proposed site areas are greater than 350m^2. Therefore the majority of the development which adjoins residential sites located on Pyramid Place, Titch Place and Woodbank Drive is consistent with the level of development contemplated as a limited discretionary activity under the District Plan. Limited discretionary activities are assessed without written approvals of neighbours.

We also note that the average net site area per unit across the site is 373m^2. Therefore, whilst some of the development is of a density higher than one unit per 350m^2, specifically Stage 3, looking at the site as a whole the intensity of development is low.

Expert input into this assessment suggest that environmental impact in relation to traffic, sedimentation and erosion, stormwater discharge, stability, and vegetation removal will be no more than minor.

As we consider the adverse effects to be no more than minor, we consider that the proposal can be processed on a non-notified basis without written approvals as no persons are considered to be adversely affected.

10.0 CONSULTATION

Council have indicated that the following Iwi have an interest in this area:

- Te Kawerau a Maki

Accordingly, a copy of this AEE has been forwarded to that Iwi. A copy of the covering letter is attached as **Appendix 14.**

Once feedback is received from that iwi it will be forwarded to the Council.

Pre-application meetings have been held with Senior Council staff who have indicated general support for the proposal in principle. In particular, the project team has been particularly conscious of involving Peter Joyce, Urban Designer at Council.

11.0 DEVELOPMENT CONTRIBUTIONS

As the application has been lodged prior to 1 July 2006, the existing development contribution regime applies.

Council has advised on this basis that the development contribution payable is $613,657.09. A cheque has been deposited at lodgement on 26 June for this figure.

As the proposed development will incorporate a number of energy efficient measures, as discussed in Section 5.3 of this report, the applicant will seek to apply for a development contributions rebate at building consent stage. The "TUSC" sustainable rating system will be applied at that stage to determine what level of remission is provided.

Council have also advised that a "Twin Streams" financial contribution for stormwater mitigation is also required, to be charged as a condition of resource consent. We anticipate that remission will also be available on this contribution given the significant area of landscaping together with weed management proposed.

12.0 CONCLUSION

Following a full and comprehensive assessment of the proposed development, it is considered that the proposal satisfies current best practice in urban design for medium density developments.

Any District Plan infringements are considered non-consequential, and an assessment of the merits of the proposal reveal that the development will positively enhance the amenity values of the area, whilst avoiding any adverse effects on the environment. All expert reports appended to this application conclude that adverse effects generated will be no more than minor.

It is considered that all statutory "tests" under the RMA are satisfied. In particular, it is considered that the proposal is not contrary to any of the matters contained in Part II of the RMA.

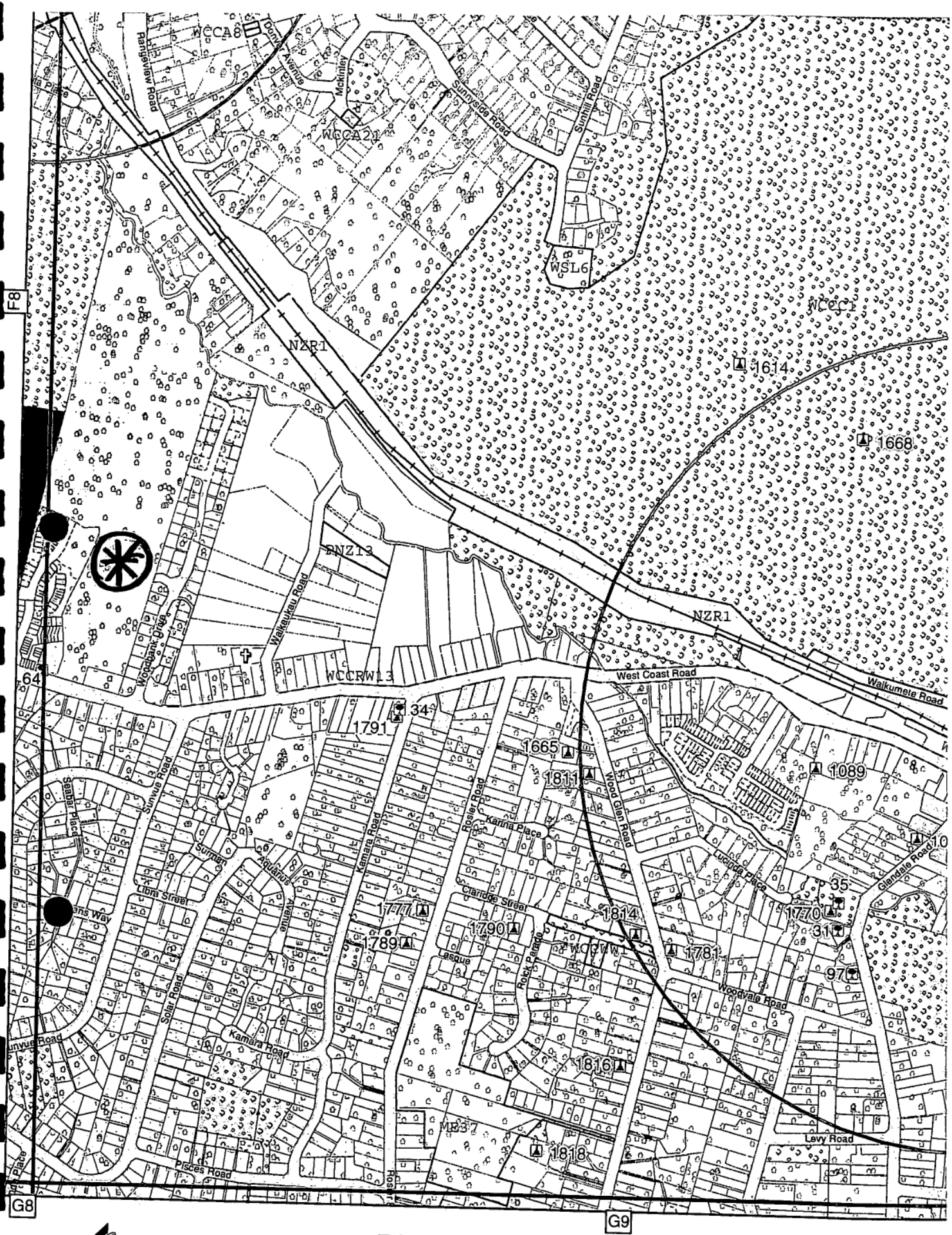
We are of the view that the proposed development will come to represent "best practice" as a demonstration project providing for affordable entry level housing which subscribes to good urban design principles and sustainability.

Therefore it is considered appropriate for resource consent approval to be granted, without notification, and subject to fair and reasonable conditions of consent.

Matthew Paetz
Senior Planner – Babbage Consultants

APPENDIX 1

Location Plan



Waitakere City Council

District Plan - Human Environments

1:8,000

250 125 0 250 Meters

Map compiled by Council. Copyrig

Cadastral inform Crown Copyright

SITE

Appendix 2

Certificates of Title

COMPUTER FREEHOLD REGISTER
UNDER LAND TRANSFER ACT 1952

Search Copy

R.W. Muir
Registrar-General
of Land

Identifier	**163629**
Land Registration District	**North Auckland**
Date Issued	02 September 2004

Prior References
NA117B/312

Estate	Fee Simple
Area	7948 square metres more or less
Legal Description	Lot 3 Deposited Plan 339810

Proprietors
New Zealand Housing Foundation

Interests

Subject to a right of way (in gross) over part N on DP 339810 in favour of the Waitakere City Council created by Transfer 6070221.1 - 7.7.2004 at 9:00 am

Subject to a stormwater detention and drainage easement (in gross) over part M on DP 339810 in favour of the Waitakere City Council created by Transfer 6070221.2 - 7.7.2004 at 9:00 am

Subject to a drainage easement (in gross) over part marked L on DP 339810 in favour of the Waitakere City Council created by Easement Instrument 6135712.4 - 2.9.2004 at 9:00 am

The easements created by Easement Instrument 6135712.4 are subject to Section 243 (a) Resource Management Act 1991

6551320.5 Mortgage to Housing New Zealand Corporation - 29.8.2005 at 9:00 am

COMPUTER FREEHOLD REGISTER
UNDER LAND TRANSFER ACT 1952

Search Copy

R.W. Muir
Registrar-General
of Land

Identifier	**163628**
Land Registration District	**North Auckland**
Date Issued	02 September 2004

Prior References
NA117B/312

Estate	Fee Simple
Area	4.9336 hectares more or less
Legal Description	Lot 2 Deposited Plan 339810

Proprietors
New Zealand Housing Foundation

Interests

Subject to a pipeline right over part marked B on DP 339810 created by Transfer B344219.1 - 30.10.1984 at 10.55 am

Subject to an oil and gas supply right (in gross) over part marked B on DP 339810 in favour of Natural Gas Corporation of New Zealand Limited created by Transfer B344219.1 - 30.10.1984 at 10.55 am

6135712.2 Consent Notice pursuant to Section 221 Resource Management Act 1991 - 2.9.2004 at 9:00 am

Subject to a drainage easement (in gross) over part marked K, B & G on DP 339810 in favour of the Waitakere City Council created by Easement Instrument 6135712.4 - 2.9.2004 at 9:00 am

The easements created by Easement Instrument 6135712.4 are subject to Section 243 (a) Resource Management Act 1991

6551320.5 Mortgage to Housing New Zealand Corporation - 29.8.2005 at 9:00 am

Felicitas Dhliwayo

From: Jodie Mitchell [jodiemitchell@slingshot.co.nz]
Sent: Wednesday, 1 November 2006 8:49 a.m.
To: Felicitas Dhliwayo
Cc: Renee Lambert; Jeannette Ibrahim
Subject: RE: 423 West Coast road

Hi Felly

Apologies for not getting back to you yesterday I was out at Waitakere for the day and didn't have access to my e-mail.

As the date of certified establishment would be prior to the release of the 224(c) I don't have any problems with condition 8 being attached to the subdivision. The maintenance bond relates to the 224(c) stage also.

Perhaps an advice note with the LUC briefly outlining their responsibility in this regard and that such a condition will be applicable at the time of the SUB will ensure that the applicant is aware/understands this aspect to avoid any later confusion.

Jodie

Jodie Mitchell
Planning Consultant
ph/fax 09 575 3635
Mob 021 664 807
Postal Address: 26 Kesteven Ave
Glendowie
Auckland 1005

-----Original Message-----
From: Felicitas Dhliwayo [mailto:Felicitas.Dhliwayo@waitakere.govt.nz]
Sent: Tuesday, October 31, 2006 9:10 AM
To: Jodie Mitchell
Cc: Renee Lambert; Jeannette Ibrahim
Subject: 423 West Coast road

Hi Jodie

We have decided to process the above application as a separate landuse and subdivision instead of a combined one. This is because the applicants would like to start earthworks as soon as possible and it appears there are still issues with Ecowater conditions which need to be addressed. Therefore we are trying to get the landuse consent signed off today if possible.

However we have noted that Condition 8 of the Parks conditions requires the payment of a bond and this will take about 5 days to process before the consent is issued. Therefore this condition will delay the issue of the landuse consent. Is it possible to put this condition under the subdivision application? If this is possible then it means the landuse consent can be granted and issued as soon as possible. Please let me know if this is okay.

Thanks

Felly.

Note:
This message is for the named person's use only. It may contain confidential, proprietary or legally privileged information. No confidentiality or privilege is waived or lost by any mistransmission. If you receive this message in error, please immediately delete it and all copies of it from your system, destroy any hard copies of it and notify the sender. You must not, directly or indirectly, use,

disclose, distribute, print, or copy any part of this message if you are not the intended recipient.
Any views expressed in this message are those of the individual sender, except where the message states otherwise and the sender is authorised to state them to be the views of any such entity.

Thank You.

http://www.waitakere.govt.nz

Amended Conditions

Waitakere City Council
Te Taiao o Waitakere

Memorandum

To	**Felicitas Dhliwayo** Consent Services Civic Offices
From	**Lucy Lunevich** Water & Drainage Engineer **EcoWater Solutions**
Date	Thursday, 26 October 2006
Subject	**ECO-WATER CONDITIONS – SUB**

RMA No. 20061078
SPW No. 22816
Address: 423 – 429 West Coast Road
Applicant: NZ Housing Foundation

The following conditions are based on an assessment of the information provided with your application, and additional information supplied by you following a Section 92 request for further information addressing storm water treatment and detention on the site. Council has reviewed the impact the development would have on the environment and on EcoWater's infrastructure. When examining the application, reference was made to Council's Code of Practice for City Infrastructure and Land Development (WCC COP), District Plan and relevant ARC publications. In addition, Council engineers responsible for Water Supply, Wastewater, Stormwater, Subdivision and Consents were also requested to review your application.

1: SECTION 223 REQUIREMENTS

(a) As required by Condition (EW 5) below, define the 1 in 100 year overland flow path and provide a drainage easement(s) in gross in favour of Council in a Memorandum of Easements endorsed on the survey plan. Include in the Section 223 approval on the plan, "subject to the granting or reserving of the easement(s) set out in the Memorandum hereon." Notes:

(i) The easement document will be prepared by Council's Solicitor at the applicant's cost.
(ii) Prior to submitting the survey plan for Section 223 certification, obtain EcoWater's approval to the drainage easement.

This condition is required to comply with WCC COP (Refer section 4.2, 4.3.2.2, 4.3.4, 4.3.7.2).

(b) Provide drainage easements (for the services through Lots to Lots to protect the existing or proposed connections) in a Memorandum of Easements endorsed on the survey plan. Include in the Section 223 approval on the plan, "subject to the granting or reserving of the easement(s) set out in the Memorandum hereon."

where appropriate

This condition is required to comply with WCC COP (Refer section 6.3.4).

2: SECTION 224C REQUIREMENTS

ECOWATER CONDITIONS (PUBLIC DRAINAGE)

(EW 1) Before the commencement of any work, obtain the approval of Council to engineering plans and specifications prepared in accordance with Council's "Code of Practice for City Infrastructure and Land Development" detailing the nature and extent of any proposed work. The engineering plans submitted will be processed separately and any amendments required will be advised in the engineering approval. *This condition is required to comply with WCC COP (Refer section 1.8).*

(EW 2) Design, provide and install a complete public wastewater reticulation system to serve all Lots in compliance with Councils Code of Practice for City Infrastructure and Land Development (Refer Section 5.0). Specific requirements:

(i) Under specific engineering approval extend the public wastewater system from the existing points within the site to serve each residential Lot within a separate connection to the public system. Specific requirements:

(ii) At the stage of engineering approval provide the written consent from Water Care Services Ltd to build over their sanitary sewer line.

(iii) No storm water treatment devices are permitted to be build above the public sewer lines.

(iv) Re-route the existing public drainage lines passing through Lot(s) 31-32 to provide more adequate building sites for those Lots. At the stage of engineering approval a quote will be obtained from Councils contractor for the proposed re - location of the reticulation system and new manholes required on the existing wastewater network.

(v) Design and install the new reticulation system clear from the proposed building platforms. Locate all drainage lines in the front on Lots where possible to provide ease of access for future maintenance requirements.

(vi) Advice Note: EcoWater policy requires any wastewater manholes or line connections to be constructed by EcoWater Solutions maintenance contractor. Wastewater manhole connections may be constructed by the applicant's contractor with engineering plan approval and under EcoWater's Quality Assurance supervision or by EcoWater Solutions maintenance contractor.

This condition is required to comply with the WCC COP (Refer section 5.0). The condition specifies location and design features required for the proposed drainage lines to minimise long term maintenance costs, increase accessibility and to minimise the likelihood of ground water infiltration into the public drainage system.

(EW 3) Take note that the existing public sanitary sewer passing through Lots may need to be re-laid at the owners expense (for that length below and one metre either side of the new dwelling) at the time application is made for building consent on this Lot. The building consent application shall include a cctv video inspection of the wastewater drain and foundation bridging details.

This condition is required to comply with the WCC COP (Refer section 4.4.3). An information leaflet is available from Council's Front Counter on building over public drains.

(EW 4) Design, provide and install a complete public storm water drainage system to serve all Lots in compliance with Council's Code of Practice for City Infrastructure and Land Development (Refer section 4.0). Specific requirements:

(i) Under specific engineering approval install the public storm water system to serve each residential Lot within a separate connection to the public system. Specific requirements:

(ii) Extend storm water line from the upstream properties 32, 34, 36 and 38 Wood Bank Drive.

(iii) Collect all existing discharge points. The system shall include connection to down pipes or drainage from any proposed buildings/paved areas.

(iv) Design the storm water network clear from the proposed building platforms.

(v) Obtain the written consent of the owner(s) if necessary prior to the commencement of work and obtain written evidence of their satisfaction with the restoration.

This condition is required to comply with the WCC COP (Refer section 4.0). The above condition specifies location and design features required for the proposed drainage lines to minimise long term maintenance costs, increase accessibility and to minimise the likelihood of ground water infiltration into the public drainage system.

(EW 5) That all new buildings must be constructed at least 500mm above the 1% AEP flood plain or the level of any downstream hydraulic control (500 mm above the crest of any road embankment), whichever is higher.

(EW 6) Provide a catchment analysis, define and form the 1 in 100 year overland flow path. Provide an As Built plan of the overland flowpath showing a long section and cross section for inclusion in Council's Hazards and Special Features Register.

This condition is required to comply with the WCC COP (Refer section 4.2, 4.3.2.2, 4.3.4, 4.3.7), and because a site visit / EcoWater records / the Hazard Register / EcoWater Catchment Studies has revealed that the property is affected by overland stormwater flows in the 1 in 100 year storm event. This overland flowpath is required to be registered on the title by easement and on Council's Hazards and Special Features Register to ensure that future development does not take place in this flowpath.

(EW 7) To prevent increasing downstream flooding and increased channel erosion on the Opanuku Stream, stormwater disposal is required to comply with the Parrs Stream Management Plan (Consent number 23006).

A consent notice is to be issued and registered on the new title(s) for Lot(s) stating that the stormwater disposal system from any development on the site shall be designed to incorporate the following requirements to the satisfaction of EcoWater:

i) The proposed development must comply with the Parrs Stream Management Plan (Consent number 23006).

ii) That new developments should incorporate storm water management measures to restrict their post-development 50% AEP flows to their pre-development levels.

iii) Mimic natural runoff patterns, and not to discharge directly to a watercourse, open drain or piped system.

iv) To allow 20m average riparian margins from the centreline of the stream channel, and 4.5m above stream bed level.

v) The proposed storm water treatment devices must be capable of 75% sediment removal (as per the ARC Technical Publication No 10).

vi) Open channels within the site must be monitored for channel erosion, and appropriate mitigation works implemented as and when necessary for the period of the construction works.

vii) Note: Council's Hazards and Special Features Register will be advised of the above requirements.

This condition is required to ensure that the stormwater flow and volume from the development is kept to predevelopment levels for various storm events. This is necessary to ensure already severe downstream flooding is not increased as a result of development. It is also required to ensure channel erosion in the Opanuku Stream or its upper tributaries is not increased. The most effective means for achieving this outcome is replanting, roofwater re-use and minimising impervious areas.

(EW 8) Provided attenuation and treatment devices to serve the development as per the Waitakere City Council Comprehensive Discharge Consent for the Parrs Cross Catchment and WCC Code of Practice for City Infrastructure and Land Development (refer Section 4).

i) The proposed swale will be replaced the exiting pond to serve the Stage 3 of the development and upstream properties (Albion Vale catchments). At the stage engineering approval application provide a methodology of the relocation of the excising storm water device (pond).

ii) Provide calculation for each treatment device to comply with ARC TP 10 requirements.

iii) The approved access to treatment device(s) must remain available at all times for the design lifetime of the pond.

iv) Mechanism to drain the main pond and the forebay without the necessity for pumping (over pumping). In other words, wherever practical, it should be possible to drain the main pond and the forebay by gravity flow.

v) Provide maintenance manual and procedures for the removal and disposal of sediment including frequency.

vi) The need for armoured spillways when the discharge velocity is greater than 2m/s for more than one-hour duration.

(i) Provide engineering plans and calculations to EcoWater for approval prior to commencing works.

(ii) Provide a planting plan, including species list, quantities, and methodology to EcoWater and Parks for approval prior to commencing planting.

(iii) Provide a surveyed as-built plan of the device showing all lid and invert levels, permanent water level, and contours at 200mm intervals below water level.

(iv) Provide a geotechnical completion report certifying construction of the pond.
(v) Provide a maintenance manual for the treatment device.

This condition is required to ensure that adverse effects of the proposed development on local waterways and receiving environments are mitigated. Stormwater quality treatment intercepts a percentage of silts, sediments, heavy metals and other pollutants washed off road carriageways and impermeable surfaces that would otherwise degrade the environment.

(EW 9) All ponds shall be operated and regularly maintained by the developer, or his agent, for a period of one year with the planting being maintained for two growing seasons. At the end of the two growing season period a final inspection and handover to Council's Storm water Operations department shall take place. The following activities and procedures shall be completed to Council's satisfaction prior to final acceptance of the pond(s):

(i) During building operations on individual lots, a significant amount of sediment is likely to enter the pond(s). Accordingly, the developer shall ensure that the pond(s) are cleaned and de-silted and sediment disposed of to the developer's own approved site.

(ii) Any rubbish collected and disposed of appropriately.

(iii) Planting well established and maintained for the two growing seasons. Grass cut regularly and dead plants replaced with the same or similar or bonding arrangements suitable to the Development Engineer arranged.

(EW 10) Design, provide and install a complete public water supply reticulation system and fire fighting services to serve all Lots in compliance with Council's Code of Practice for City Infrastructure and Land Development (Refer section 6). Specific requirements:

(i) Under specific engineering approval install the public water supply system from within the site to serve each residential Lot within a separate connection to the public system. Specific requirements:
(ii) Provide and install a private water service pipe to the body of each Lot as specified in WCC COP Section 6.3.12 Case 1.
(iii) Pay to the Council the cost of supervising the shut down of Council's water supply mains. This service includes Council providing written advice to all affected property owners/tenants.
(iv) Provide a detail showing the proposed connection to the existing Council watermain/s. The detail is to include all flanges, joints and applicable details. In addition any water reticulation plan is to show all necessary design details to inform construction (eg. thrust blocks etc).
(v) Provide and install a fire hydrant within 135 metres of the farthest point of fire risk and within 65m of the end of a cul-de-sac. Note: The hydrant is to be on a direct traffic route to the property. The distance specified above may not be measured as a radius.
(vi) Where the required public system is on private property, easements over the course of such system in favour of Council will be necessary.

This condition is required to comply with the WCC COP (Refer section 6.0), and to specify location and design features required for the proposed water reticulation to minimise long term maintenance costs, increase accessibility and encourage property owner accountability for water use and water conservation.

(EW 11) Provide in the design of services for the reticulation of the upstream catchment and install such reticulation to the boundary of the upstream properties.

(EW 12) Where drainage work is required to be carried out on land outside the subdivision, obtain the written consent of the owner(s) of that land prior to the approval of the drainage plans. After construction and prior to Section 224 release, obtain the written acknowledgement of the owner(s) that the property has been satisfactorily reinstated.

This condition is required to comply with the WCC COP (Refer section 1.6.2.3).

(EW 13) Contact EcoWater's Subdivisions Assistant (ph 8368000ext8248) to arrange a pre-start meeting. Plans are required to be submitted and Engineering Approval obtained before requesting a pre-start meeting.

(EW 14) Provide an As-Built drainage plan prepared by a registered surveyor and cctv video inspection of the new public drainage, in accordance with WCC COP.

FEES, BONDS & CONTRIBUTIONS

(FC 1) Pay any EcoWater engineering, works supervision, 224c processing, and administrative fees as incurred. These fees will be charged at Councils advertised schedule of fees.

(FC 2) Pay a 2½% maintenance deposit (minimum $500.00) on the value of works being taken over by Council, which is refundable upon final acceptance of the works at the end of the maintenance period.

This condition is required to comply with the WCC COP (Refer section 1.10.1, 1.11.5.1, 5.7 Quality & Release Section).

(FC 3) Pay to the Council pursuant to Section 407/409 of the Act the sum of **$207,492.01 (incl. GST at 12.5%). This includes $30,071.34** for 18 units and **$177,420.67** for 59 dwellings (incl. GST at 12.5%) towards the mitigation of downstream flooding through the Twin Streams Project (Oratia / Opanuku Stream Catchment) necessary to serve the subdivision. ($1,670.63 per additional unit or $3,007.13 per additional Lot).

This condition is required to comply with the requirements of Section 283 of the Local Government Act, and because stormwater drains in the catchment are under capacity to accommodate development to permitted activity level. Therefore the applicant is required to contribute towards the cost of upgrading the under capacity drainage to enable development to proceed without increasing the frequency or severity of overflows.

GENERAL CONDITIONS

(GL 1) Advise Council the name of the Consultant and/or person(s) who will be the developer's representative fulfilling engineering responsibilities as detailed in section 1.4.1 of Council's Code of Practice for City Infrastructure and Land Development.

A résumé stating the qualifications and experience of the nominated representative may be required at the Council's discretion.

Note: WCC COP requires the developer to appoint a suitably qualified and experienced person for any projects that involve development works for which standards are specified in the COP. On larger projects (those with public roading) a Registered Engineer or Registered Surveyor will be deemed to meet these criteria. The developer's representative shall have insurance liability and indemnity cover as appropriate, and be responsible for the following:

i) Investigating, designing and obtaining approvals for the works.
ii) Providing contract administration and engineering supervision of the works.
iii) Co-ordination of specialist responses e.g. geotechnical, hydrology, structural reporting.
iv) Certification of the works upon completion.

This condition is required to comply with WCC COP (Refer section 1.4).

Felicitas Dhliwayo

From: Gordon Griffin
Sent: Wednesday, 25 October 2006 10:14 a.m.
To: Felicitas Dhliwayo
Subject: West coast rd Landscape conditions.doc

Felly please save these changes, regards, Gordon

Landscape development on private lots including framework planting shall be in general accordance with ~~as per~~ the landscape Master Plan and Typical Garden Layout, Drawing LSP-01 Rev C and LSP-02 Rev C, both dated 16.06.06 and in accordance with the Street Tree Planting Plan 1 of 2 Drawing LSP-05 Rev B, and Street Tree Planting Plan 2 of 2 Drawing LSP-06 Rev B both dated 15.08.06 by SOUL Environments and the 'Additional information on proposed planting' Rev C, received at Council 16 October 2006, and shall be established to the satisfaction of Council's Environmental Monitoring Officer, Resource consents.

Comment: The first two are concept type plans with latitude and so in general accordance is fine for them, the latter street planting plans are specific, there has been significant to and fro with council over these and we are now happy with them, provided they are implemented as shown. Therefore 'in accordance with' is necessary.

On site planting for each private lot shall have the framework tree planting and fencing as per the afore-cited plans and shall have lawn areas, gardens, paving and other site features, in general accordance with the 'Typical Planting Plan House Type 4A, dated 7.08.06 and 'Typical Garden Layout House Type 4B' dated 16.08.06 plans and associated planting schedule by Soul submitted with the application and to the satisfaction of Council's Environmental Monitoring Officer, Resource Consents. –
I do not accept the following addition: The typical master plan allows for some flexibility, and so it is acknowledged that this will happen to an extent, but the framework tree planting associated with the street tree planting, which includes trees planted on private lots, has had considerable negotiation to agree to it and should be as proposed. Therefore the following addition is not desirable or required. It should be noted however that a measure of the stated flexibility has been provided for. Delete the following therefore.
However in order to allow for personalisation of individual lots, a degree of flexibility will be provided for in landscaping.

Grassed areas shall be manually graded to be flush with adjacent paved areas and shall be prepared prior to occupation of units and establishment of any proposed fencing. Fences and gates shall be set in place following final forming of ground levels including grassed areas. Garden areas and grassed areas shall be good quality topsoil or garden mix (50:50 topsoil and compost), weed and debris free with garden areas to 300mm depth minimum and grassed areas to 200mm minimum depth.

Comments: Change made above on basis of comments made and accepted.
~~400mm~~ 400mm This depth is excessive -plan specifies 300 for planting areas. Grass areas woul only reasonably require up to 200mm topsoil to establish good turfminimum depth and shall be to the satisfaction of Council's Environmental Monitoring Officer Resource Consents.
OK, I will accept gardens depth be to 300mm and to 200mm for grassed areas. (Parks Department has a code of Practice standard requiring it be to 400mm)

Planting shall be set in place in the first planting season (May till 7th September) following use of each dwelling unit to the satisfaction of Council's Environmental Monitoring Officer, Resource Consents. If the development is staged then the landscape development including planting shall be staged accordingly. The planting in the lower stream bank area would be at risk if planted in rainy

season – suggest spring – Oct to Nov.
Comments: This is for Parks Department to agree about as it is outside the private area. It should be noted that the planting season is May till 7th September however. Outside of this period the ground gets drier, the days longer and warmer, the dessicating equinoxial winds start Oct, all making for higher evapo-transpiration pressures on plants and so establishment of plants more difficult. Project twin streams plants in the planting season and it would be unwise, with far greater losses expected and poorer plant growth, to plant outside of the planting season. I do not support Matthew Paetz's request. It ignores the fact that planting must occur within the planting season to have a reliable and good success rate. Perhaps later rather than earlier, eg towards mid September, would address his concerns, with no need to change the condition therefore, but from when the plants go in, root growth develops and they start to provide stability anyway. They are unlikely to be washed away.

Any tree planted within a grass area shall be within a 600mm diameter weed and debris-free garden area with a woodchip mulch to 60mm depth, and with two marker stakes 50mm x 50mm x 1.2m per tree (ties not required).

Lawn areas and gardens shall be watered as necessary to facilitate establishment, and with gardens kept weed free on an ongoing basis for the first two years following initial planting to the satisfaction of the Environmental Monitoring Officer, Resource Consents. Any tree or plant that dies, is removed This seems unreasonable , especially for private lots where the developer could not be reasonably expected to control removal of trees or other acts of wilful damage over a 2 year period. Should only reasonably expect replacement of losses in public lots due to lack of care. or otherwise fails to establish shall be replaced the following planting season and maintained for a further two years to the satisfaction of the Environmental Monitoring Officer, Resource Consents.

Comment:
We have given consent on an agreed outcome. Therefore this is a reasonable condition. The applicant can advise property owners of the conditions of consent and expectations and obligations that apply. It is desirable that the framework trees be replaced if they die. Please note however that the wording, 'to the satisfaction of the environmental Monitoring Officer, Resource Consents' implies some potential judgement in the circumstances. He or she is likely to be reasonable and to make reasonable requests. I consider that this condition should apply as worded. I am confident that the EMO will use his/her intelligence and fair judgement to ensure that we have an acceptable outcome. In short, this is not unreasonable.
Gordon Griffin, Landscape architect.

Waitakere City Council
Private Bag 93 109
Henderson
Waitakere City 1231
New Zealand

Job Number: 42608/C
fk
19 October 2006

Attention: Felicitas Dhliwayo

Dear Felicitas

Housing Development
West Coast Rd (No. 423-429), Henderson
Ecowater Draft Consent Conditions – RMA No. 20061078/SPW No. 22816

Further to your email to Matthew Paetz concerning the Ecowater draft consent conditions from Lucy Lunevich, we have the following comments with reference to your numbering:

1. SECTION 223 REQUIREMENTS

(a) The 100 year overland flow path except as otherwise noted will be within the public roads.
  (i) We are agreeable that the Council's Solicitor should prepare the easement document but we request the right to review this document prior to finalisation.
  (ii) We would assume that during the preparation of the easement document referenced above, that Ecowater would have been consulted and therefore approval of the document would be implicit.

(b) Can you please confirm this relates to watermains only. **Can be confirmed at the stage of 223 only, if it won't be applicable we will say so.**

2. SECTION 224C REQUIREMENTS

(EW2)
  (ii) We do not propose to do any building works over the Water Care Services Ltd sanitary sewer line. We will be placing fill above the sanitary sewer line and we will obtain requisite consents for this work. **Water Care Services's line exists along the proposed pond/wetland and according the WCC policies are required to confirmation from Water Care Limited. Please provide a confirmation at the stage of an engineering approval application.**

(EW5) We note that with the lot size, unacceptable gradients would exist for access from the road to the garage if 500mm was applied. We request that the 500mm above the crest of any road embankment be changed to 150mm above the road crown or the ground level at the back boundary in accordance with the Acceptable Solution E1/AS1 of the

Building Industry Authority. With reference to Lot 56, it should be noted that the garage level is at 25.5 and the habitable level is on the second storey. **It is fine. A consent notice on the title of new property will be required.**

(EW7) We note in Section 1.3 paragraph 1 that Ecowater's Countryside and Foothills Stormwater Management Code of Practice only applies to lot sizes greater than 4,000m^2 and as such is not applicable to our proposal. We request all reference to this document be removed. **No problem. Will specify only the existing Parrs Storm Water Discharge Consent.**

(i) As per our previous discussions and correspondence relating to this matter, we request that such agreed conditions should be reflected in the consent notice. **Yes. It is consent notice**

(iii) This condition is contrary to our design as accepted by Waitakere City Council/ Ecowater Officers as best engineering practice for this development. We request that this condition be removed. **This condition is not contrary to an approach submitted by the Consultancy. However, if your engineers believe that the proposed storm water mitigation approach does not meet this condition you may need to re-visit a design concept.**

(iv) Information has been provided to confirm the design complies with a 20m average riparian margin over the whole development. In respect to Lots 8, 13-18 and 30-34 inclusive the application of 4.5m above stream bed level is impractical owing to there horizontal displacement from the confluence of the streams. Due to the width of the flood plain adjacent to these lots it was agreed with Waitakere City Council/Ecowater that this condition was inappropriate for these lots. Please modify the consent accordingly. **A consent notice on the title of each Lot will be required to advice the outlined above.**

(vi) We request that this item is changed to include the period of monitoring which would be for the period of the construction works. **No problem can be amended.**

(EW11) We note that all development upstream of our development is completed and as such no reticulation is required so we therefore request the deletion of this item. This is standard condition and must be a part of nearly each development.

Yours faithfully

Thank you for your comments. Do not hesitate to contact me if necessary.

N S (Paddy) Luxford
Babbage Consultants Limited

cc Lucy Lunevich – Ecowater Solutions

Design is to avoid discharging direct into the watercourse.

WAITAKERE CITY COUNCIL
20 OCT 2006

679614

Babbage CONSULTANTS

BABBAGE CONSULTANTS LIMITED
109 FANSHAWE STREET, AUCKLAND 1010
PO BOX 2027, AUCKLAND 1140, NEW ZEALAND
PHONE: 0-9-379 9980, FAX: 0-9-377 1170
EMAIL: admin@babbage.co.nz

Waitakere City Council
Private Bag 93 109
Henderson
Waitakere City 1231
New Zealand

Job Number: 42608/C
fk
19 October 2006

Attention: Felicitas Dhliwayo

Dear Felicitas

Housing Development
West Coast Rd (No. 423-429), Henderson
Ecowater Draft Consent Conditions – RMA No. 20061078/SPW No. 22816

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  (i) We are agreeable that the Council's Solicitor should prepare the easement document but we request the right to review this document prior to finalisation.
  (ii) We would assume that during the preparation of the easement document referenced above, that Ecowater would have been consulted and therefore approval of the document would be implicit.

(b) Can you please confirm this relates to watermains only.

2. SECTION 224C REQUIREMENTS

(EW2)
  (ii) We do not propose to do any building works over the Water Care Services Ltd sanitary sewer line. We will be placing fill above the sanitary sewer line and we will obtain requisite consents for this work.

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Yours faithfully

N S (Paddy) Luxford
Babbage Consultants Limited

cc Lucy Lunevich – Ecowater Solutions

Chief Executive	
Corporate Services	
City Services Moselle	
Consultancy Services	
ECO - WATER	
Strategic Group	
Consent Services	✓
Field Services	

439 West Coast Road:
RMA 20061077

We will seek comment from the Parks arborist re street tree planting, and whoever at Parks has the authority for approving the reserve planting and weed management. With regard to on-site planting proposed, the Landscape Master Plan, and Typical Garden Layout plans are good as far as they go, but are incomplete in terms of being able to use them to carry out the planting. It is desirable that each plan have a planting schedule so that it is not just a concept plan,and can be followed for implementation.
I can approve the on-site planting only. In this regard, the Typical Garden Layout plan applies.In this regard, proposed 0.8m high front fences do not appear to be shown (but are on the key), I would recommend a linear clothesline in preference to a rotary one (as linear ones compromise space less).
There would be a lot of hedges. I have concerns re the maintenance required to keep these right. Where there would be a 1.8m high fence, wouldn't it be better to have some trees or medium sized shrubs within a few defined garden areas, rather than a hedge fronting a fence? For frontages, where some surveillance of the road is required, a low fence with some low shrubs, would be preferable to a hedge that may grow well above the intended 0.8m height). This may be intended, but without species proposed, it is not possible to evaluate adequately.
Comments on tree species proposed (as per planting schedules):
List A (for street trees and front yards) would be mostly very large trees: Pin oak grows to circa 18m high, similarly red oak, liquidambar and Claret ash. Oak leaves fall over a long time and don't break down quickly. When we have a planting plan it will be clearer whether the tree planting plan would have any problems. The Paulownia tomentosa would be of a better scale for within the residential sites. Puriri does not make a good street tree unless there are very wide road verges. Ash has pinnate leaves that blow away with fewer problems. I suggest for a deciduous tree on site, Ulmus parbifolia, Chinese elm. This has a suitable scale.
A Tree planting Plan and schedule is needed associated with the landscape Master Plan therefore.
(Parks have say re the revegetation areas but I add my comments): Stream edge planting: Species look fine, could include kahikatea, Dacrycarpus dacrydioides in the stream margin area also.
Schefflera digitata is frost sensitive and probably better not used as a pioneer species.
List E: Low to medium shrubs for reserve and garden areas:
Don't use Coprosma kirkii, it is invasive and dull (and of hybrid origin). Preferably use species naturally occurring in Waitakere City ahead of outside forms. Eg Don't use Coprosma repens 'Poor Knights'.

Don't use Raphiolepis umbellata, which seeds everywhere and becomes a weed species. (Though has yet to be listed as environmentally damaging).
Include some locally occurring native shrubs, eg Coprosma lucida,Corokia buddleioides, C cotoneaster.
Felicia amellioides and Strobilanthes anisophyllus are subshrubs and relatively weak exotic plants. We want a framework of planting, of garden areas, trees and shrubs that are likely to endure. Those residents that garden can add such plants if they are interested at a subsequent stage. I consider these species are suitable.
Identify proposed hedge species.
Some of the species listed, eg Luculia grandifolia, Viburnum "Emeralf Lustre', are better as specimen shrubs rather than as hedge species (This is fine but don't use them as hedges).

Proposed street lighting locations should be shown on the Landscape Master Plan.

Retaining walls: I note that there would be a retaining wall along the east boundary. I am concerned at the potential to have a poor relationship with the adjacent land and development to the east. Appendix 6 Earthworks Plans, shows the location of retaining walls but does not give the height for each. There would be extensive retaining, evidently associated with creating a stepped/terraced approach to the residential sites. Please provide retaining wall heights for all proposed retaining, and please show spot levels for the land adjacent to the east, and some cross sections.

F Sedges: Parks department will have input. (Desirably Chris Ferkins). It is desirable that the Carex species locally natural to Waitakere City be used. Carex comans is not natural to this area. I would suggest Carex lessoniana, C lambertiana, c dipsacea, C secta (Refer 'Carex in Auckland A Field Guide' by Chris McKain).

There is an area of native vegetation, kanuka dominant,on the east bank of the stream, and west of units 2c and 5c-4c. A proposed driveway and pedestrian path is show within this area. Further detailing as to the locations of the trees, and with regard to the path and driveway and whether there would be any retaining or works within the driplines is needed for this area.

Gordon Griffin
Landscape architect. W.C.c. 24.7.2006.

-----Original Message-----
From: Felicitas Dhliwayo
Sent: Monday, 24 July 2006 9:41 a.m.
To: Gordon Griffin
Subject: FW: Landscape design for West Coast Road

FYI

-----Original Message-----
From: Matthew Paetz [mailto:matthew.paetz@babbage.co.nz]
Sent: Friday, 21 July 2006 10:17 a.m.
To: Felicitas Dhliwayo; matthew.paetz@babbage.co.nz; bd.nzhf@xtra.co.nz; rientjes.consult@xtra.co.nz; fhc@babbage.co.nz; ian.petty@babbage.co.nz; stas.louca@babbage.co.nz
Subject: Landscape design for West Coast Road

Conditions:

Landscape Development within Private lots:
Landscape development on private lots including framework planting shall be as per the landscape Master Plan and Typical Garden Layout, Drawing LSP-01 Rev C and LSP-02 Rev C, both dated 16.06.06 and Street Tree Planting Plan 1 of 2 Drawing LSP-05 Rev B, and Street Tree Planting Plan 2 of 2 Drawing LSP-06 Rev B both dated 15.08.06 by SOUL Environments and the 'Additional information on proposed planting' Rev C, received at Council 16 October 2006, and shall be established to the satisfaction of Council's Environmental Monitoring Officer, Resource consents.
On site planting for each private lot shall have the framework tree planting and fencing as per the afore-cited plans and shall have lawn areas, gardens, paving and other site features, in general accordance with the 'Typical Planting Plan House Type 4A, dated 7.08.06 and 'Typical Garden Layout House Type 4B' dated 16.08.06 plans and associated planting schedule by Soul submitted with the application, and shall be to the satisfaction of Council's Environmental Monitoring Officer, Resource Consents.

Grassed areas shall be manually graded to be flush with adjacent paved or retained areas and, in association with garden areas, shall be prepared prior to occupation of units and establishment of any proposed fencing. Fences and gates shall be set in place following final forming of ground levels including grassed areas. Garden areas and grassed areas shall be good quality topsoil or garden mix (50:50 topsoil and compost), weed and debris free to 400mm minimum depth and shall be to the satisfaction of Council's Environmental Monitoring Officer Resource Consents.
Planting shall be set in place in the first planting season (May till 7th September) following use of each dwelling unit to the satisfaction of Council's Environmental Monitoring Officer, Resource Consents. If the development is staged then the landscape development including planting shall be staged accordingly.

Any tree planted within a grass area shall be within a 600mm diameter weed and debris-free garden area with a woodchip mulch to 60mm depth, and with two marker stakes 50mm x 50mm x 1.2m per tree (ties not required).
Lawn areas and gardens shall be watered as necessary to facilitate establishment, and with gardens kept weed free on an ongoing basis for the first two years following initial planting, to the satisfaction of the Environmental Monitoring Officer, Resource Consents.
Any tree or plant that dies, is removed or otherwise fails to establish shall be replaced the following planting season and shall be maintained for a further two years to the satisfaction of the Environmental Monitoring Officer, Resource Consents.

Jodie Mitchell
Planning Consultant

PARKS ASSESSMENT FOR COMBINED LAND USE SUBDIVISION RESOURCE CONSENT AT 423-429 WEST COAST ROAD, GLEN EDEN

To:	**Felicitas Dhliwayo**
	Resource Planner
Cc:	**Renee Lambert**
	Service Manager, Parks Planning
From:	**Jodie Mitchell**
	Planning Consultant
Date:	**16 October 2006**
Site Address:	**423-429 West Coast Road, Glen Eden**
Resource Consent No:	**RMA 20061077 /SUB 20061078 / SPW22816**
Zoning:	**Human Environment - Living**
	Natural Environment – General & Restoration
	Riparian Margin 7m
	Non-Riparian Stream

1.0 PROPOSAL

The vacant subject site of 5.738m^2 is located on the northern side of West Coast Road.

77 units are proposed made up of detached, semi-detached, and apartment building designs varying from 2- 5 bedrooms. The applicant is the New Zealand Housing Foundation their aim is to provide affordable housing for people who may not otherwise be able to own their own home together with rental housing.

The site is an irregular elongated shape. The irregularity is influenced by the western boundary which, with the exception being the southern end, for the most part approximates the course of Parrs Stream. The southern end includes land that will also have road frontage to the subdivision accessed by Albionvale Road on the opposite side of the stream. The land to the west contains an older residential subdivision developed over the last ten years and is accessed from Woodbank Drive.

Generally, the site slopes down towards Parrs Stream which passes through the site from north to south. The most level portion of the site is at the northern end. The stream is the main natural feature of the site and creates the setting. A 7 metre Riparian Margin applies to the watercourse.

The area surrounding the watercourse is to be set aside as drainage reserve. A walkway will be provided along the eastern side of the stream. A footbridge will provide pedestrian access

across the stream from the Albionvale Road subdivision. A drainage reserve at the northern end of the development will provide an additional reserve area.

Some earthworks and vegetation removal have been undertaken leaving the majority of the site is in grass, with vegetation concentrated along the Stream. The applicant proposes to clear the weed infestation and most of the stream side vegetation and provide enhancement and mitigation through native revegetation.

2.0 INSTRUCTIONS

Assess the proposal in terms of the 7 metre Riparian Margin, the proposed reserves, General Natural Area and Restoration Natural Area. Provide conditions where relevant.

3.0 STATUTORY CRITERA

For consideration in this assessment are the rules relating to:

1.0 Natural Areas – Riparian Margins

Statutory Criteria District Plan Rules #1

The 7 metre Riparian Margin relates to the western portion of the subject site. Riparian Margins are particularly sensitive to the adverse effects of use and development. The role of these areas it to ensure that ecological buffers are created beside natural water systems. Further by preserving the natural character of these areas natural hazards can also be mitigated against.

The Riparian Margin relates to a watercourse in its natural state meandering through the lowest points of the site. The following assessment looks at the preservation and enhancement of the Margin in relation to the proposed development and the effect on vegetation and the wider ecosystem.

2.0 Outline of Vegetation Removal Works

The applicant proposes to remove weed species together with native and exotic vegetation within the Riparian Margin. While some native vegetation is worthy of retention and compatible with the development, the majority of vegetation will be removed. The areas of weed infestation, rough pasture land, unsuitable species and corresponding removal is shown on the plan prepared by Willy Coenradi *"Housing Foundation HZ, West Coast Road Development (Part of 423-429 West Coast Road) vegetation and major features, Sheets 1 & 2"*, dated 12 June 2006 drawn by, and is attached in Appendix 7 of the application. Weed species scattered throughout the Riparian Margin include woolly nightshade, willow, privet, salix caprea, and climbing honeysuckle.

Trees and vegetation to be retained include:

a) a mature totara and area of mature native revegetation highlighted as #4 and #5 on the above referenced plan

b) a large Kahikatea, on the western side of the stream towards the northern end reference #7

c) a group of naturally occurring native revegetation, referenced #6.

d) a Cordyline australis, reference #13. The tree is located within the proposed drainage reserve at the northern end of the site.

e) there are two existing Pear trees, located to the north of the proposed stormwater detention area at the northern end of the site. The landscape plan prepared by SOUL Environments, reference LSP-01, dated 16/06/06 shows that the northern most specimen is to be retained.

f) the restoration area along the northern boundary which includes part of the esplanade reserve contains kanuka, Corosma Robusta, Myrsine australis and Cyathea with an understory of carex and ferns.

While it is appropriate to retain this vegetation there is a small level of weed infestation that will be removed and enhancement planting introduced. While it is preferable that appropriate existing vegetation be retained, once weed control and vegetation alteration commence on site, it may not be practicable or possible to retain vegetation referenced above. Therefore, it is recommended that a level of flexibility be afforded in this regard and that the applicant and/or their arborist assess the situation in conjunction with a WCC Council arborist or a representative thereof. Chris Boucher has been involved in the assessment phase and it may therefore be fitting, given his familiarity, to include Chris in the post approval on-site progressive assessment.

Overall, vegetation to be removed will consist of native and exotic vegetation more than 6 metres in height and / or 600mm in girth and also vegetation listed as removable and environmentally damaging plants in the District Plans appendices. It is noted that some clearance of stream side vegetation has already been undertaken towards the northern end of the stream. The arborist in his assessment notes that this related to exotic weed cover. In terms of the proposed vegetation alteration, assessment is required against the relevant criteria 2(a) – 2(t).

Assessment Criteria 2(a)

In terms of the assessment criteria 2(a), the potential for sediment run-off exists through reduced vegetative filtering along the stream edges. This increases the potential for silt laden run-off that may threaten the natural ecosystem operating in the Green Network. In order to mitigate potential adverse effects in this regard, it is considered that the silt fence and dirt water diversion run-off bund as recommended by the applicant be implemented.

This aspect is also relevant in terms of safeguarding the existing trees to be retained, the applicant's arborist, Willy Coenradi in his report dated 16 June 2006, recommends that, *"suitable protective fencing, should be installed prior to any works taking place, and maintained for the duration of the project."* This recommendation will be included as a consent condition.

Until the area, particularly that on either side of the stream can be revegetated, sediment control mechanisms should be kept in place to avoid or mitigate any adverse effects in this regard.

In terms of mitigating adverse effects from vegetation alterations, it is considered that a comprehensive weed management strategy needs to be provided to the satisfaction of the Parks Consent Planner, as per condition (1) of this report. Subject to compliance with this condition together with other relevant mitigation aspects as disucssed, it is considered that the vegetation removal will not adversely affect the overall resilience, biodiversity and integrity of the Green Network.

In the medium to long-term, the removal of weeds will improve the biodiversity of the Green Network. Over time water quality will be enhanced providing a more hospitable environment for in-stream native wildlife and the facilitation of an ecological corridor within the Riparian Margin will improve the integrity of the Green Network.

Assessment Criteria 2(b)

Assessment criteria 2(b) is concerned with the extent to which the vegetation alteration reduces the extent, range and linkages between vegetation, fauna habitat and natural features. In this case, the natural features relates to the Riparian Margin and a small amount of vegetation that will be retained and integrated into the proposed landscaping.

Weed species included in the Districts Plan's Removable Vegetation Appendix such as willow species and Environmentally Damaging Appendix such as ginger, gorse, wattle, pampas grass are proposed for removal. These species threaten natural ecosystems and therefore the linkages between appropriate vegetation, and fauna habitat in the Riparian Margins. However,

they also provide support for the wildlife habitat and the weed management methodology will need to be staged to allow for this aspect.

Native species compatible with the riparian area will also be removed. Provided that the work is undertaken in accordance with approved weed control methodology and appropriate revegetation occurs any adverse effect in terms of the above, will be adequately mitigated.

In terms of the wider environment, to the south the stream connects to an existing stormwater pipe will flows under West Coast Road. From this point the watercourse continues in its natural form. The removal of undesirable vegetation and revegetation compatible with the Riparian Environment will assist with improving water in terms of down stream effects.

Assessment Criteria 2(c)

Concerning assessment criteria 2(c) it is considered that there will be no adverse effects on the mauri (life-force) of native vegetation. This is because the native replanting proposed will result in an overall increase in the native vegetation within the Riparian Margin. Long-term this aspect together with the removal of weed species will protect and restore the mauri of the waterway.

Further the experience gained from the overall clean up of the stream will be enhanced as the Stream will be able to be viewed and therefore enjoyed to a greater extent. The introduction of a walkway along the eastern side will also result in the Stream and therefore mauri associated with it will being able to be experienced to a larger extent.

Assessment Criteria 2(d)

As the area is not identified as a fisheries management area seafood gathering area, it is considered that the assessment criteria of 2(d) does not require assessment other than to comment that the removal of weeds and appropriate revegetation will have positive downstream effects in this regard.

Assessment Criteria 2(e)

The applicant has requested input from iwi regarding the development and feedback is currently being awaited.

However, at this time the site is not known to contain any historical, cultural or spiritual significance, waahi tapu or significant to iwi, that would be affected in terms of assessment criteria 2(e). If relevant, any comments can be integrated into the planners report and if necessary referred to Parks for comment.

Assessment Criteria 2(f)

Assessment criteria 2(f) requires consideration of the extent to which the work will adversely affect the significance or landscape or natural character or heritage value of any natural features. The vegetation removal does not involve modifying the natural slope down to the stream. Further with the exception of the stream there are no know items located within the riparian margin that would result in the vegetation removal being inconsistent with this criteria.

Assessment Criteria 2(g)

Assessment criteria 2(g) does not require discussion as there are no trees notable to their species located within the Riparian Margin or site overall.

Assessment Criteria 2(h)

Providing that the vegetation alteration is carried out under the supervision of an appropriately qualified and experienced arborist, an approved weed management strategy, it is considered

that the proposed vegetation alteration will not create any edge effects from wind on the existing vegetation. The vegetation to be retained within the Riparian Margin consists primarily of mature trees. Further, in order to avoid adverse effects on the vegetation to be retained, elements to be included in the methodology include staged removal and protective fencing prior to and throughout earthworks and construction phases. Spraying out of weed species within the Riparian Margin and site generally, shall be undertaken in dry periods of low to no wind to prevent spray drift.

Ongoing assessment during the alteration in conjunction with a council arborist will address any adverse effects in this regard should they arise.

As no smaller saplings sized regenerating native plants will be exposed, it is unlikely that mitigation such as sun shades clothes will be necessary.

Assessment Criteria 2(i)

No identified heritage items will be affected by the proposed vegetation alteration. In terms of amenity, it is considered that overall amenity values and neighbourhood character will be improved. In general terms, assessment criteria 2(i) is satisfied as, the removal of undesirable species and appropriate restoration planting will enhance the amenity values of the Riparian Margin. Further the proposed drainage reserve along Parrs Stream will be overlooked by the adjoining Albionvlae Road subdivision. The proposed planting, footpath and footbridge, as illustrated in the Landscape Master Plan prepared by SOUL Environments dated 16/06/06 Revision C and the Street Tree Planting Plan prepared by the same and dated 15/08/06 will provide a maintained, enhanced and attractive natural environment improving neighbourhood character and therefore amenity values.

Assessment Criteria 2(j)

Assessment criteria (j) requires consideration of the extent to which the vegetation alteration can be off-set by restoration or enhancement. The introduction of native seedlings, saplings and specimens through revegetation will enhance the natural ecosystem of the reserve and surrounding area. Proposed revegetation has been broken into three categories, as outlined in the information provided by SOUL Environments *"NZ Housing Foundation Babbage Consultants 423 -429 West Coast Road, Henderson. Additional information on proposed planting 13-October-06, Revision C"*:

1. Higher Stream Bank Areas refer Types B and C

2. Planting on Upper Bank: Generally moist ground with high water table and occasional flooding; and
   Marginal Emergents: marsh areas and below winter water levels; and
   Lower Stream bank: ground above common water levels but subject to flooding
   – refer Type D

3. Planting in Reserves at road sides, and adjacent to boundaries – Type E.

Detail as to the spacing, planting and size is contained in the above referenced Tables on pages 1-6.

It is considered that a dense buffer of ground cover around margins such as carex interspersed with amenity natives such as Kahihatea and Cabbage appropriate.

Soul Environments have advised that all native stock planting is to be eco-sourced. A consent condition will be included in this regard.

The significance of the natural character or landscape value of the natural features is not remarkable in terms of identification by the District Plan or any other relevant documents. As

such, the removal of the vegetation as proposed will have less than minor affects on these values and the proposed revegetation will enhance amenity values and view of the site from the adjoining roads and the residential neighbourhood.

Assessment Criteria 2(k)

There are no known stability problems that would be exacerbated by the proposed vegetation alteration.

Assessment Criteria 2(l)

This criteria requires consideration of the extent to which the existing cleared areas are utilised for proposed development. In response to this, it is considered that the clearance in the Riparian Margin is not to provide for building platforms but to provide for a public walkway adjacent to Parrs Stream and clearance of weed species and planting of vegetation incompatible with the development and proposed enhancement of the Riparian area. Further, through the use of battering the proposal has been specifically designed to avoid retaining walls within the Riparian Margin. This means that the construction of buildings, with the exception of the footbridge, has been prevented within close proximity to the stream.

Assessment Criteria 2(m)

The payment of a reserve contribution together with various conditions relating to sediment control, protection of vegetation to be retained, and planting, will be effective in adequately avoiding, remedying or mitigating against any more than minor adverse effects as a result of the vegetation alteration. 61 new lots are proposed and 77 new units. There are two existing lots so a reserve contribution will be conditioned for 59 new lots.

Assessment Criteria 2(n)

The proposed vegetation alteration required in relation to the Riparian Margin is not specifically required to accommodate development otherwise permitted by the plan. The density of residential units is compatible with the Living Human Environment. The vegetation alteration within the Margin is proposed in order to provide weed eradication and enhancement of the area while protecting the ecosystem of the watercourse. The vegetation alteration has been proposed for this purpose together with the provision of a walkway adjacent to the stream, and footbridge within the Margin.

It would be invented to state that the work is unrelated to the residential development proposed and that the weed eradication and revegetation are being undertaken purely to enhance the watercourse and it's margins. However, the development does provide an opportunity to tidy up the Riparian Margin and provide vegetative and ecological enhancement concurrently with public access.

The weed eradication proposed would have been requested by WCC prior to the vesting of the Riparian Areas as drainage reserve.

Assessment Criteria 2(o)

This requires weighing up of the extent to which the vegetation alteration will adversely affect the natural, cultural and amenity values of surface water in rivers and lakes. As the proposal does not relate to these water forms this criteria does not require discussion.

Assessment Criteria 2(p)

In relation to the criteria 2(p) it is considered that there will be no more than a minor affect on water quality and aquatic ecosystem health of the stream itself or upstream or downstream, provided that the activity is undertaken in accordance with an approved Weed Management

Strategy and conditions of consent regarding sediment control. Vegetation clearance will be beneficial to the ecosystem by the removal all environmentally damaging plants and removable plants as listed in the Waitakere City Council District Plan. As noted previously, it is important given the scale of the removal that it is staged to avoid mass scale removal leaving the habitat over exposed and avoid adverse effects on water quality and the aquatic ecosystem.

The revegetation of the area will increase the ability of the Margins and Stream to provide food sources and shade thereby facilitating a healthy aquatic ecosystem.

Direct application low toxicity herbicide, such as Roundup is the preferred method for within 5m of watercourses. This will be achieved through direct application of low-toxicity herbicide treatment for large infestations on the edges of the stream, minimising soil disturbance while also presenting a low risk of spray-drift.

However, some weeds including salix do not respond as desired and in these instances, the applicant proposes to use more effective herbicides, such as Escort. As with Roundup, direct application will minimise harm to non-target vegetation and potential for water contamination. A condition of consent regarding a weed control plan will provide further certainty on appropriate methodology.

Assessment Criteria 2(q)

The subdivision has been designed in a manner that does not require vegetation clearance within the Riparian Margin to accommodate residential lots. The Riparian Margin will be afforded protection through the establishment of drainage reserves and enhanced through replanting. Further as noted above the much of alteration includes weed species and replanting that will be more appropriate for the stream edge and the Living Human Environment zoning which applies to the site.

Assessment Criteria 2(r)

The vegetation alteration associated with the subdivision is not primarily required to construct a stream crossing. A footbridge is proposed from a walkway from the Albionvale road subdivision on the opposite side of Parrs Steam. No significant trees will be removed to accommodate the bridge.

Assessment Criteria 2(s)

In this instance, vegetation alteration associated with the subdivision has been minimised in relation to the Riparian Margins. Existing mature trees and native regenerating vegetation have, where appropriate and possible, been accommodated into the drainage reserves.

Assessment Criteria 2(t)

The proposal represents vegetation alteration that is consistent with the *Draft* Parks and Open Space Strategy 2005. Green Linkages along streams are encouraged through the strategy which recognises that these waterways *"provide the best opportunities as key green linkage corridors".* This Strategy is discussed in more detail in Section 8.8 of this report.

3.0 <u>Rule 3.0 Earthworks</u>

Minor earthworks will be required to construct the footbridge and pathway along the eastern side of the Stream.

As the level of earthworks within the Riparian Margin is not significant and the natural contour of the slope will not be altered a full assessment of the assessment criteria contained in Rule 3 of the District Plan is not warranted in this report. The applicant advises that earthworks will be undertaken in accordance with the Auckland Regional Council's Technical Publication 90 (TP90). Further erosion control measures in relation to the stream specifically will include silt fencing and earth bunds. Appendix 10 of the application illustrates the proposed location of silt control fences in relation to the stream (Appendix 10 Erosion and Sediment Control Plan prepared by Babbage Consultants dated June 2006 drawing No C05 – C07). Higher up from

the stream, dirty water runoff diversion bunds are proposed. The bunds will be a minimum of 0.6m high. Babbage advises that earth bunds are more efficient at controlling sediment run-off. Further monitoring will be undertaken during periods of heavy rain to ensure that any damage is immediately rectified.

Provided that the above methodology is implemented, it is considered that there will be no adverse flow-on effects on the watercourse itself, nor upstream or downstream, as a result of the earthworks.

4.0 Rule 4.0 Impermeable Surface

An impermeable surface not exceeding 10% of that part of the site within the Riparian Margin is proposed. This is a restricted discretionary activity. The impermeable surface will consist of a pedestrian pathway along the side of the Stream. The walkway is not within the Riparian Margin for the entire length, relating primarily to the portion southwards from approximately Lot 56.

The walkway will be 1.5 metres in width, this is in accordance with section 7.3.7.12 of the Waitakere City Council Code of Practice. While the applicant advises that the path will be concrete or asphalt, under section 7.3.7.3 of the above Code of Practice, requires that all footpath concrete paving is required to be exposed aggregate. This aspect can be confirmed by a consent condition.

The impermeable surface involves modification of the Riparian Margin to provide a level surface. In relation to the Riparian Margin, it is considered that the impermeable surface meets the assessment criteria as it does not result in an inappropriate or excessive modification to the edges of a stream or a Riparian Margin.

5.0 Rule 5.0 Stock

The applicant does not propose to graze any stock on the site.

6.0 Rule 6.0 Establishment of Vegetation

A comprehensive Landscape assessment together with additional information has been provided by Soul Environments, both the Landscape Master Plan and the Street Tree Planting Plan are referenced above under Assessment Criteria 2(i) vegetation alteration. These documents confirm that the Riparian Margins and reserve areas will be replanted with a mix of native and exotic specimen trees, shrubs and under planting. As the proposal does not involve:

1) the establishment of vegetation contained within the Environmentally Damaging Plants Appendix of the District Plan, or
2) any vegetation established for woodlot or forestry purposes

the establishment of vegetation is a permitted activity.

7.0 Rule 7.0 Buildings

The proposed footbridge over the stream is defined as a building under the definitions section of the District Plan. This requires assessment of a building within the Riparian Margin.

The footbridge will be constructed in accordance with the WCC Code of Practice Standard Detail for footbridges or a suitable design as agreed by the Parks Consent Planner. Given the minor nature of the building work within the Riparian Margin, and upon review of the relevant assessment criteria, it is considered that the proposed bridge is in accordance with the criteria. This assessment can be summarised as follows:

1) The Green Network will not be adversely affected as the footbridge will not interrupt the flow of the watercourse, or result in discharge.
2) The footbridge is not of a physical size so as to reduce the extent, range or linkages between vegetation, fauna habitat, or natural features.
3) Amenity will not be affected by the footbridge, it will be constructed in accordance with design principles adopted by WCC through the Code of Practice.

4) Given the minor nature of the building work, it will not exacerbate flooding, erosion or stability problems.

5) The footbridge provides a valuable pedestrian link from the subdivision on the western side of Parrs Stream to the walkway along the eastern side of the Stream and also the proposed housing development.

8.0 Draft Parks and Open Space Strategy 2005

There is an existing drainage easement relating to the site. This easement will be come a local purpose drainage reserve.

While the *Draft Parks and Open Space Strategy 2005* looks at the wider roles and range of open spaces in Waitakere, and outlines the method for managing and developing parks, as there will be a public walkway along the stream in the reserve, a brief review to ensure compatibility is deemed appropriate.

The Strategy includes protecting the Green Network, of which the Blue Network is a part. The Strategy cites Ecowater as, *"the department of WCC that manages the City's assets and servies that relate to the 'three waters' - water supply, wastewater and stormwater".* Ecowater's role is backed by the Strategy.

On review of the Strategy and Ecowater's role, it is concluded from Parks perspective that compatibility is achieved. The drainage reserve provides for a public walkway along Parrs Stream which through required weed control and appropriate planting of the Riparian Margin will facilitate an ecological corridor along the stream edge which will:

"Extend and enhance the City's natural ecosystems and biodiversity"

The proposal will achieve retention of the Riparian area will also providing for development in the Living Environment. The Green Network, *"seeks to bring the natural environment closer to the everyday lives of the citizens – and particularly the urban dwellers – of Waitekere City - so they can come to know and value it".* The subdivision results in residential development that is in keeping with this intention.

Overall, the proposal will not involve any activities that are inconsistent with the strategy for the Green Network.

9.0 Reserves Act 1977

The reserve is classified as a local purpose reserve under the Reserves Act 1977. In accordance with section 23, the purpose of local purpose reserves is as follows—

"[(1) It is hereby declared that the appropriate provisions of this Act shall have effect, in relation to reserves classified as local purpose reserves for the purpose of providing and retaining areas for such local purpose or purposes as are specified in any classification of the reserve.]"

It is considered that the proposed subdivision will enhance public access to the Stream through the provision of a walkway and footbridge while concurrently achieving it's purpose under the Reserves Act for water conservation.

5.0 CONCLUSION

Provided that vegetation removal is undertaken in accordance with consent conditions together with the earthworks, and landscaping proposed, it is concluded that any adverse effects on the Riparian Margin can be adequately avoided, remedied or mitigated.

Further, the activity is in accordance with the relevant assessment criteria of the District Plan. The proposal also provides for enhancement of the Riparian Margin while concurrently providing public access and pedestrian permeability.

6.0 RECOMMENDATIONS

Approval is given to the above application providing the following conditions are met:

SECTION 224(C) REQUIREMENTS

(1) Carry out the removal of environmentally damaging plants from all lots including the proposed esplanade reserve, as listed in the Waitakere City Council Proposed District Plan. Submit a Weed Control Programme to the satisfaction of the Manager, Resource Consents within 2 months of the issue of this consent. This Weed Control Programme shall be implemented on the site within 6 months of the date of issue of this resource consent to the satisfaction of the Manager, Resource Consents. The programme needs to include:

a) an inventory of the weed species to be removed;
b) removal techniques to be utilised; weed disposal methods;
c) time frames for work and whether the weed removal needs to be staged (particularly relevant for sensitive areas such as coastal edges or riparian margins);
d) any re-vegetation programme required to prevent re infestation of weeds;
e) an assessment of any ecological issues around the removal of vegetation;
f) methods for addressing stability and erosion and sediment control methods.

(2) Enter into a registerable fencing agreement with Council in regards to Lots 23, 24, 25, and 46 – 60 to the effect that the Council will not be liable to contribute towards the cost of creating or maintaining any dividing fence between any reserve or other land vested in or administered by the Council. Also, that any fences facing the reserve shall be visually of permeable construction such as swimming pool fencing and 1.2metres maximum height in order to ensure good surveillance of the reserve, and to reduce the likelihood of graffiti.

(3) Prior to work commencing on the site, protective fencing shall be placed around the dripline of the Totara (#4), Kahikatea (#7), Cabbage (#13), Pear (#10) and groups of native revegetation (references #4 and #6) as shown on the plan titled *"Housing Foundation HZ, West Coast Road Development (Part of 423-429 West Coast Road) vegetation and major features, Sheets 1 & 2"*, dated 12 June 2006 prepared by Willy Coenradi. The fencing shall remain in place throughout the vegetation alteration, earthworks and construction stages.

(4) That monitoring of the health of the vegetation referenced in (2) above shall be undertaken prior to the commencement of, and during the vegetation alteration, earthworks and construction stages. This monitoring shall be undertaken by an appropriately qualified arborist engaged by the applicant in conjunction with a WCC arborist to provide progressive on-site assessment of the effects of the work on the health of the Riparian vegetation.

(5) That a silt fence and dirty water diversion run-off bund as depicted on the Erosion and Sediment Control Plan prepared by Babbage Consultants dated 23/06/06 contained in Appendix 10 of the application shall be implemented along the full length of the western side of the stream to the satisfaction of prior to Parks Consent Planner prior to earthworks or vegetation alteration commencing on the site.

(6) Landscaping and street tree planting is to be established within the development to the satisfaction of the Parks Consent Planner. The landscaping and street tree plans prepared by SOUL Environments specifically:

- Landscape Master Plan dated 16/06/06 Revision C Reference LSP-01
- Street Tree Planting Plan, Plan 1 of 2 and 2 of 2, dated 15/08/06 Revision B

- Accompanying information titled "NZ Housing Foundation Babbage Consultants 423 -429 West Coast Road, Henderson. Additional information on proposed planting 13-October-06, Revision C".

are to be implemented in accordance with WCC parks guidelines and subject to the following:

i. That the bollards along the road frontage of the drainage reserve at the northern end shall be implemented in accordance with the WCC Code of Practice Standard Detail 7.17 and 7.71. That a 3 metre chain entry for maintenance access to the stormwater pond and wetland area shall be located in an appropriate location to the satisfaction of the Parks Consents Planner.

ii. Street Lighting shall be implemented in accordance with the WCC Code of Practice Section 3.3.14 and Standard Detail 7.91 attached and located so as to not conflict with street tree planting.

iii. In accordance with Section 7.3.7.3 of the WCC Code of Practice all footpath concrete paving in the reserve shall be 1.5 metres wide and exposed aggregate.

iv. That the plants along the footpath adjacent to the Stream shall be low level and set back a suitable distance so as to not restrict access or visibility along the pathway.

v. That the parking areas provided on the streets adjacent to footpaths shall be curbed or wheel stops implemented to the satisfaction of the Parks Consent Planner.

vi. All plants shall be best nursery stock, healthy vigorous and eco-sourced.

(7) The street tree planting shall be implemented to the satisfaction of the Parks Consent Planner. All plantings are to be in accordance with the WCC parks guidelines, Code of Practice and the landscape specification submitted with the Landscape Plan. An option exists for the applicant to pay Council the cost of supplying, planting and staking of street trees per plan, to carry out the planting of street trees following the completion of the building works. The cost for this would be $153 plus GST per tree (the current contract price for supply, planting, and staking of a PB95 tree as at April 2003).

(8) The consent holder is to be responsible for the maintenance of all street trees and reserve landscaping for a period of two years (from the date of its certified establishment from Council) including the replacement of any dead or dying vegetation, to the satisfaction of the Parks Consent Planner. A bond, based on $7 per sq metre per annum for gardens/shrubbery, and $75 per tree per annum, will be required to ensure the satisfaction of this condition. The consent applicant is to advise the Parks Consent Planner of a maintenance schedule and the name of the qualified person/company responsible for the planting maintenance. Alternatively, a maintenance cash contribution may be paid, and the maintenance will be undertaken by Council. The contribution will be calculated at a rate of $75 per tree per annum and $7 per square metre of garden per annum.

(9) The details of the pedestrian footpath, footbridge and boardwalk shall be finalised at the Engineering Plan stage to the satisfaction of the Parks Consent Planner. Engineering plans for the footpath, footbridge and boardwalk shall be submitted within 3 months of the issue of this consent. All works shall comply with the Waitakere City Council Code of Practice for City Infrastructure and Land Development. The developer must advise the Parks Consent Planner of when work will commence and prior to any works being carried out. Engineering plan details shall be provided at Engineering Plan stages for the following:

i. The exposed aggregate footpath alignment details shall be to a width of 1.5m and constructed in accordance with the Waitakere City Council Code of Practice for City Infrastructure and Land Development Standard Detail 7.102 for Parks Walkway Types attached.

ii. That the footbridge shall be constructed in accordance with the Waitakere City Council Code of Practice City Infrastructure and Land Development Standard Detail 7.106 for Typical Foot Bridge attached.

iii. The boardwalk along the stream shall be constructed in accordance with the WCC Code of Practice Standard detail 7.105 for Typical Boardwalk attached.

(10) Ensure that the reserves are left in a condition suitable for maintenance and mowing in accordance with section 7.3 of the WCC Code of Practice and to the satisfaction of the Parks Asset Planner.

FEES, BONDS AND CONTRIBUTIONS

(1) In accordance with sections 108(2)(b) and 108A a cash or bank guaranteed bond shall be required prior to the release of the Section 224(c) compliance certificate for any uncompleted works or maintenance required to ensure the performance of conditions (6), (7) and (8). The amount of the bond will be twice the GST inclusive estimated coast of completing or maintaining the works for the maintenance period. The bond will be prepared by the Council's solicitor at the applicant's cost and will provide, inter alia, that the liability of the holder of the resource consent will not be limited to the amount of the bond. Make this a registered bond.

(2) Pay to the Council a financial contribution equal to 6% (plus GST at 12.5%) of Quotable New Zealand's market values, to be obtained for Lots 3 - 61 as of the date of issue of this subdivision consent (or as at the date of any subsequent re-approval of subdivision consent or at intervals of not greater than three years) for reserve purposes.

Approved by:

Jodie Mitchell
Consultant Planner, Parks Planning

Date:

Reviewed and Approved by:

Renee Lambert
Service Manager, Parks Planning

Date:

(D1) REVEGETATION CODE OF PRACTICE

1.0 The importance of revegetation

Native revegetation in conjunction with weed control often forms the most significant component of the restoration of natural areas.

As a component of the restoration process, the primary function of revegetation is the reintroduction of native plants to a site, as a means of facilitating natural ecological processes.

In addition to encouraging natural plant succession, revegetation can be utilised as a management tool to achieve a number of positive environmental outcomes including (but not limited to):

1. Buffering of vulnerable habitat or areas of high ecological value
2. Enhancing riparian margins
3. Establishing wildlife corridors
4. Reducing weed habitat (i.e. weed replacement rather than merely weed control)
5. Facilitating the eventual self-maintenance of a site
6. Providing food and habitat resources for native fauna
7. Conserving the genetic variation of common and/or local native plant species
8. Reducing soil erosion and land subsidence
9. Enhancing the aesthetics of an area
10. Increasing the size of vegetated areas and thereby reducing forest edge effects
11. Increasing the biodiversity within a site

It is important to realise that as part of the restoration process there is often a need for multiple management actions to operate in association with revegetation, in order to achieve the environmental outcomes listed above. Adequate planning is required to ensure revegetation programmes are implemented in a consistent and logical manner (see Section 2.1).

Revegetation forms an important component of the Green Network Link through enhancing, connecting and extending existing natural areas. This Green Network will help to increase biodiversity within Waitakere City by enabling a greater number of flora and fauna to inhabit the City's natural areas, which in turn will enhance the delivery of ecosystem services at both a catchment and citywide scale.

Revegetation code of practice-DRAFT
May 2006

2.0 Revegetation guidelines

There are a number of guidelines that should be adhered to when implementing revegetation actions. These guidelines are covered in the following sections.

2.1 Planning

A successful revegetation project requires planning to ensure that issues, at both a site-specific and catchment scale, are addressed and a clear course of action is outlined that is logical and effective.

The first consideration relates to the appropriateness of revegetation for a particular site, as not all areas require active revegetation. In certain sites ecological restoration is achieved more appropriately through the management of the existing regenerative processes occurring therein (i.e. succession is allowed to occur naturally rather than via revegetation).

This 'hands-off' approach is appropriate when a local native seed source exists that will be adequate to recolonise the site **and** when the site and its surrounds are already forested and canopy cover occurs over the majority of the area.

In such a situation limited habitat is available for the reinvasion of weed species.

It is more commonly necessary to revegetate because of the absence of a local native seed source or to prevent weed establishment.

Examples of such vulnerable environments include:

- Forest edges that require enhancement or repair to exclude invasive weeds

and to maintain a moist internal environment.

- Large canopy gaps where natural regeneration is absent and the potential for weed invasion is high.
- Creation of wildlife corridors to create or enhance linkages between isolated natural areas.

Where revegetation is deemed appropriate a planning document should consider the following:

- Goals and objectives of revegetation (see Section 1.0).
- Physical description of the site (incl. site plan, pre-planting assessment etc).
- Management issues and threats.
- Methods to achieve the goals and objectives and a timeframe for doing so.
- Monitoring methods for assessing the effects of management actions or natural change.
- Methods to allow for adaptive management as the project evolves.

2.2 Plant Supply and Propagation

2.2.1 Ecosourcing

Ecosourcing is an important principle of revegetation that should be understood and adhered to in all revegetation projects. The benefits of ecosourcing include the maintenance of local biodiversity/ genetic variability, the use of plants adapted to growing in local soil and climatic conditions, and a reduced threat of plant disease. The principle of ecosourcing becomes even more significant when revegetation is occurring within habitats with a unique ecology i.e. wetlands, rare/ endangered plant

populations, sites exposed to notable climatic variables, and also when large plant quantities are involved.

All planting material used for revegetation programmes within Waitakere City is to be eco-sourced whenever practical from naturally occurring native plant populations growing as close to the proposed planting site as possible. Seed should be sourced from (in order of preference):

- The area most likely to have supplied propagules to the proposed planting area
- Down stream/ down wind
- Within the stream catchment
- Within the same habitat or acetone
- Within the same Ecological District.

2.2.2 Plant Propagation

The time required to collect ecosourced seed and propagate genuinely ecosourced native plants necessitates a lead-in timeframe of between 1-2 years (depending on the species involved).

The planning stage should allow for the ordering of plants either 1 or 2 years prior to planting commencing, depending on whether the species are fast-growing pioneer species or the commonly slower growing 'forest diversity' species.

Nursery-grown ecosourced stock is preferable to transplanting 'wilding' seedlings, which have a lower survival rate.

2.3 Site Preparation

Site preparation involves those actions required to prepare a site for planting. The particular approach taken to site preparation is site-specific and should be considered in the context of the intended outcome of the restoration process (see Section 1.0)

Site preparation may include the fencing of an area to exclude stock, the mechanical 'ripping' of artificially compacted soils, the establishment of a less-competitive 'cover crop', the removal of large stands of invasive plant species, and the control of invasive groundcover plant species. Effective site preparation is critical to the successful establishment of revegetation plantings, offering young native plants a period of time to establish themselves in the absence of competition from invasive

weed species and animal pests. Weeds compete strongly for light, water and nutrients and if left unchecked, can strongly compete with native plants, suppressing regenerative and ecosystem processes and damaging or removing habitat availability.

Key actions for effective site preparation involve:

□ Maintaining where practical all existing native vegetation.

o It should be ensured that all retained vegetation is not damaged as a result of operations on site.

□ Removing all invasive weed species using appropriate weed control methodologies.

o Where possible herbaceous and grass species should not be controlled as their presence assists in sheltering native plantings, while preventing reinvasion of more invasive weeds. Some exotic grass species (i.e. kikuyu) however have the potential to outcompete native plantings and therefore require control.

o Where plants are to be established in areas containing kikuyu this vigorous species should initially be blanket sprayed with a Glyphosatebased agrichemical. A follow-up treatment of the regrowth should occur no later than 4-6 weeks after the initial treatment and again after 8-12 weeks. The site should then be left for a minimum of 3 weeks prior to planting.

□ Retention of existing exotic species/ staggering weed control:

o In some situations it may be appropriate to retain some exotic and/or invasive species, such as large trees or broadleaf species, whose removal may result in more problems than their retention (i.e. soil instability, habitat vulnerable to weed infestation etc). Such species can provide for positive environmental outcomes through providing site stability, shade and shelter for regenerating native species, and roosting, nesting and food resources for birdlife.

While the removal of these canopy species will become more difficult as the area underneath is revegetated, the benefits associated with their retention commonly ensure they remain *in-situ*. In these situations the preferred long-term management strategy is to underplant the stand to encourage natural succession, and then to fell, remove section-by-section, poison standing or leave *in-situ* depending on the circumstances.

□ In planting areas defined as erosion prone sites (in particular, riparian areas and coastal cliffs) stumps are to be left *in-situ*.

2.4 Species selection

There are a number of issues that should be considered in the selection of plant species for any given revegetation site. Selecting the most appropriate species will ensure a revegetation project has the best possible chance of success, whereby vegetation cover is established rapidly and natural successional processes are encouraged.

2.4.1 Use of pioneer/ early-colonising species – First stage

Pioneer species are those species that specialise in growing in exposed open sites that are drier and hotter than those shaded by shrubs or trees. These species are commonly used in the early stages of a revegetation project as they act as a nurse crop, which provides sheltered conditions within which other species will establish naturally or be planted at a later stage. If the nurse crop is established from wellselected, rapid growing and closely planted native plants it is also likely that weed seed germination will be reduced significantly on the establishment of canopy closure. Depending on the species selected canopy closure may occur within 1-5 years after planting.

2.4.2 Use of forest diversity species – Second stage

Where it is possible that forest diversity species will regenerate naturally within a site from local seed sources, this natural process should be encouraged and any planting proposed should be avoided or be kept to a minimum.

In those sites where the eventual cover is intended to be forest, further planting can be carried out when the pioneer canopy cover of the site has established successfully, with the objective being to imitate the second stage of. The forest diversity species planted in these later stages are those that require the protection and shade provided by colonising species.

2.4.3 Ecosystem and environmental characteristics

The choice of plant species should take into consideration a number of environmental factors such as slope, aspect, soil type and exposure (wind and salt) of a particular area.

Additional considerations in determining plant species selections include a species ability to:

- Improve land stability.
- Function as a food source for birds or insects.
- Function as a visual buffer or conversely create view shafts.
- Provide a degree of shade / sun infiltration.
- Improve the aesthetics of a particular site.

Consideration should also be given to the eventual height of plant species and their role in:

- Creating a backdrop to, or screen in front of, development.
- Posing a potential health and safety threat
- Interfering with view shafts and pathways.

2.4.4 Plant size selection

The selection of the grade/ size in which revegetation plants are to be supplied in is an important consideration in ensuring the success of revegetation plantings. A number of factors influence the grade or size of plants suitable for revegetation, including:

- Budget considerations –

Plants grown in root trainers are the smallest and therefore the cheapest grade of revegetation plant suitable for planting out.

- Environmental tolerances –

As a general principle smaller plants are more tolerant of the environmental extremes experienced during establishment as they quickly recover from the stress of planting.

- Site logistics and accessibility –

Where site access is limited or restricted then smaller grade plants will be significantly easier to transport to and within planting areas.

- Availability from nurseries –

Specialist wholesale native plant nurseries often only grow large quantities of revegetation plants in Hillson root trainers, which are efficient to produce and require less space in the nursery. Several nurseries are also utilising 'plug' sizes that are commonly too small for planting out.

As a general rule it is recommended that forest diversity species be sourced from nurseries as either Pb 3's or Pb 5's. Colonising species should be sourced as either Pb ¾ or Pb 3's, with the exception being manuka, kanuka, toetoe and karamu, which may be sourced as root trainers (although Pb ¾'s are preferable).

To minimise the need for ongoing follow-up maintenance work the optimal plant size for revegetation is a Pb 3, as the establishment rates from this grade of plant are rapid.

2.4.5 Plant quality

All planting material should be sourced/ supplied as first class nursery-raised stock, true to name and type, free from pests and disease, and with a shoot to root ratio of between 3:1 and 5:1. Shrubs and trees should have a solid basal stem and sedges and grasses a solid cluster of stems/ sheaths. Plant stock should not be produced from cuttings, via the cultivation of hybrids or from seed whose source is unknown. Plants should be hardened-off for at least 4 weeks prior to pick-up/ planting, in order to better cope with the climatic conditions of exposed revegetation sites.

2.4.6 Plant density

Plant density is dependant on plant size and the requirements of a particular site. A planting density of 1m centres (equivalent of 10,000 plants per hectare) is preferable in order to achieve the rapid establishment of native vegetation cover and a reduction in competition from grass and weed species. A 1m planting density is common for most small to medium sized shrub and tree species. For large-scale projects a planting density of 1.5m (equivalent of 4,444 plants per hectare) is often adopted to ensure the project is not cost-prohibitive.

Certain species need to be planted at a greater density to ensure that effective ground cover is achieved e.g. . For example fern, rush and small sedge species should be planted at 0.5m centres (equivalent of 40,000 plants per hectare) Species intended as forest diversity species should be either spaced at least 5m centres throughout the site, or planted in groups to reflect the natural functioning of a species i.e. 'pole' kahikatea.

It is recommended that the majority of species should be planted in groups (for example 3-5 of the same species) rather than individuals scattered across the site. This will ensure the overall effect appears more natural, while helping provide linkages to the Green Network and also aiding in attracting fauna to the site.

2.4.7 Timing of planting

It is recommended that the most appropriate time for planting in the Auckland region for most plants is during the months of May-July. In these months the temperature of the soil has not dropped significantly and plant roots are given the opportunity to establish prior to the onset of spring growth.

It is best to concentrate on planting pioneer species first as these species will act as a nurse crop that will shelter other species that can be introduced later, or that may establish naturally.

In a artificial wetland scenario plants tolerant of standing water must first be planted in moist conditions before becoming flooded. The most suitable time for planting these species is late summer, when water levels are lowest. This is particularly important for nursery grown species that have not been subjected to waterlogged conditions.

Timing of planting post-weed control should take into consideration the residual period of the herbicide(s) used during weed control/site preparation. Certain herbicides (i.e. Metsulfuron) may require a timeframe of 3 months to elapse prior to the commencement of planting to ensure that the residual effects of herbicide do not affect plant establishment or growth.

2.4.8 Fertiliser

Fertiliser can be used and is recommended in areas containing poor soils, particularly where planting is undertaken on areas that have undergone earthworks and topsoil has been removed, or where mature stands of *Pinus*/ *Eucalypts* species have been growing.

The best means of fertilising is to use slow release tablets (preferably of a balanced N: P: K product) dropped into the planting hole during planting, ensuring in doing so that there is soil between the fertiliser tablet and the plant roots. If slow-release fertiliser is to be applied in riparian zones, it should not be used within 5m of the water's edge to avoid eutrophication of the waterway. This is also the case in wetland

plantings.

2.4.9Maintenance

To ensure the successful establishment and long-term viability of an area of revegetation it is important to ensure a significant percentage of the projects costs are assigned to the maintenance of the revegetated area.
Maintenance tasks should include the following:

2.4.10 Weed control

A relatively intensive programme of weed control will be required until canopy closure is established to prevent young plants being overgrown and out-competed. Maintenance will therefore focus primarily on ensuring the survival of the planted species via weed control. Post planting weed control should have two broad objectives.

- The first objective is to minimise the competition between the invasive/competitive weed species and the plants through regular plant releasing.
- The second objective is to control/ remove any invasive weed species that invade the revegetation areas or the remaining forest remnants.

2.4.11 Pest control

Pests such as rabbits, hares, possums and goats may need to be controlled where they will negatively impact the survival of revegetation plantings.

2.4.12 Monitoring

It is important to establish some form of monitoring practice to gauge the effectiveness and success of a native revegetation project. Comparisons between years will allow a qualitative assessment of the effects of weed control on weed infestations and native regeneration within an area, as well as the growth and survival rates of plantings. Monitoring also ensures the aims of the revegetation process are being met, while helping to identify any new management issues that may arise, such as the need for follow up weed control and enhancement planting. There are a number of options for monitoring, from the recording of revegetation 'stages' on an map, to the establishment of photopoints and permanent vegetation plots.
Photopoints are a series of photos taken through time from the same location. This method qualitatively records the change in the abundance and composition of exotic and native species at a particular site. Photopoints can be set up before weed control and/or operations commence, and re-taken annually. Comparisons between years will allow a qualitative assessment of the effects of native regeneration within the revegetation area as well as the growth and survival rates of plantings. It is recommended that permanent markers be installed and sites recorded with GPS to aid relocation of photopoint sites.
It is also possible to set up a series of permanent monitoring plots to provide for the more accurate monitoring of the vegetation (e.g. species abundance), within a revegetation site. This is however a more time consuming method that is only recommended if time and resources allow.

3.0 SITE SPECIFIC REVEGETATION GUIDELINES

3.1 Revegetation in Riparian Zones

Where riparian margins are being revegetated the ARC publication entitled "Riparian Zone Management" (ARC Technical Publication 148, June 2001), should be used as a reference for riparian planting.

Riparian revegetation aims to establish continuous healthy vegetation cover that will: inhibit the re-establishment of weeds, provide an effective buffer against runoff; an increase in stream habitat quality and diversity; and increase in the structure and

diversity of habitat adjoining the streamside.
The revegetation of riparian zones requires an understanding of the different zones within a typical wetland/ stream cross-section and the plant species suited to each zone. Plants need to be placed in the appropriate conditions so that they can survive, thrive and serve their inherent functions.
When planting in a freshwater or saline riparian zone key considerations are the topographical position in relation to the wetland/stream profile and substrate. These factors determine the combination of the planting medium and the amount of soilmoisture present. With this in mind the site should be divided into revegetation planting units of similar characteristics as illustrated in Figure one.

Figure one Location of each riparian revegetation zone in relation to each other (Source: A Beginner's Guide to Wetland Restoration, Greater Wellington Regional Council, 2003).

3.1.1 Buffer width

A buffer width of at least 10m wide either side of the waterway is recommended to achieve a positive outcome for the aquatic environment (ARC, 2001). Such a buffer allows for indigenous vegetation succession and should result in a relatively lowmaintenance riparian zone/ wetland. Edge effects mean that the outer 1-2m of the buffer is still likely to suffer from reinvasion of weed species. These weed species will

spread into the interior of the planting zone wherever canopy gaps occur and provide justification for follow up of all initial weed control works to help maintain low/zero density weed populations in an area.

3.1.2 Site-specific riparian planting notes

- Plants tolerant of standing water, including rushes and sedges must first be planted in moist conditions before becoming flooded. The most suitable time for planting these plants is near the end of summer, when water levels are lowest. This is particularly important for nursery grown species that have not been subjected to waterlogged conditions.
- When planting in areas of saturated soil build low mounds (20-30cm) to plant the young plants on. This will keep their roots above water until they have become used to the local conditions.
- Avoid planting the riparian margin completely as this impedes the natural flight path of waterfowl. Use low growing species near the water's edge, with occasional tall trees over hanging the water and some gaps to provide waterfowl with escape cover.
- As the provision of views and physical access to streams and waterways is desirable, some areas need to have low planting/grasses only and vegetation gaps need to be left at appropriate intervals and locations in order to maintain access and views.
- Each plant should be pegged (weed mat pin or similar) to prevent uprooting by birds or moving water. These should be removed once plants are established.

3.2 Revegetation in coastal zones

Where coastal zones are being revegetated the ARC fact sheet for 'Coastal Plantings' should be referred to for additional information.

The land margin bordering the sea represents a unique and sensitive environment and the vegetation in this zone has several important functions. Good vegetation cover can help to protect coastal soils and sands from being eroded by wind and water action. The natural character of the coastal environment can be conserved through the maintenance and restoration of native plant communities found within these zones. Stands of native vegetation between the beach and adjacent human development provide an important buffer, screening buildings and providing habitat for native birds and animals.

Coastal plantings have a number of different functions including:

- To improve biodiversity by: restoring threatened ecosystem types and habitats by increasing the diversity of native coastal plant and animal species and enhancing remnant vegetation. Many native birds, reptiles and invertebrates live in the coastal zone or use them as a corridor for dispersal. Larger areas of coastal vegetation frequently support a greater species abundance and diversity, thereby enhancing the long-term viability of these sensitive ecosystems.
- To help reduce erosion and improve soil stability by dewatering soil and increasing soil binding root mass. Vegetation buffers are less expensive than engineered erosion management options. Some native plants are better designed to stabilise foredunes, and other native coastal species are more appropriate in backdune areas, coastal forests, banks and cliffs.

- To improve scenic values and to enhance or restore natural character of the coastline through the use of native plants found naturally in these zones.
- Dense stands of native species can out-compete introduced weed species.
- To define public access ways for pedestrians from the land down to the beach, and to prevent people reaching cliff edges.
- To enhance desirable views and to create native gardens in coastal zones (It is important to take into account the size mature plants will grow to if you seek to preserve coastal views from properties).
- To provide shade and shelter for both regenerating native species and public users of coastal areas.

3.3 Revegetation in roadside zones

Roads segment ecosystems through which they are built and may impact on the climate, air, noise, light environment, hydrology and water quality in the local area. Revegetation with native species aims to minimise or mitigate these effects on the biological and human environments. As roadsides and batters are visible to many people, they have great impact on the perceptions and values held by road users. The key short-term aim of roadside revegetation is to stabilise roadside areas against erosion and also where practical prevent the invasion of weed species. Planting of fast growing colonising species can achieve this as they have the ability to rapidly shade out weeds, thereby minimising long-term maintenance costs. These species should also be able to handle a certain degree of periodic pruning/trimming. Additional aims for roadside revegetation are to create plantings that achieve the following:

- Meet safety standards for visibility
  - Species with a low growth habit should be used where unobstructed views are required from a safety point of view.
  - Planting should also begin at an appropriate distance from the road edge.
- Are attractive from the road users point of view, complementing or blending into adjacent areas of native plantings (N.B. These roadside plantings will also act as corridors for bird dispersal).
  - Use of specimen trees such as pohutukawa or kowhai may be suitable in certain situations.
- Reduce the visual, noise and dust impacts of the road on neighbours by establishing dense vegetation.

3.4 Revegetation in parks

Revegetation in parks should follow the standard revegetation guidelines as outlined above in section 2.0. There are some additional considerations that should be taken into account within park environments.

3.4.1 Retention of view shafts

Low species may be more appropriate in certain park areas where it is important to retain view shafts.

3.4.2 Consideration of public safety

Public safety should be considered for revegetation in areas of high public usage. This can be achieved through planting of low growing species and avoiding species such as flax beside tracks, which provide opportunities for undesirable individuals to conceal themselves.

3.4.3 Consideration of access ways

Plantings close to pathways or access tracks should be placed at an appropriate distance from the path/road to avoid obstruction of the accessway.

WAITAKERE CITY COUNCIL
16 OCT 2006

Babbage CONSULTANTS

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Waitakere City Council
6 Henderson Valley Road
Henderson
Waitakere

COPY

Job Number: 42608
MP
13 October 2006

Attention: Felicitas Dhilwayo

Dear Felicitas

West Coast Rd (No. 423-429), Henderson
Further information - Staging Plans and final arborist report

Please find enclosed 4 copies of:

- Subdivision staging plans
- Final Arborist report

Yours faithfully

Matthew Paetz
Babbage Consultants Limited

WATER
Strategic Group
Consent Services ✓
Land Services
Copy letter + plans in bucket

16/10/06

Wilcon Sylvan Parks and Landscape Management
C/- Willy Coenradi
341 Rimmer Road, RD2
Helensville 1250
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E-Mail: coenradi@ihug.co.nz

8 October 2006

Housing Foundation NZ, West Coast Road Development. (Part of 423-429 West Coast Road)

This report should be read in context of the above application and will:

1. *Identify tree(s) and vegetation which may be affected by proposed works.*
2. *Assess condition of individual tree(s).*
3. *Assess to what extent vegetation may be affected and recommend remedial work./action with a view to minimize (potential) damage to trees)*

It is proposed to develop the above site for housing purposes with associated infrastructure and landscaping.

The proposed works and items referred to in this report are generally shown on the attached **"Housing Foundation NZ, West Coast Road Development. (Part of 423-429 West Coast Road), vegetation and major features plan 1 & 2".**

Note: These plans must be printed at minimum A3 size for clarity.

In addition, this report should be submitted together with the Babbage Consultants plans Ref#;

1. **42608 C1 Rev B (Contours and Services Plan)**
2. **42608 C2 Rev B (Contours and Services Plan)**
3. **42608 C3 Rev B (Earthworks Plan)**
4. **42608 C4 Rev B (Earthworks Plan)**
5. **Landscape/Planting Plans**
6. **Retaining wall layout plan (Especially adjacent 4-6 Woodbank Drive)- to be approved by Works Arborist & WCC.**

Summary:

- The proposed works are located within the **General, Riparian and Restoration Natural Areas.**
- The vegetation plan has been overlaid on to the Earthworks plan for easy reference showing the cut-fill requirements.
- The majority of vegetation is located along the stream meandering through the site, and consists of areas of exotic weed growth interspersed with occasional native vegetation species. These areas are circled in **YELLOW** on the vegetation plans, and to be cleared from all vegetation.
- There are some smaller areas of more significant native vegetation to be retained including a few larger native specimen trees, and mature Kanuka vegetation. These areas are circled in **GREEN** on the above vegetation plans
- Significant individual trees to be retained are marked in **BLUE**.
- Significant individual trees to be removed are marked in **RED**.

The minor watercourse meandering through the site is designated as a **Riparian stream** (7.00m zone, joining the Upper Waikumete Stream (20m Zone) on the Northern side of the site.

The land is largely designated as a General Natural Area, with a small area along the Northern boundary of the site designated as Restoration.

Vegetation on site

The development site is part of an area which appears to have been farmed and in pasture until recent times, and since has reverted to an un-maintained rough pasture land, with some natural streamside vegetation areas from West Coast Road joining up with an area along the Northern boundary along the Waikumete Stream which is in a relatively good condition.

The layout of the site is as per the attached Vegetation Plans and construction drawings.

It is intended to clear all vegetation from the areas circled in **YELLOW** and landscape, restore and revegetate these areas as per the attached Landscape Plans. These areas largely consist of exotic weed species and rough pasture covering in excess of 98% of these areas including species such as:

Botanical Name	Common Name
Solanum mauritianum	Woolly Nightshade
Salix alba	Willow
Ligustrum	Privet
Lonicera sp.	Climbing Honeysuckle
Salix caprea	Pussy Willow

Sporadic natives such as Cordyline australis and a few Cyathea dealbata can also be found in these areas. Any specimens over 6 metres in height are individually marked on the Vegetation plans.

The areas covered in **green** consist of typical streamside vegetation, but can be classified as "species poor", with the predominant species found Kunzea ericoides (Kanuka).

The areas marked Ref #8,9 are in this category, but have potential for "infill" revegetation planting

Area ref# 16 is part of the Upper Waikumete Stream riparian vegetation, and is of average to good quality with a good canopy cover.

Species found include:

Botanical Name	Common Name
Kunzea ericoides	Kanuka
Coprosma robusta	
Myrsine australis	Matipo
Cordyline australis	Cabbage Tree
Podocarpus totara (1 large specimen only)	Totara

In our opinion all areas marked in **green** include native vegetation with densities and quality to such an extent that restoration of these areas and enhancing the existing vegetation is preferable over complete clearing and replanting.

It is recommended that these areas are protected from damage during development and construction with suitable protective fencing, which should be installed prior to any works taking place, and maintained for the duration of the project.

Any specimen trees marked in **BLUE** are to be retained, any specimen trees in **RED** are to be removed.

Protection status of the vegetation

To follow is a table indicating the protection status of the vegetation within the working area, dimensions/comments and Natural Area designation.

Ref #	Species	Comments	Natural Area	Protected in District Plan
1	Cordyline australis	4.00m H x 400mm Girth. To be removed	General	No
2	Cyathea dealbata	4.00m H. To be removed	General	No
3	Cryptomeria japonica	Up to 13.00m H x 1.10m Girth. (Hedgerow on adjoining property) Works within dripline, to be retained	General	Yes
4	Cordyline australis	Up to 8.00m H x700mm Girth. Group of trees in poor/average condition-to be removed	General	Yes
5	Pinus radiata	Up to 14.00m H x 1.30m Girth-to be removed	General	No
6	Pinus radiata	16.00m H x 1.70m Girth-to be removed	General	No
7	Podocarpus totara	17.00m H x 1.60m Girth-to be retained	General	Yes
8	Mixed native revegetation.species	Up to 12.00m in height, to be retained and enhanced	General/Riparian(7m)	Yes
9	Mixed planted revegetation species	Up to 2.50m in height	General	No
10	Mixed native revegetation.species	Up to 12.00m in height, to be retained and enhanced	General/Riparian(7m)	Yes
11	Mixed native revegetation.species	Up to 12.00m in height, to be cleared for re-contouring requirement and re-landscaped.	General/Riparian(7m)	Yes
12	Mixed native revegetation.species	Up to 12.00m in height, to be retained and enhanced	General/Riparian(7m)	Yes
13	Cordyline australis	6.00m H x 700mm Girth	General	Yes
14	Cordyline australis	4.00m H x 500mm Girth	General	No
15	Pyrus var.	11.00m H x 1.70m Girth. Large mature fruit tree in average/good condition, to be removed.	General	No
16	Pyrus var.	11.00m H x 1.70m Girth. Large mature fruit tree in	General	No

Ref #	Species	Comments	Natural Area	Protected in District Plan
		average/good condition, to be removed.		
17	Mixed native revegetation.species	Up to 12.00m in height, to be retained and enhanced	General/ restoration/Riparian(20m)	Yes

Photos and further detail of the vegetation on site

Photo looking towards West Coast Road consisting of mixed exotic weed species

Ref # 1&2: Photo taken towards area behind 421 West Coast Road with exotic weed species and a Cyathea dealbata (under 3.00m in height) and a 10-15 yr old. Cordyline australis at appr. 5.00m in height. Both will require removal.

Ref # 3: Hedge row of Cryptomeria japonica just within 4-6 Woodbank Drive. A two tier retaining wall is to be constructed, with the first wall a minimum of 3.00m from the boundary. (Well outside the dripline of these trees)

Ref # 4: A group of semi-mature Cordyline australis up to 8.00m in height, in generally poor condition. These trees are to be removed.

Ref # 5 Photo of Pinus radiata shelterbelt. These trees are to be removed.

Ref # 6, Pinus radiata to be removed, Ref# 7 Semi mature Podocarpus totara, to be retained. The latter is close to a proposed driveway access. Ensure driveway is located outside tree dripline, and protective fencing is in place during construction,

Ref # 8 Photo of area with mature native revegetation species as outlined in report. Area to be retained and fenced during construction, additional enhancement planting as per landscaping plan

Ref # 9. Small area with juvenile (planted) revegetation species < 5yrs of age. Includes Phormium, Cordyline australis and Coprosma robusta. This area will be within a future building lot, and all vegetation is to be removed

Ref #10, 11, 12, areas vegetated with up to 20% naturally occurring native revegetation species (Cordyline, Coprosma etc.) all under 4.00m in height, and exotic weed species (Mainly Privet, Salix alba). Much of the exotic weed cover in this area has already been cleared. It is proposed to restore areas ref #10 and 12 with native streamside vegetation in this area as per the landscape plan. The vegetation within area ref #11 will be cleared to allow for cut/fill operations (See report detail)

Photo showing vegetation within this area shown circled in yellow on the vegetation map. Only weed species occur in these areas, except for the Cordyline australis (Ref #13). This area will be cleared and landscaped as per the attached plans, with

the Cordyline removed

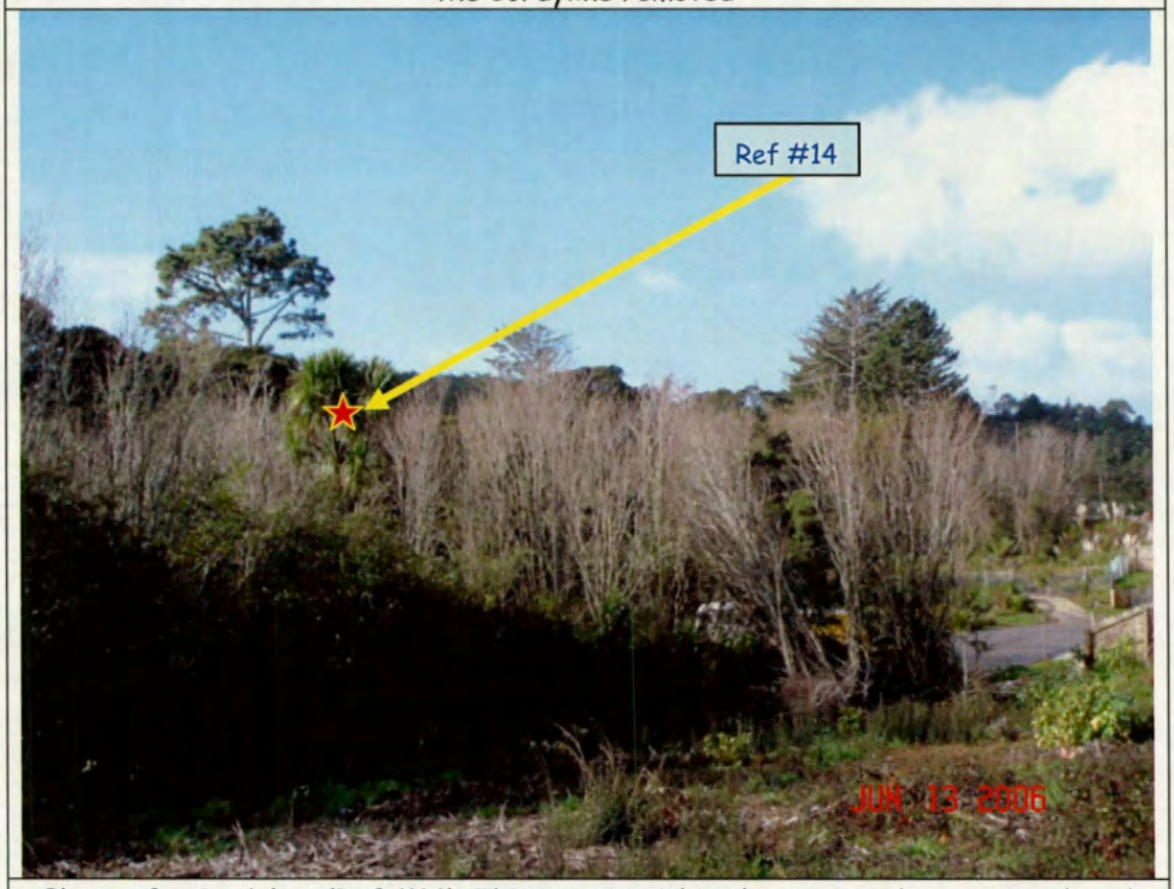


Photo of a Cordyline (Ref #14). This tree is within the proposed access road, and will require removal but if possible should be retained and fenced during construction.

Photo of looking East from Ref #14, showing 95+% of exotic weed species such as Salix caprea, privet, interspersed with the odd Coprosma robusta and Myrsine australis less than 3.00m in height. This area is to be cleared, with the proposed access road from the existing housing development to be constructed on the left, and the remainder landscaped as per the landscape plans. The vegetation on the

right with mature revegetation species is within ref #17 and is not affected

Ref #15, large, old Pyrus (Pear) tree, appr. 11.00m H x 550mm DBH in good condition. Tree is within the proposed stormwater pond area and needs to be removed. There is another large pear tree (ref #16) which will be retained.

Impact/adverse effects on existing vegetation

As outlined in this report it is intended to either preserve areas with a good native vegetation cover present, or clear and revegetate other areas where the existing native vegetation cover is of such poor quality that clearing and revegetation is considered a more appropriate option.

The bulk of the development will take place within already cleared areas, or areas largely void of significant vegetation.

It is noted however that the large Totara tree **(Ref #7)** and other vegetation included within the area of significant vegetation marked **Ref #8** may be within a proposed driveway alignment. The driveway needs to be realigned to outside the dripline of this tree and other significant vegetation present.

Cut/Fill operations

It is proposed to undertake significant cut/fill earthworks at the site as per the attached plans.

The earthworks will specifically impact **Ref #11**, where in order to obtain the required grades a narrow strip of vegetation will require removal. This area will be below the proposed footpath, and will be re-landscaped as per the landscape plans.

A hedgerow of Cryptomeria japonica **(Ref#3)** is located just within 4-6 Woodbank Drive adjoining the development site. The ground levels in this area are to be lowered by up to two metres.

In order to minimise the adverse effects of the works, it is proposed to maintain the existing levels to 3.00m from the boundary to a proposed retaining wall, at which

point the level will "step" down by 1.00m to a further retaining wall and another 1.00m step. Please refer to the construction drawings for detail.

The ground surface within the trees dripline and 3.00m wide strip along the boundary is not to be disturbed apart from weed control and re-grassing.

The lowering of the ground levels will likely influence the groundwater levels in this area, however as the trees will be at the toe of a slope from Woodbank Drive it is expected that they will receive adequate moisture to allow for normal growth and vigour.

No other significant privately owned vegetation is affected by the proposed works.

No earthworks may be undertaken within the dripline of the large Totara tree **(Ref #7)**

As can be seen on the attached Earthworks plans the adverse effects of the works on other vegetation is expected to be minor.

Mitigation works

Although the adverse effects on any protected or significant vegetation is relatively minor in nature, it is proposed to implement a comprehensive landscaping and revegetation plan.

This will seek to provide a high level of visual amenity and functionality within the development, as well as restoration of the streamside native ecosystems.

It is considered that this will more than mitigate any adverse impacts of the proposed vegetation alteration which may be caused by the works, and will enhance the natural environment to well beyond its current levels.

Protective measures of trees to be retained

It is proposed to erect suitable temporary fencing along the outside dripline of all vegetation **(marked blue or green)** to be retained including:

1. **All item references # 3,7,8,10,12, 16 and 17**.

This fencing shall be installed prior to the commencement of any works, and remain in place until the completion of all works, and be approved by the works arborist.

The fence shall be of such a standard that they are not easily moved/removed, and are suitable to exclude any works from these areas

No (earth)works are to be undertaken within these areas, and no machine access or storage of materials permitted

Assessment of vegetation using the General Natural Area Criteria

Rule Ref #	Description	Assessed effect
2a	The extent to which vegetation alteration adversely affects amenity values and neighbourhood character	The removal of weed species and subsequent revegetation of affected areas will improve amenity values and neighbourhood character to well beyond existing levels.

2b	The extent to which the vegetation alteration will threaten natural ecosystems	The removal of the weedcover could potentially cause erosion runoff into the stream. This will be addressed as part of the main Resource Consent application for the proposed works
2c	The extent to which vegetation alteration creates, contributes to or exacerbates stability problems	Nil
2d	The extent to which development is located or can be designed in a way that avoids the need to remove vegetation, and in particular the removal of any trees which are notable examples of their species	It is proposed to where possible locate any development outside any areas of significant or protected vegetation.
2e (A74)	The extent to which vegetation alteration is necessary: • To accommodate development otherwise permitted by the plan • To ensure the safety or integrity of existing development by the plan • For pruning to provide light • For pruning to preserve public views	The works are proposed To accommodate development otherwise permitted by the plan
2f	The extent to which vegetation alteration adversely affects plant health	Minor. The proposed works will require the removal of some protected vegetation, the adverse effects will however be fully mitigated as outlined in this report and attached landscape plans
2g	The effect the vegetation alteration adversely affects the historical, cultural or spiritual significance of any site or waahi tapu of significance to Iwi or archaeological site	Nil
2h	The extent to which more than minor adverse effects can be adequately avoided, remedied, mitigated or offset through provision of works and services on or off the site and/ or through payment or provision of a financial contribution	The adverse effects will be fully mitigated as outlined in this report and attached landscape plans
2i	The extent to which the vegetation alteration reduces the extent, range and linkages between vegetation, fauna habitats and natural features	When complete, the proposed restoration and enhancement of the streamside vegetation areas will greatly improve the range and linkages between vegetation, fauna habitats and natural features

2j	The effect the vegetation alteration can be offset by restoration or enhancement around and within the area subject to the application	Comprehensive restoration and enhancement of the natural areas and stream sides is proposed as part of the development
2k	The extent to which vegetation alteration adversely affects the significance, natural character or landscape value of any natural features	Nil, When complete, the proposed restoration and enhancement of the streamside vegetation areas will greatly improve the significance, natural character or landscape value of any natural features
2l	The extent to which the proposed vegetation alteration is for development proposed in a relative Operational Reserve Management Plan, Parks concept plan, current WCC Parks Strategy or current operative Regional Parks Management Plan	N/A

Assessment of vegetation using the Restoration Natural Area Criteria

Rule Ref #	Description	Assessed effect
2a	The extent to which vegetation alteration adversely affects the overall resilience, biodiversity and integrity of the Green Network.	Nil, When complete, the proposed restoration and enhancement of the streamside vegetation areas will greatly improve the overall resilience, biodiversity and integrity of the Green Network, as well a being complementary to the aims of the Twin Streams project.
2b	The extent to which vegetation alteration reduces the ability to create linkages between vegetation, fauna habitats or natural features and landforms.	Nil, When complete, the proposed restoration and enhancement of the streamside vegetation areas will greatly improve the ability to create linkages between vegetation, fauna habitats or natural features and landforms.
2c	The extent to which vegetation alteration adversely affects the significance, natural character or landscape value of any natural features.	Nil, When complete, the proposed restoration and enhancement of the streamside vegetation areas will greatly improve the significance, natural character or landscape

		value of any natural features.
2d	The extent to which trees which are notable examples of their species can be retained..	It is recommended that several large significant native and exotic trees are retained as part of the development. No notable trees are proposed for removal.
2e	The extent to which vegetation alteration adversely affects the mauri (life force) of native vegetation.	Nil
2f	The extent to which vegetation alteration adversely affects heritage or amenity values.	When complete, the proposed restoration and enhancement of the streamside vegetation areas will greatly improve amenity values.
2g	The effect the vegetation alteration can be offset by restoration or enhancement around and within the area subject to the application	Comprehensive restoration and enhancement of the natural areas and stream sides is proposed as part of the development
2h	The extent to which vegetation alteration creates, contributes to, or exacerbates stability problems.	Minor in the short term only, the proposed restoration and enhancement of the streamside vegetation areas when complete will fully mitigate any stability issues.
2i	The extent to which the proposed development could be positioned on any area of the site within a General Natural Area.	The proposed development, wherever possible will be located within a General Natural Area
2j	The extent to which more than minor adverse effects can be adequately avoided, remedied, mitigated or offset through provision of works and services on or off site and/or through payment or provision of a financial contribution.	Comprehensive restoration and enhancement of the natural areas and stream sides is proposed as part of the development
2k	The extent to which the vegetation alteration adversely affects plant health.	Minor. The proposed works will require the removal of some protected vegetation, the adverse effects will however be fully mitigated as outlined in this report and attached landscape plans

Assessment of vegetation using the Riparian Margin Natural Area Criteria

Rule Ref #	Description	Assessed effect
2a	The extent to which vegetation alteration adversely affects the overall resilience, biodiversity and integrity of the Green Network	Nil, When complete, the proposed restoration and enhancement of the streamside vegetation areas will greatly improve the overall resilience, biodiversity and integrity of the Green Network, as well a being complementary to the aims of the Twin Streams project.
2b	The extent to which the vegetation alteration reduces the extent, range and linkages between vegetation, fauna habitats and natural features	Nil, When complete, the proposed restoration and enhancement of the streamside vegetation areas will greatly improve the ability to create linkages between vegetation, fauna habitats or natural features and landforms.
2c	The extent to which clearance adversely affects the *mauri* (life force) of native vegetation	Nil
2d	The extent to which clearance adversely affects the water quality of *taiapuri* or *mahinga mataitai.*	Nil
2e	The extent to which the vegetation alteration adversely affects the historical, cultural or spiritual significance of any site or *waahi tapu* of significance to Iwi	Nil
2f	The extent to which vegetation alteration adversely affects the significance or landscape or natural character of any natural features	Nil, When complete, the proposed restoration and enhancement of the streamside vegetation areas will greatly improve the landscape and natural character of the site.
2g	The extent to which trees which are notable examples of their species can be retained	N/A
2h	The extent to which vegetation alteration creates edge effects from wind or light on remaining vegetation	Nil
2i	The extent to which vegetation alteration adversely affects heritage or amenity values	The proposed restoration and enhancement of the streamside vegetation areas will have a positive effect on amenity values.

2j	The effect the vegetation alteration can be offset by restoration or enhancement around and within the area subject to the application	The proposed restoration and enhancement of the streamside vegetation areas will be undertaken within the site
2k	The extent to which vegetation alteration creates, contributes to or exacerbates stability problems	Nil
2l	The extent to which existing cleared sites are used for proposed developments	N/A
2m	The extent to which more than minor adverse effects can be adequately avoided, remedied, mitigated or offset through provision of works and services on or off the site and/or through payment or provisions of a financial contribution	Extensive mitigation and enhancement plantings are proposed on site as part of the works
2n	The extent to which the proposed vegetation alteration id necessary: • To accommodate development otherwise permitted by the plan • To ensure the safety and integrity of existing development on the site • For pruning to provide light • For vegetation alteration (other than clearance) for cultural purposes in accordance with established protocols • For pruning to preserve public views	The proposed works are required to accommodate development otherwise permitted by the plan.
2o	The extent to which the proposed clearance adversely affects the natural, cultural and amenity values of surface waters in rivers and lakes.	The proposed works could adversely affect the natural, cultural and amenity values of surface waters. These issues will be addressed as part of the main Resource Consent application for the proposed works
2p	The extent to which vegetation alteration affects or may affect the water quality and aquatic ecosystem health of any part of the waterway adjacent to, upstream of or downstream of the vegetation alteration	The proposed works could adversely affect the natural, cultural and amenity values of surface waters. These issues will be addressed as part of the main Resource Consent application for the proposed works
2q	The extent to which any vegetation alteration associated with a subdivision can be avoided by carrying out works on parts of the site which are not in a Green Network natural area	N/A
2r	The extent to which vegetation alteration with a subdivision is necessary to construct a stream crossing.	N/A
2s	The extent to which vegetation alteration	Vegetation alteration is

	associated with a subdivision is minimised	largely limited to "low value" vegetation areas.
2t	The extent to which the proposed vegetation alteration is for development proposed in a relative Operational Reserve Management Plan, Parks concept plan, current WCC Parks Strategy or current operative Regional Parks Management Plan	N/A

A suitably qualified Arborist will be in attendance at the following stages:

Setting out	Arborist to brief site manager on vegetation ossues and RC conditions
Prior to commencement of work	Arborist to approve tree protection measures
During construction	Arborist to monitor compliance with RC conditions in regards to vegetation
Completion of construction	Arborist to check for damage and prepare completion report

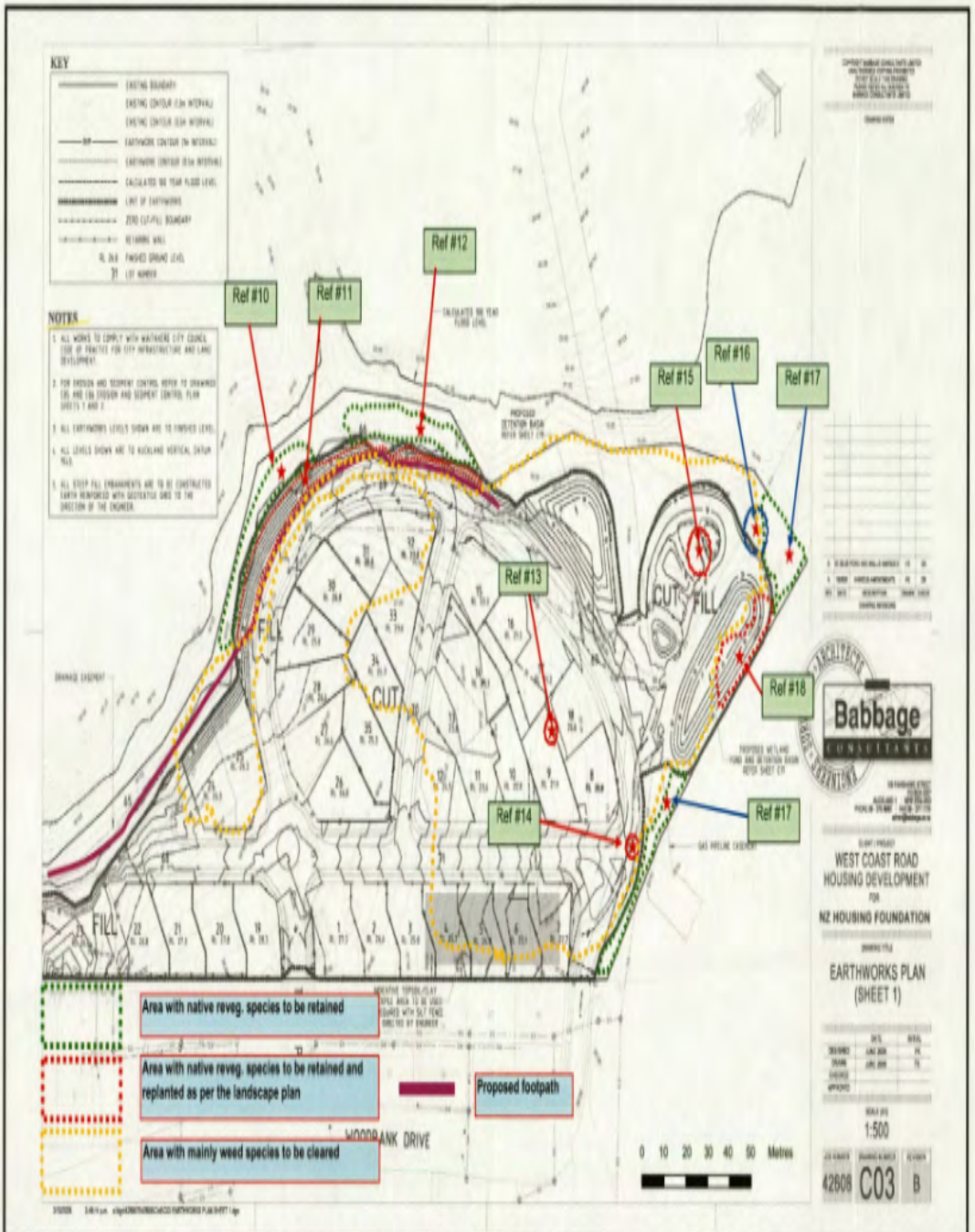
Recommended conditions:

It is recommended that the following conditions are included as part of the Resource Consent conditions:

- A suitably qualified Arborist to be in attendance at critical stages as outlined in the above table.
- Area adjacent works envelope to be temporarily fenced to prevent damage to significant and protected vegetation.

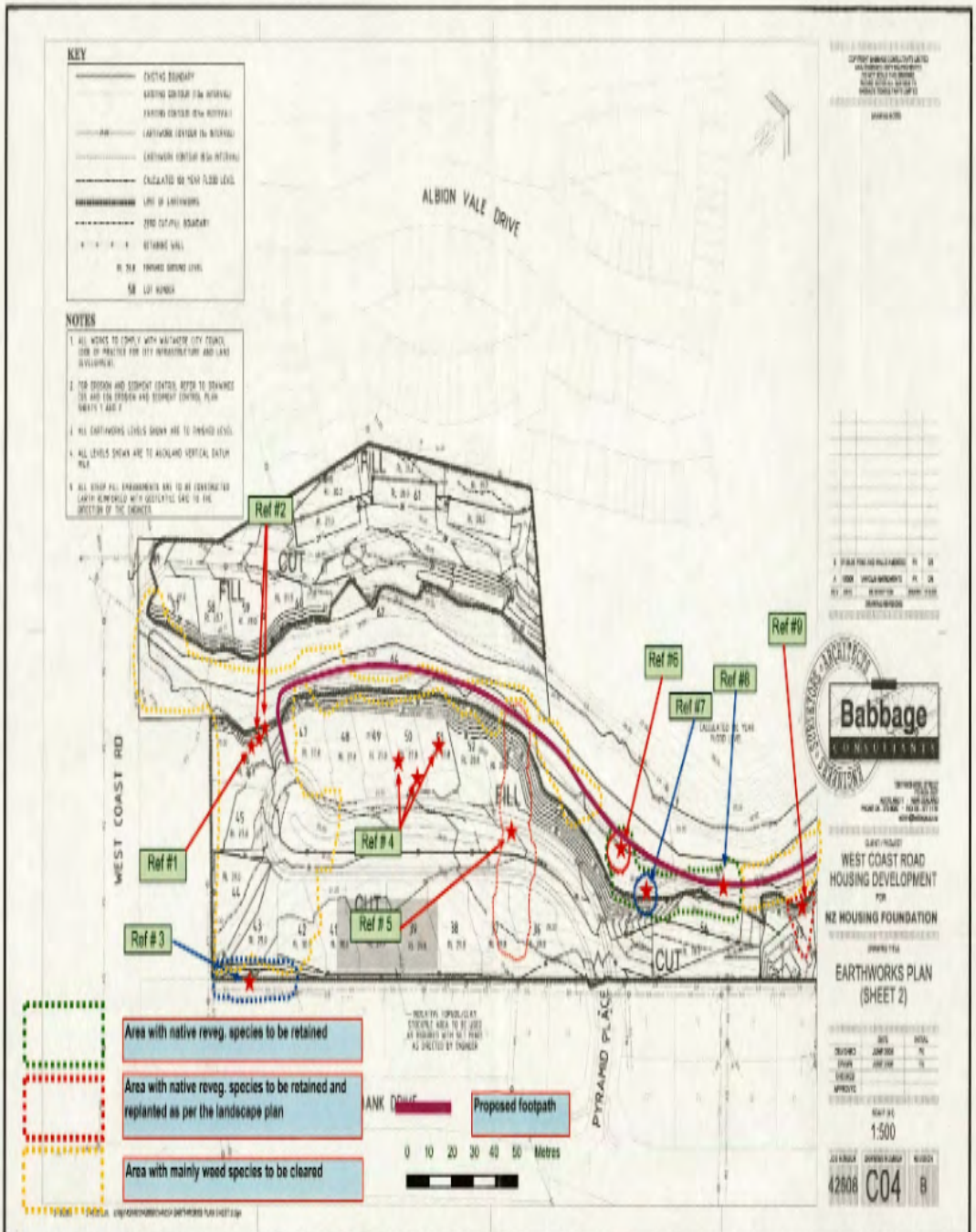
Yours sincerely

Willy Coenradi.
Wilcon Sylvan Parks and Landscape Management



Housing Foundation NZ, West Coast Road Development. (Part of 423-429 West Coast Road), vegetation and major features, Sheet 1

Date: 9 October 2006	Approved by:
Drawn by: Willy Coenradi	Scale: See Key



Housing Foundation NZ, West Coast Road Development. (Part of 423-429 West Coast Road), vegetation and major features plan, Sheet 2

Date: 9 October 2006	Approved by:
Drawn by: Willy Coenradi	Scale: See Key

Felicitas Dhliwayo

From: Matthew Paetz [matthew.paetz@babbage.co.nz]
Sent: Wednesday, 11 October 2006 2:10 p.m.
To: Felicitas Dhliwayo
Subject: RE: RMA 20061078 EW Con.doc- 423 West coast Roa

HI Felicitas
yes I should have clarified. I thought there was a height infringement too, however the architect clarified that it complies. If you look very carefully you can see that the roof eave is shaded grey. Whilst cross section 16 looks like its an infringement through the middle of the roof, this is essentially an "illusion" as the hatched maximum height line applies to the building at the point of the eave Where the roof slopes up from the eave as the building gets closer to the boundary the permitted building line also rises Does this make sense?
Matt

| - - - - - Original Message - - - - -
| Subject : RE: RMA 20061078 EW Con.doc- 423 West coast Roa
| Sent : 11 Oct 2006 14:01:35
| To : matthew.paetz@babbage.co.nz
| CC :
| From: Felicitas Dhliwayo, Felicitas.Dhliwayo@waitakere.govt.nz
|
| Thanks for this Matthew, however you did not include Lot 56. There
| appears to be a height infringement on that Lot as well?
|
| Thanks Felicitas.
|
| -----Original Message-----
| From: Matthew Paetz [mailto:matthew.paetz@babbage.co.nz]
| Sent: Wednesday, 11 October 2006 1:52 p.m.
| To: Felicitas Dhliwayo
| Cc: mjd@babbage.co.nz; ja@babbage.co.nz; csui@babbage.co.nz;
| bd.nzhf@xtra.co.nz
| Subject: RE: RMA 20061078 EW Con.doc- 423 West coast Roa
|
| HI Felicitas
| In terms of the staging, we are in the process of preparing some plans
| that clearly define the staging. We will forward these to you as soon as
| they are complete.
|
| In terms of infringements to the maximum height control not noted in the
| original AEE, we note that the application is also subject to approval
| for the following infringements (we apologise for the unintentional
| oversight) :
|
| Lot 9 - infringement of 250mm maximum
| Lot 30 - infringement of 500mm maximum
| Lot 54 - infringement of 2700mm maximum
| Lot 55 - infringement of 3200mm maximum
|
| We comment on visual effects as follows:
|
| Lot 9
| The effect of the infringement will be minimal. The degree of
| infringement is minor, and the effects of the infringement will be
| contained within the site.
|
| Lot 30
| The effect of the infringement will be minimal. The degree of
| infringement is minor, and the effects of the infringement will be
| contained within the site.
|
| Lot 54
| The proposed house on this allotment will be located approximately 45 -
| 50m from the nearest external boundary of the neighbouring Albionvale
| subdivision to the west. We consider that the proposed impact of the

height infringement will be no more than minor for the following reasons:

- the western face of the "building proper" will be less than 8m in height. The height infringement is a product of the topography, which slopes down relatively steeply at this point. This necessitates that the dwelling must be on poles. The effect of this is that the height of the building, when including the poles, as measured from ground level, exceeds 8m.
However, the bulk of the building when viewed from the west will essentially be that of a complying two storey dwelling, as the poles do not present as a solid face.
The topography also assists in minimising visual impact. After sloping down towards the stream, the land slopes up again towards the external boundary. The effect of this is that houses on neighbouring properties to the west will be located on a higher contour. These factors together with the substantial separation distance from neighbouring properties will ensure the impact of this infringement is no more than minor.

Lot 55
Essentially the same comments as stated above in relation to Lot 54 apply.

In conclusion we believe that these infringements will generate adverse effects that are no more than minor, and furthermore no persons will be adversely affected by these infringements.

Regards

Matthew Paetz

> - - - - - Original Message - - - - -
> Subject : RE: RMA 20061078 EW Con.doc- 423 West coast Roa
> Sent : 11 Oct 2006 09:57:42
> To : matthew.paetz@babbage.co.nz
> CC :
> From: Felicitas Dhliwayo, Felicitas.Dhliwayo@waitakere.govt.nz
>
> Hi Matthew
>
> Yes we do require you to note the extent of the infringement and an assessment of environmental effects- e-mail would be fine. In addition we would also like you to clearly outline the staging of the application- what lots, roads, reserves etc to be done for each stage (if that's the case). Please also identify any conditions (ecowater) that would be specific to each stage.
>
> Thanks
>
> Felicitas.
>
> -----Original Message-----
> From: Matthew Paetz [mailto:matthew.paetz@babbage.co.nz]
> Sent: Wednesday, 11 October 2006 9:39 a.m.
> To: Felicitas Dhliwayo
> Subject: RE: RMA 20061078 EW Con.doc- 423 West coast Roa
>
> Hi Felicitas
> I understand from yesterday's meeting you require a brief assessment of the visual impact of the three houses that infringe the maximum height control Please confirm. Also is it OK if I set out my assessment in an email?
> Matthew

| | | - - - - - Original Message - - - - -
| | | Subject : RMA 20061078 EW Con.doc- 423 West coast Roa
| | | Sent : 11 Oct 2006 08:53:07
| | | To : matthew.paetz@babbage.co.nz
| | | CC :
| | | From: Felicitas Dhliwayo, Felicitas.Dhliwayo@waitakere.govt.nz
| | |
| | | Hi Matthew
| | |
| | | Following the meeting yesterday, please find attached Ecowater comments
| | | and conditions of consent. I will send you the Parks and Landscaping
| | | conditions once I receive those.
| | |
| | | Regards,
| | |
| | |
| | | Felicitas.
| | |
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| | | Babbage Consultants Limited
| | | Ph +64 9 379 9980 Fax +64 9 377 1170
| | | E-mail; matthew.paetz@babbage.co.nz
| | | Web; www.babbage.co.nz
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|
|
| Matthew Paetz
| Babbage Consultants Limited
| Ph +64 9 379 9980 Fax +64 9 377 1170
| E-mail; matthew.paetz@babbage.co.nz
| Web; www.babbage.co.nz
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| Ref: 42608 : West Coast Rd (No. 423-429), Henderson
|
|
| Matthew Paetz
| Babbage Consultants Limited
| Ph +64 9 379 9980 Fax +64 9 377 1170
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Matthew Paetz
Babbage Consultants Limited
Ph +64 9 379 9980 Fax +64 9 377 1170
E-mail; matthew.paetz@babbage.co.nz
Web; www.babbage.co.nz

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Ref: 42608 : West Coast Rd (No. 423-429), Henderson

Progress meeting for 423 - 429 West Coast Road 10/10/06

Present - Babbage	WCC
Brian - Donnelly	Jeanette
Paddy Luxford	Peter Joyce
Louise	Kelly

- The majority of the proposed retaining walls will be 1m high (max). However some retaining walls along the eastern boundary will be 1.7 - 2m in height.
- However the property is below the neighbouring properties - & the retaining walls will be to the south. ∴ the neighbouring properties will not be adversely affected.

*Recommended condition of consent - Retaining walls to be no ~~more~~ higher than 2m.

- Condition for bridge design - to be in accordance with WCC requirements.
- Bldng consents to be lodged once 223c is signed off - Applicant to organise meeting with Alan Foster (Bldng)
- Street Names?
- Staging of Application - Paddy/Matthew to come back to me regarding staging & the EW conditions relating to each stage.
- Paddy/Matthew to address Height infringement on Lot 54, 55 & 56

meeting ~~ended~~ at 4pm.