RCSGEN 24.3.04.92

File Note:

TO: File 34.3.04.92

SUBJECT: **RECORD OF DISCUSSION WITH STEVE THORNTON RE DEVELOPMENT OF 2C KOWHAI STREET.**

DATE: 18 April 2012

I met with Mr and Mrs Thornton this afternoon. The meeting was at the request of Mr Thornton and was to answer questions he had about development of the site.

The first question he asked was does the geotech work completed as part of the subdivision relevant for the development of a dwelling. I advised that the geotech had be required and had been peer reviewed and should be used as the basis for any future work on the site. I provided Mr Thornton with a copy of the 24 October 2008 Terrane peer review. He is intending to provide that to his engineer in Tonkin and Taylor.

Mr Thornton also asked if Council would have concerns in principal to having a garage cut in and retained under the proposed dwelling. This to have access from the existing driveway put in to serve the other lot as part of the subdivision. I advised that as long as the car parks were on the site and were supported by engineering, then it was possible.

Shane McGhie
TEAM LEADER CONSENTS - PLANNING

S223/S224

Stuff

Whakatane District Council



STATEMENT

SA & CG THORNTON
P O BOX 3109
Ohope

Statement Date: 23 Mar 2011

Customer No: 106553

DATE	TYPE	OUR REF	YOUR REF	INVOICE AMOUNT	INVOICE BALANCE	BALANCE
19 May 2010	INVOICE	63217	5794/	514.87	514.87	514.87

Whakatane District Council

With my compliments



Dear Mr and Mrs Thornton,

The enclosed was originally sent to your agent in 2007 but appears to have had a new, out of date address. Mail has recently been returned to us.

Nadia Bestgen

Whakatane District Council Private Bag 1002 Whakatane 3158 New Zealand
Telephone +64 7 306 0500 Facsimile +64 7 307 0718 Email information@whakatane.govt.nz Website www.whakatane.govt.nz

$514.87

AGED ANALYSIS

CURRENT	30 DAYS	60 DAYS	90+ DAYS
0.00	0.00	0.00	514.87

Please detach and return with your payment to the address below

CHANGE OF ADDRESS
If the Name and Address shown is incorrect, please enter correct details:

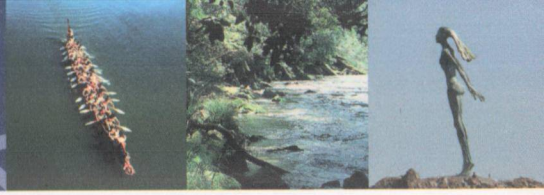
NAME

ADDRESS

CUSTOMER: 106553
SA & CG THORNTON (106553)

TOTAL DUE: **$514.87**

PAYMENT MADE: $



STATEMENT

SA & CG THORNTON
8B KOWHAI STREET
OHOPE 3121

Statement Date: 1 Mar 2011

Customer No: 106553
RCON

DATE	TYPE	OUR REF	YOUR REF	INVOICE BALANCE	BALANCE
19 May 2010	INVOICE	63217	5794/	514.87	514.87

23.3.11

Emailed Nadia

CLOSING BALANCE $514.87

AGED ANALYSIS			
CURRENT	**30 DAYS**	**60 DAYS**	**90+ DAYS**
0.00	0.00	0.00	514.87

Please detach and return with your payment to the address below

CHANGE OF ADDRESS
If the Name and Address shown is incorrect, please enter correct details:

NAME

ADDRESS

CUSTOMER: 106553
SA & CG THORNTON (106553)

TOTAL DUE: **$514.87**

PAYMENT MADE: $

24.3.04.92

Whakatane District Council
Private Bag 1002
Whakatane 3158

Postage Included

F. nora.



Return to Sender.

RETURN TO SENDER
Gone no address
Insufficient address
Not known
Other .....
WHAKATANE DELIVERY
ROUND No

Hasn't lived at this address 4 years.

Try Trident High.

Postage on this envelope may be used only once within New Zealand

Sorted and delivered by NZ Post

Sender

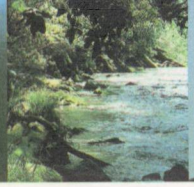
Name:

Company:

Address:

Town/City:

Postcode:


Resource Consent No. 24.3.04.92

19 May 2010

SA & CG Thornton
C/- Harrison Grierson Consultants Ltd
PO Box 366
WHAKATANE

Dear Sir/Madam

CONSENT NOTICE INVOICE – SUBDIVISION – 2B KOWHAI STREET, OHOPE

A condition of your subdivision consent required preparation of a consent notice. You or your surveyor requested that this consent notice document be prepared by Council's solicitors and this has been completed. Further to this request, we enclose a note of our costs and disbursements related to this matter.

We are recovering legal fees incurred for preparation of the document which are based on the New Zealand Law Society requirement that all professional fees shall be fair and reasonable. The following is a general description of the solicitor's tasks:

- Take Council's instructions;
- Prepare consent notice and send to Council for execution;
- Liaise with Council in relation to any specific conditions;
- If necessary, liaise with Council and surveyor regarding subdivision resource consent conditions and plan of subdivision.

Under our current Annual Plan, there is a charge of $200.00 for the actual and reasonable costs incurred by Council in respect of the preparation and signing of consent notices. This relates to internal analytical costs (e.g. perusal and correction (if necessary) of the document; signing fees; record keeping (e.g. photocopying, paper and electronic filing) and mapping of the document in our geographic mapping system.

We look forward to payment at your earliest convenience.

Yours faithfully

Nadia Bestgen
(Technical Administration Officer)

Whakatane District Council





TAX INVOICE

GST REG NO: 16-940-356

SA & CG THORNTON C/- HARRISON GRIERSON CONSULTANTS LIMITED PO BOX 336 WHAKATANE ATTENTION:	**Invoice No:** **Date:** **Customer No:** **Council Reference:**	63217 19 May 2010 46748* 106553 SS-2004-5794-00

DETAILS	QTY	UNIT	AMOUNT
2 Lot Residential Subdivison - 1 Additional Lot			
Legal Fees - Hamertons			314.87
Consent Notice			200.00

Receipt No:	**LESS AMOUNT PAID**	-$
	TOTAL TO PAY	**$514.87**
	GST CONTENT	*57.21*

Detach this portion and return with your payment to the address below.

Whakatane District Council Commerce Street Private Bag 1002 Whakatane 3120 New Zealand Telephone: 07 3060 500	SA & CG THORNTON C/- HARRISON GRIERSON CONSULTANTS LIMITED PO Box 336 WHAKATANE	**INVOICE NUMBER:** **CUSTOMER NO:** **AMOUNT:**	63217 46748* 106553 **$514.87**

Whakatane District Council
Private Bag
WHAKATANE

COPY

Dr to **HAMERTONS**
Barristers and Solicitors
P O Box 601
Whakatane

TAX INVOICE GST REFERENCE: 27-122-688 File Ref: 954371/ 256

BILL OF COSTS

re: **SUBDIVISION CONSENT NOTICE — SA AND CA THORNTON – 28 KOWHAI STREET, OHOPE - COUNCIL REFERENCE NO. 24.3.04.92 (TRISH EVANS)**

TO Our fee preparation of Consent Notice:

TO	Our fee	$250.00
TO	GST	31.25
TO	Disbursements (GST Inclusive): Photocopying	5.00
		$286.25

FOURTEEN DAYS TERMS OF PAYMENT
Unless payment arrangements have been made please pay this account by 9th August 2007

HAMERTONS

per:

25 July 2007

E. & O. E.
DRT(bills)30ab537a

+200
486.25
less GST =

Ellen - Opus - 2/8/07.

Julie JB. 26/5/08.

Helena. S+R 03-12-07

Records.

OPUS
INTERNATIONAL
CONSULTANTS

UTILITIES PROJECT COMPLETION REPORT

Job No _____/0___

P/Engineer		Description	Subd of Lot 25 DPS 9167 + Lot 2 DP 327498.				
Job Location:	2B Kowhai Rd - Ohope.			Date commenced:		Date completed:	
Code:	24.3.04.92.	Budget:	$	Actual cost to date:	$	Outstanding payments	$
Contract No/contractor:		Drg Nos	H+G 11050 - AB02.			As built drg supplied:	Yes / No

Asset	Component	Sub-component	Description/attributes	ID	R/C	Unit Price Total	Qty	Amount ($)
Cesspits.	✓		CP 1 LL 23.00		C		1	
	✓		CP 2 LL 22.98 IL 22.51				1	
	✓		CP 3 LL 21.76 IL 21.27				1	
	✓		CP 4 LL 20.82 IL 20.09				1	
Water	Meter ✓				C		1	
	Line ✓		new 200 mm UPVC		C		25 m.	
Stormwater	manholes ✓		SWMH 1 LL 20.71 IL 22.51		C		1	
	" ✓		SWMH 2 LL 18.91 IL 18.31				1	
	" ✓		SWMH 3 LL 18.26 IL 17.66				1	
"	lines. ✓		200 mm. UPVC		C		31	
	" ✓		" "		C		18	
SW.	Connectn. ✓		150 mm UPVC				9 x 3	
Sewer.	Connection ✓				C		1	

Total cost of asset	
To be expensed	
Total cost of work	

Signature:		Date:	

ELLEN THIS IS UP date to Thornton 224(C)

ELLEN Rec'd 27/6/07

Laura

HARRISON GRIERSON

DAVIS FILE NOTE
25 JUL 2007
Received Opotiki Whakatane

3.00 pm 25/7/07

21 June 2007

The General Manager
Whakatane District Council
Private Bag 1002
WHAKATANE

Your Reference: 24.3.04.92

Attention: Mr J Farrell, Manager Development & Compliance

Dear Jeff

Subdivision Of 2A Kowhai St: Thornton: Services As Built

With our letter dated 18 April 2007 we provided a Services As Built Plan- H G drwg no. 11050-AB02(A3) dated 16.04.07. We have since updated this plan to now include the new water connections to the two lots. The new plan shows the new 50 mm rider main that the Council's Operations Business Unit arranged to be thrust under Wainui Road and under the new accessway. A new water meter was then installed for lot 2 and the existing water meter to serve lot 1 was relocated to a position 1.0 m from the lot 1 meter (i.e. shifted approximately 17.8 metres northwards). Both meters are now fed from the new 50 mm rider main in Wainui Road.

✓ on 07 plan.

Accordingly we enclose two copies of our updated plan drwg. No. 11050-AB02(A3) dated 20.06.07.

Furthermore, we enclose a marked up copy of an aerial photograph which shows a water service line that fed the existing lot (i.e. the Thornton house) from the rider main in the lane way above the site up until the 15 June 2007 when the meter was shifted as described above. This service line is on the mains side of the meter and is therefore a WDC asset. We requested that this service line be disconnected (at the position where it was joined to the rider main) at the end of the lane way as it is now redundant. The Council's records should be amended by deleting the service line when the OBU confirm the work is completed.

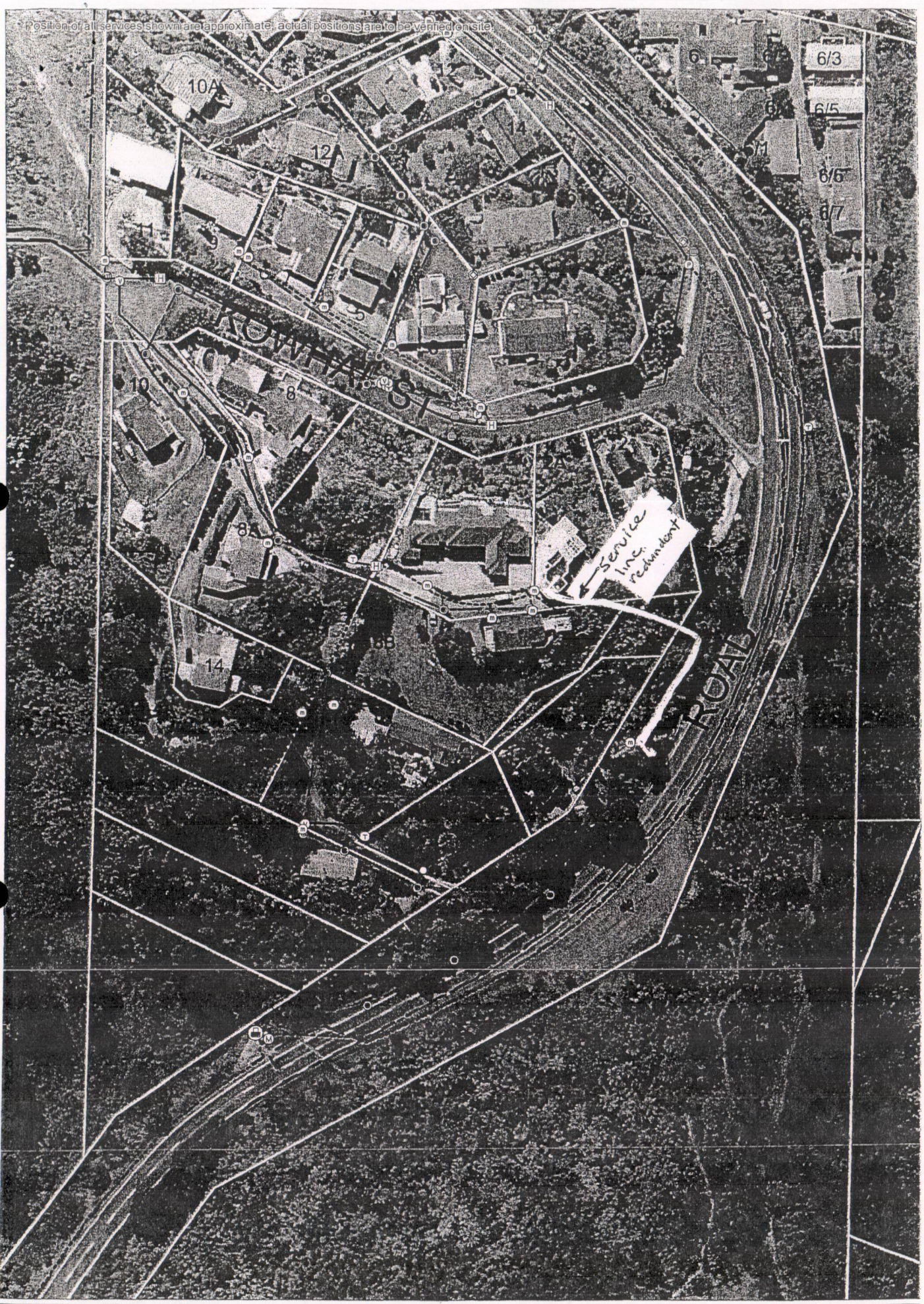
Yours sincerely
Harrison Grierson Consultants Limited

Jim Finlay
Senior Associate /Office Manager
Chartered Engineer

N:\1510\11050\Admin\wdc-letasblts.doc

Copy to WDC.

Harrison Grierson Consultants Limited
Ground Floor Concordia House
17 Pyne Street, Whakatane
PO Box 336, Whakatane, New Zealand
Ph 07 308 5478 Fax 07 308 4907
Email whakatane@harrisongrierson.com
www.harrisongrierson.com
ISO9001 Quality Assured



Whakatane District Council	Kowhai Street - Ohope	PLAN No. A3 Layout
Digital Cadastral Database (DCDB). CROWN COPYRIGHT RESERVED. Approved for internal reproduction by the Whakatane District Council, Digital Licence No HH033525. Parcel boundaries are to be taken as approximate only. Not to be substituted for site specific survey.		Mapinfo/AsbuiltsAerial.WOR Scale = 1:1,000 Date of Issue 16/01/2007 DMVN

Drawn: JDF Harrison Grierson
Date: 21.06.07

Showing Redundant Length of Water Service line as of 15 June 2007

NOTES:
Levels are in terms of Moturiki Datum

Measurements and levels on this plan are certified as correct.

Jim Finlay
22 / 04 / 2007

WAINUI ROAD

Existing WDC Watermain (50mmø)

SWMH 1
LL 20.71
IL 22.51

9.1
200mmø uPVC
1.6
1.6
3.0
4.9
0.5
1.8

CP 1
LL 23.00

CP 2
LL 22.98
IL 22.51

Open Roadside Drain

150mmø uPVC
Stormwater Connection
to serve Lot 1
DP 327498 (no pipe
laid to date in
easement)

2
DPS 49257

200mmø uPVC
New 50mmø uPVC
50mm Valve
in meter box

SWMH 2
LL 18.91
IL 18.31

CP 3
LL 21.76
IL 21.27

0.9
13.2
18.2
19.2
200mmø uPVC

SWMH 3
LL 18.26
IL 17.64

0.1
19.9
12.6
6.1
2.7
2.8

CP 4
LL 20.82
IL 20.09

0.8
12.8
6.5
2.8
1.9

Water Meter
To Serve Lot 2

Water Meter
To Serve Lot 1
(Existing House)

Sewer
Inlet

16.4
17.4

edge of seal

edge of seal

46.0

Ex. SSMH

2

1
DPS 49257

1
DP 327498

1

REF	AMENDMENT	BY	DATE
	ADDED NEW WATER METERS	DJC	21.06.07

DESIGNED: DATE: SIGNATURE:
DRAWN: DJC DATE: 16.4.07 SIGNATURE:
CHECKED: DATE: SIGNATURE:
APPROVED: DATE: SIGNATURE:
PLOT DATE: 19.4.07
CAD REF:
CAD XREF:
SURVEY BY:
SURVEY DATE:
SDR REF:

ASSOCIATION OF CONSULTING ENGINEERS NEW ZEALAND
ISO 9001 QUALITY ASSURED

THIS DRAWING AND DESIGN REMAINS THE PROPERTY OF, AND MAY NOT BE REPRODUCED OR ALTERED, WITHOUT THE WRITTEN PERMISSION OF HARRISON GRIERSON CONSULTANTS LIMITED. NO LIABILITY SHALL BE ACCEPTED FOR UNAUTHORISED USE OF THIS DRAWING.

HARRISON GRIERSON
CONSULTING ENGINEERS SURVEYORS PLANNERS
17 Pyne Street Whakatane Ph 07 308 5478 Fax 07 308 4907

PROJECT: S THORNTON
WAINUI ROAD
OHOPE

TITLE: AS BUILT SERVICES

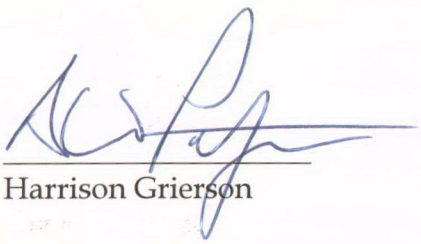
PLOT STATUS:
PROJECT No: 1510-011050
SCALES: 1:250
A3
DRAWING No: 11050-AB02
REV

23 July 2007

Thornton – 24.3.04.92

I have today collected from the Whakatane District Council the following document:

1. Signed 233 Certificate.



Harrison Grierson

DUE TO ALCHEMY NOT BEING ABLE TO RECORD INCOMING DOUCUMENTS WE SENT MAIL OUT WITHOUT THE "g" NUMBER ON IT.

CAN YOU PLEASE FIND THE CORRESPONDING DOCUMENT TO THIS COPY AND RECORD THE SAME "g" NUMBER IN THE SPACE BESIDE THE "Reg no…"

THANK YOU.

24·3·04·92
2B Iconhai Street
2080/0002/B00

HARRISON
GRIERSON

WHAKATANE DISTRICT COUNCIL
FILE:
REG. No.: G H 28329
29 MAY 2007
ACTIONED DATE
1 Carol G
2 Laura S
3
4
Chq attached

25 May 2007

Whakatane District Council
Private Bag 1002
WHAKATANE

Attention: Laura Swan

Dear Laura

SECTION 127 RMA APPLICATION TO CHANGE CONDITIONS OF RESOURCE CONSENT - S.A. AND C.A. THORNTON, 2B KOWHAI STREET, OHOPE

As agreed at our meeting on 15 May 2007, this application is made under section 127 of the Resource Management Act 1991 and seeks to change several conditions of the subdivision consent granted on 16 November 2006 to our clients, Steve and Corry Thornton.

Enclosed is a cheque for $250.00, being the Council processing fee for a variation to conditions.

BACKGROUND

At present, the subdivision consent requires that a "retaining and debris wall system" be designed for the proposed building platform (prior to s224 approval) and that a building consent application be lodged in respect of that structure (after title has issued, prior to building). As we understand it, the intent of the conditions is to ensure that:

- the subject site and future house will not be subject to material damage by erosion, falling debris, subsidence or slippage (thereby satisfying the requirements of s106 of the RMA); and
- land disturbance activities on the subject site will not adversely affect the neighbouring (upslope) property.

The problem is that the current wording of the consent conditions requires *extensive* design input into a solution (ie. a "retaining and debris wall system") that is just one of several potential solutions and also the one that is the least likely to ever be implemented (as it will be so expensive). In short, the existing consent requires considerable time and cost that will most likely be wasted.

Alternative wording is presented by way of this application which achieves the same intent of the existing conditions but in a more flexible manner.

Harrison Grierson Consultants Limited
Level 1, 141 Cameron Road, Tauranga
PO Box 1199, Tauranga
New Zealand
Ph 07 578 0023 Fax 07 577 9557
Email tauranga@harrisongrierson.com
www.harrisongrierson.com
ISO9001 Quality Assured

CHANGES SOUGHT

Changes are sought as follows (strikeout text like ~~*this*~~ is to be deleted and bold text like ***this*** is to be added):

1. CONDITION (P)

(A) PROPOSED WORDING

~~*A retaining and debris wall system shall be designed for the proposed building platform on proposed Lot 2 in general accordance with those shown on the Harrison Grierson Consultants Limited drawing 011050-200 and in accordance with the proposed construction sequence identified in further information supplied by Harrison Grierson Consultants Limited dated 26 April 2006 and 20 June 2006*~~

A preliminary design (which may incorporate either retaining wall, propped wall or pole house solutions) shall be submitted to Council, along with supporting calculations, to demonstrate to the satisfaction of Council that a dwelling can be constructed on Lot 2. In the event that the preliminary design relates to a pole house solution, the focus shall be on the design of the pole foundations up to floor level and it shall be demonstrated how structural loads will be taken, including pole layouts and key pole loading calculations.

This design shall take into account the requirements for inspection and maintenance of these structures inclusive of anchoring systems, ***where required by the design****. A peer review of the design of these structures shall be undertaken to the satisfaction of Director of Environment and Policy prior to Section 223 and Section 224 approval being issued for the subdivision and at the expense of the consent holder.*

(B) REASON

As noted above, there are at least three different design and construction options available for the construction of a house on the subject lot. These options are:

- *Option 1 - Tied back retaining wall option* (to create building platform)
- *Option 2 - Propped wall retaining wall option* (house to take some of loading from slope above, in combination with some lesser retaining walls)
- *Option 3 - Pole house option* (minimal earthworks, no building platform)

At subdivision stage (prior to issue of s224 certificate), the Council just needs to be satisfied that one of the options has been proven to be practical (whether or not this is the option that is subsequently progressed to building stage). Any option selected at the later house building stage will need to be subject to specific design and be "proven" prior to building permit issue).

The proposed changes maintain flexibility for the owner of the lot (once title is obtained) to consider each of the technical design/construction options and to select the most appropriate one to pursue having regard to the costs and benefits involved in the detailed design and construction process for each option.

At the time of this application, work is underway to satisfy this proposed condition by demonstrating that Option 3 above is practical and will have no adverse effects on the neighbouring property. At this stage, it is intended that this will become the "default option" referred to below.

2. CONDITION (U)

(A) PROPOSED WORDING

In accordance with Section 221 of the Resource Management Act 1991 a Consent Notice shall be registered against the Title of Lot 2 requiring that:

~~*(i) A building consent shall be lodged for the Debris and Retaining walls structures referenced in condition (p) of the subdivision consent and any other retaining walls required on site.*~~

(i) The owners of Lot 2 shall be aware that:

- ***There are geotechnical constraints affecting the design of a house on Lot 2.***
- ***As part of the subdivision consent process that created this allotment, the subdivider provided a preliminary design for one particular building solution [PLAN AND REPORT REFERENCE TO BE ADDED] to the satisfaction of Council (as required by condition (p) of the subdivision consent). This shall be considered as the "default option".***
- ***For any building option selected (including the default option referred to above) specific design will be required, with expert geotech input, prior to the issue of a building permit.***
- ***Where the building option selected involves the creation of a building platform prior to subsequent house construction, a building consent shall be obtained for the associated debris and retaining walls required prior to any works being undertaken.***
- ***It may not be practical to provide turning circles on the site which meet Council's dimension requirements, in which case alternative solutions such as a carousel (turntable) may be required.***

NOTE:
Requirements (ii) to (vii) below shall apply only where the building option selected involves the creation of a building platform prior to subsequent house construction, with corresponding debris and retaining wall requirements.

(ii) to (xi) Same as existing consent.

(B) REASON

The reasons stated above (regarding changes to condition (p)) apply here too. The changes are required to provide flexibility while still avoiding risk for Council and neighbours. The fifth bullet point is required to advise future owners that, depending on final house designs, it may be difficult to provide adequate vehicle turning circles on the site and, therefore, alternative solutions may be required to ensure that the required manoeuvring outcomes are still met.

Requirements (ii) to (vii) all apply to debris/retaining wall options and the creation of a building platform. As such, their applicability will be confined to where that is the building option selected and approved by Council. Except to the extent that may be addressed in the preliminary design report, they will not be applicable to other options such as the pole house option (intended to be the "default option" proven at subdivision stage) *if* that option is subsequently developed further at detailed design stage.

3. ADVICE NOTE (3)

(A) PROPOSED WORDING

Detailed design of the proposed subdivision should include specific assessment of the following aspects of the ground anchor design ***(where applicable):***

... (remainder same as existing consent)

(B) REASON

To reflect that the subdivision consent is being amended to provide flexibility for several design and construction options to be considered and proven.

4. ADVICE NOTE (6)

(A) PROPOSED WORDING

Where applicable, *Retaining and Debris Wall Structure anchors will require strength testing, a condition of Building Consent for these structures shall require this testing is undertaken.*

(B) REASON

To reflect that the subdivision consent is being amended to provide flexibility for several design and construction options to be considered and proven.

ASSESSMENT OF ENVIRONMENTAL EFFECTS

In accordance with section 127(3) of the Resource Management Act 1991, our assessment of environmental effects need only address any effects of the requested *change* in conditions, and not the effects of the proposal per se.

In this case, the proposed changes have been carefully worded to ensure that there are no adverse environmental effects as a result of these changes. The changes provide flexibility for design/construction options *other than* just earthworks to create a building platform which is formed and protected by means of an elaborate debris/retaining wall.

Should this be the building solution selected, all the same safeguards are retained within the subdivision consent, so there is no adverse effect.

Should other building solutions be selected (ie. *Option 3 - Pole house option*), the proposed changes require specific design input (and peer review) to ensure that the preliminary design (at subdivision consent stage) and detailed design (prior to house building stage) is robust.

The pole house concept minimises earthworks on the subject site. It will not adversely affect the stability of the current slope and, conversely, pole foundations may assist to anchor the slope and *improve* the current situation.

We do not consider that the proposed changes will have any adverse effect on the environment in terms of traffic, noise, visual aspects, ecology, slope stability or natural hazards.

POTENTIALLY AFFECTED PARTIES

In accordance with section 127(4) of the Resource Management Act 1991, in determining who is adversely affected by the requested change in conditions, the Council must consider, in particular, every person who:

(a) made a submission on the original application; *and*
(b) may be affected by the change (of conditions)

In this case while the owners of the neighbouring (upslope) property were submitters in respect of the original subdivision consent application, they will not be affected by the *changes* to the conditions because the changes are designed to provide reasonable design flexibility while retaining existing *safeguards* to their property in terms of geotech input, peer reviews and slope stability measures.

As noted above, a pole house solution would not adversely affect the stability of the current slope. Conversely, pole foundations may assist to anchor the slope and improve the current situation.

Therefore, it is considered that no parties are potentially affected by this variation to the original consent.

CONCLUSION

We trust that this provides enough information for the determination of this request. However, should you have any queries regarding this matter, please contact the undersigned.

Yours faithfully
Harrison Grierson Consultants Limited

Andrew Collins
Director

N:\1510\011050\Phase 1\500 Del\thornton s127 consent variation application.doc

Terrane Consultants Limited
PO Box 13-607
Tauranga, 3141, New Zealand
T: 07 579 9708 | F: 07 579 9702

enquiries@terrane.co.nz
www.terrane.co.nz

Terrane
geotechnical solutions

Our ref: 3055.07_R8.rev1
24 October 2008

WHAKATANE DISTRICT COUNCIL
FILE:
REG. No.: Ca 56096
29 OCT 2008
ACTIONED Paul H DATE
1
2
3
4

Whakatane District Council
Private Bag 1002
WHAKATANE

Attention: Paul Howells

Dear Mr Howells,

THORNTON SUBDIVISION, 24 WAINUI ROAD, OHOPE
GEOTECHNICAL PEER REVIEW - SUMMARY

Further to your request on behalf of Whakatane District Council (WDC) we have undertaken a geotechnical peer review of the proposed subdivision of the Thornton property at 24 Wainui Road, Ohope.

This report provides an overall summary of the geotechnical peer review. In overall summary, the documentation provided is considered sufficient for the purposes of demonstrating that a safe building platform can be developed on the new Lot 2. Further geotechnical inputs will be required during the detailed design and construction phases.

1.0 BACKGROUND

The geotechnical assessment for the site has been staged over the last three years.

The design for the lower driveway was given the report by Harrison Grierson Consultants Ltd (H&G):

> "Driveway Alignment and Retaining Walls, 24 Wainui Road, Ohope", letter report prepared for Mr S. Thornton, dated 14 June 2004, H&G ref. 71.11050.1.

Construction of the driveway was undertaken in late 2006 - early 2007.

The geotechnical assessment for the new building platform was provided in a series of reports and other documentation by H&G. In mid-2007 this was distilled into a single, overall report containing the additional information and assessment requested as part of the peer review process;

> "Site Suitability Report for Thornton Subdivision, Wainui Road, Whakatane", prepared for Mr S. Thornton, dated June 2007, H&G reference 1510-011050-01.

Comments in this review are given in relation to this report.

2.0 SCOPE OF PEER REVIEW

The scope of the peer review included:

- Review of the reports, calculations and details prepared by H&G;
- A detailed inspection of the site;
- Meetings with H&G staff;
- Observations during construction of the lower driveway;
- Checking of other information provided to WDC as part of the geotechnical peer review for the subdivision consent application.

3.0 DRIVEWAY CONSTRUCTION

The construction of the driveway along the lower end of Lot 2 was discussed in our facsimile dated 9 July 2007. The following conclusions were given:

> "Based on the information provided by Harrison Grierson Consultants Ltd and our observations during construction of the driveway and associated retaining walls at 24 Wainui Road, Ohope, we conclude the following:
>
> (a) The works as constructed appear to comply with the conditions of the building consent issued by Whakatane District Council;
>
> (b) The changes made to the design during the construction phase were required by the ground conditions that were encountered, and are considered reasonable variations to the approved design;
>
> (c) The driveway works have not decreased the stability of the area further upslope, the proposed house site."

With the retaining wall on the upslope side of the driveway now in place, the requirements for lateral restraint at the outside edge of the building platform can now be quantified.

4.0 PEER REVIEW COMMENTS

As mentioned previously the geotechnical peer review included a number of iterations. The issues affecting the proposed Option 1 - Pole House have been resolved. The following comments are made in relation to the H&G report dated June 2007 and include key issues that remain important to subsequent stages of development.

(a) General

The proposed building platform is located on steeply sloping ground and is physically constrained in terms of formation of vehicle access. There are a number of significant geotechnical issues affecting development of the proposed building platform. There has been a history of landslippage within the local area, including slips that occurred as a result of the March 2004 storm event. Some instability occurred during construction of the lower driveway. Significant groundworks will be required in development of the proposed building platform.

(b) Subsurface conditions

The H&G borehole logs give soil descriptions but do not differentiate between insitu soil, transported soils or filled ground. This is important for assessing retention requirements. Some additional information on subsoil conditions was available from the cut batter at the level of lower driveway further down the slope. In particular, it showed the southern part of the site contains a zone of naturally reworked soils - that is, slopewash and/or landslip debris.

(c) Groundwater conditions

Our previous comments have now been addressed.

(d) Slope stability analysis

The Macstars slope stability program used in the H&G assessment has some limitations (both conservative and unconservative). For example, the analysis is limited to circular slip surfaces, a tension crack is not included, while no embedment is included in the modelling of surcharge loads. A check analysis indicates that the results quoted in H&G analysis is adequate for potential deep-seated instability.

The analysis of shallow-seated instability is more problematic, however this failure mode is covered by the approach of considering the depth of soil likely to be subject to movement and allow for the resultant loadings on retaining wall(s) and foundations.

(e) Wall Design

The H&G design allows for the retained height to be greater than the physical height of the wall. It is essential that pole embedment, diameter, etc allow for factors such as the reduced passive restraint due to a sloping ground surface; creep movements due to seasonal changes in soil moisture content; and possible landslippage.

(f) Support to the new building platform

The interface between the upper wall on the driveway and the Lot 2 building platform was discussed at some length with the designer. The original design used active earth pressures behind the retaining wall, which minimised soil loads on the wall and was therefore a low cost solution, but it also reduced lateral support to the new house platform compared to "at-rest" conditions.

The design for the retaining wall on the upslope side of the driveway used an earth pressure coefficient part-way between active and at-rest conditions. The coefficient appeared reasonable for the soils that were exposed during wall construction, with the wall assessed as having reasonable capacity but not up to full "at-rest" conditions. The actual amount of support provided will depend on slope gradients and the arrangement of surcharge loads acting on the wall[1].

This aspect will need to be considered during detailed design of the retaining walls and other groundworks for the Lot 2 building platform. Stability analysis will need to consider the overall slope and whether active or at-rest soil conditions prevail at the toe of the potential slip surfaces. The calculations to date (using Macstars) are considered to be indicative rather than definitive.

(g) Building foundations

The H&G analysis appears reasonable for current purposes.

(h) Turning Platform

The proposed design shows this is to be supported on reinforced concrete piles. The structural loads are considerable. The geotechnical aspects of the design appear reasonable.

[1] For example, the approximation of surcharge loads for slopes greater than 28° given in the calculations allows for vertical loads but not lateral loads, and therefore is somewhat unconservative.

5.0 DEVELOPMENT OPTIONS 2 AND 3

The H&G report refers to two other alternatives for development, being Option 2 = retaining walls integral with the house structure, and Option 3 = tied back retaining walls.

These options can still be considered. It is expected that either of Option 2 or Option 3 would be more onerous (and therefore more expensive) than Option 1.

An example of this is the treatment of the small overland flowpath from the upslope neighbour into the top end of the building platform. For Option 1 the flow can be simply channelled down the garden steps at the side of the pole house. Weathertightness requirements would be significantly more onerous for either Option 2 or 3.

The H&G report identified that further geotechnical analysis and reporting would be required for either Option 2 or Option 3. We concur that this would be essential.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the information provided during the peer review process it is concluded that the geotechnical assessment given in the Harrison Grierson Consultants Ltd report dated June 2007 for 24 Wainui Road, Ohope, is sufficient to demonstrate the geotechnical viability of development of the proposed Lot 2 building platform.

The slippage that occurred during the construction of the driveway towards the southern end of the lower driveway confirms the importance of slope stability to development of the proposed building platform.

The following recommendations are made:

(a) The requirements and recommendations given in the H&G report dated June 2007 be adopted for the purposes of consent.

(b) Detailed design of the building platform preparation works shall be subject to specific geotechnical input. The proposed methodology for the groundworks, particularly the stability of temporary cut batters, shall be included in the design documentation.

(c) During construction the ground conditions shall be inspected and approved by a suitably experienced geotechnical engineer.

(d) Certification of construction of the building platform preparation and/or the house foundations should include confirmation of post-construction requirements and recommendations advice to the property owner, including those given in Section 10.0 of the H&G report.

7.0 CLOSURE

This review report is provided to Whakatane District Council with respect to the specific brief given to us, and should not be used in any other context without our prior written review and written agreement.

Comments and conclusions are made in relation to the specific scope of development given in the documentation prepared by H&G and included in the H&G report dated June 2007.

We trust the above is sufficient for your present purposes. Please contact the undersigned on ph 07-579 9708 if there are any queries arising.

Yours faithfully
TERRANE CONSULTANTS LTD

A. J. (Tony) Cowbourne
BE(Hons) MSc(Hons) BSc MIPENZ CPEng
GEOTECHNICAL SPECIALIST

24 October 2008
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HARRISON GRIERSON

STEVEN THORNTON

Site Suitability Report For Thornton Subdivision, Wainui Road, Whakatane

24.3 04.92

June 2007
HG Ref 1510 011050 01

HARRISON GRIERSON

WHAKATANE DISTRICT COUNCIL
FILE:
REG. No.: G HH467
-3 AUG 2007
ACTIONED DATE
1 David B 5/8
2 Laura
3
4

2 August 2007

Terrane Consultants Limited
P O Box 13 -607
TAURANGA

Attention Tony Cowbourne

Dear Tony

Thornton Subdivision: 2b Kowhai Street Ohope
HG Ref 1510 011050 01

Please find enclosed our final report for the above property incorporating all revisions to 1 August 2007.

Yours faithfully
Harrison Grierson Consultants Limited

Gavin Moore CPEng
Engineering Manager

N:\1510\011050\Phase 1\300 Comms\L18 Terrane.doc

CC:

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Attention: David Bewley

CC:

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Attention: Steve and Corrie Thornton

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STEVEN THORNTON

Site Suitability Report For Thornton Subdivision, Wainui Road, Whakatane

June 2007
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APPENDICES

Appendix 1	Site Investigation Data: Borelogs and Scala Penetrometers
Appendix 2	Stability Analysis Printouts
Appendix 3	Pole House Structural Calculations

DRAWINGS

1.0 INTRODUCTION

It is proposed to subdivide Lot 25 DPS9167, located on Wainui Road, Ohope, near the intersection of Kowhai Street, into two titles as shown on the Digital Title Plan (LT 387121). Refer Drawings.

At the time of writing a Resource Consent is to be issued for the subdivision including a condition that requires the applicant to provide a preliminary design to demonstrate one of three options to construct a dwelling on the proposed lot. The three options identified in the Resource Consent are:

Option 1. To construct a pole house above the existing slope.

Option 2. To construct a dwelling into the side of the hillside where the dwelling is designed to retain the slope and propped retaining structures form part of the dwelling.

Option 3. To provide a level building platform on the existing slope by constructing a series of tied back retaining walls at the rear of the site to enable construction of a dwelling independent of these walls.

The Resource Consent conditions also make owners aware it may not be practical to provide turning circles on the site and alternative solutions such as a carousel (turntable) may be required.

This report considers Option 1 with a turntable for turning vehicles and provides a preliminary design to demonstrate a pole house can be constructed on the proposed Lot 2. Assessments of geotechnical conditions and recommendations on measures required to stabilise the slope above and below the proposed dwelling are made. Further geotechnical analysis and reporting will be required at the time of Building Consent Application if Options 2 or 3 were to be considered.

In August 2005 a report was prepared by Harrison Grierson Consultants Ltd to assess geotechnical conditions for a dwelling to be constructed into the hillside (Option 2). This report supersedes the August 2005 report.

In June 2004 a report was prepared by Harrison Grierson Consultants Ltd for the construction of a driveway across the lower portion of the site, including a slope stability analysis and recommendations for retaining walls. This driveway has now been constructed and at the time of writing a Code Compliance Certificate is due to be issued subject to some minor remedial works.

The Site Survey Plan, preliminary design drawings and calculations for the pole house option are appended to this report.

2.0 SITE DESCRIPTION

2.1 TOPOGRAPHY

The site is located on the side of the eastern end of the escarpment above the main portion of Ohope Beach.

A topographical survey has been undertaken which shows the site contours. The dwelling footprint for the Pole House, Option 1 is shown on the site contours drawing 011050-2-201, along with the asbuilt driveway position.

The site falls to the east by 13m, and in the area of the proposed dwelling has slopes ranging from to 16° to 45°.

A narrow track was bulldozed across the site below the proposed dwelling and above the driveway retaining walls. The track was formed sometime between our initial site visit (early 2004) and the time of our topographical survey of the site. During the period of heavy rain (mid 2004) that caused many landslides in the Ohope area, a shallow slip less than 10m wide occurred above the track, partially blocking it. During construction of the driveway retaining walls another shallow slip occurred at the southern end of the driveway.

2.2 EXISTING DEVELOPMENT

The site has a recently constructed driveway, and a dwelling, garage and turning area on the proposed Lot 1 at the southern end of the site. Prior to construction of the new driveway in early 2007 the existing house was accessed directly off Wainui road. This access has now been removed.

A disused watermain crosses the proposed lot 2 north of the proposed pole house. This watermain is shown on the appended aerial photograph included with the drawings.

2.3 VEGETATION

At the time of our initial visit in early 2004 the portion of the site, which will become Lot 2, was vegetated with low-level native plantings, which were cut to allow survey and are now regenerating.

2.4 GEOLOGY

We have used the following geological map to assess the geology of the site:

- Geological Map of New Zealand Sheet 5 published by the Department of Scientific and Industrial Research, New Zealand 1975 Scale 1:250,000.

According to this map the site is underlain by the Pleistocene age marine sandstones with conglomerates and interbedded pumaceous tuffs. The map also

shows fluviatile sands and silts overlaying the sandstone layers. These sands and silts are present on the site below the topsoil layer. (See 3.2 below.)

3.0 INVESTIGATIONS UNDERTAKEN

3.1 TESTING

Borelogs, HA 1, HA 2, and Scala penetrometer tests were undertaken north of the proposed dwelling during driveway investigations in May 2004. Three hand augered borelogs (labelled HA 3 to HA 5) have been undertaken, along a section through the centre of the proposed dwelling with depths ranging from 2.0m to 2.7m in May 2005. Shear vane tests were undertaken at 0.5m and 1.0m intervals in the boreholes.

Three Scala penetrometer tests were undertaken alongside the borelogs, HA 3 to HA 5, to 4m deep.

Borelogs and test results are appended. (Appendix1)

3.2 SUBSURFACE CONDITIONS

The boreholes show the subsurface conditions at borehole locations comprise 0.2m to 0.6m of topsoil. HA 4 and HA 1 show some filling has been placed over topsoil in the construction of the bulldozed track. Beneath the topsoil various layers of silts and sands were encountered to depths of 2.0m and 2.4m in HA 1 and HA 2. Gravels were encountered in the silt and sand layers in HA 3 and in HA 1.

A light brown sand silt layer underlies the various silt and sand layers in HA 1 and HA 4. This layer is located immediately below topsoil in HA 5 at depths of 2.0m to 2.5m and is too hard for the hand auger to penetrate.

Scala penetrometer test readings indicate soil bearing capacities increase with depth.

No groundwater was encountered in the borelogs undertaken through the centre of the proposed dwelling. However borelog HA1 undertaken during driveway investigations shows groundwater was encountered at 2m deep.

In addition during construction of the driveway (early 2007) sands were encountered with flowing groundwater below the upper layers, towards the eastern end of the driveway.

In summary the investigations reveal that the upper 1m is relatively loose, the next 1m is moderately dense to 2.0m deep, and below 2m soils are very dense. This would account for the fact that the relatively steep site, and the escarpment itself appear stable on this site. The looser upper layers, together with probable

saturation in mid 2004, and cutting into the slope without providing support would account for the shallow slip above the bulldozed track.

Soils encountered during the driveway construction indicate there may be possible pockets of slip debris on parts of the site.

Borelogs with shear vane results and Scala penetrometer results are appended.

4.0 PROPOSED DEVELOPMENT

It is proposed that the existing dwelling on Lot 1 remains and a pole house dwelling is constructed on Lot 2. Retaining walls are required above and below the Lot 2 driveway and a debris wall is required above the proposed pole house.

4.1 POLE HOUSE PRELIMINARY DESIGN

A preliminary design for an Option 1 Pole House, retaining walls, and a debris wall are shown on drawings 011050-2-200 to 011050-2-205. Structural calculations demonstrating the pole spacing, retaining walls and member sizes are appended. (Appendix 3.)

The purpose of the preliminary design is to demonstrate that a pole house is a feasible option. The calculations and drawings are not intended for use in a Building Consent Application or as construction details.

The pole system to support the house has been designed with governing seismic loads and on the basis that the upper 2m of soil will provide no lateral support but will impose a horizontal load onto the piles. Floor joists and bearers have been sized to span between piles and the floor will need to be constructed as a diaphragm to distribute lateral loads to piles.

A carousel vehicle turntable has been incorporated into the pole house preliminary design to increase the practicality of vehicle manoeuvrability. A support system for the turntable has been designed with pile supports and piles downhill of the turntable to be used for retaining should they be required.

5.0 SLOPE STABILITY

There have been two instances of failure of surficial soils in recent years. The first was in mid 2004 when during a period of heavy rain that caused many landslides in the Ohope area, a shallow slip less than 10m wide occurred above the buldozered track, partially blocking it.

The second was during construction of the driveway retaining walls. Slumping occurred in the area around the southern end of the new driveway after the alignment was first cut out. When the driveway was cut to the original design levels, soft soils were encountered, so the contractor undercut the soft soils to

firmer ground. This undercut extended by up to 1.2m when sands were encountered with flowing groundwater. The undercut area was backfilled with imported rock hardfill. The undercut area was only partially backfilled, and an unsupported cut face up to 1.5m high was left which slumped during wet weather overnight.

There are two slope stability issues affecting Lot 2.

- Stability of the building platform, and
- The risk of incident landslip debris from further upslope.

Before the proposed dwelling can be constructed on the proposed new lot the overall ground stability must be verified. Determination of the stability of a slope can be influenced by many factors and variables. A frequently used requirement is to have a minimum factor of safety against sliding of 1.5 for a slope under normal conditions, and a minimum of 1.2 for extreme conditions.

Using the critical cross section determined from the topographical survey information through the centre of the proposed dwelling, an assessment of soil parameters and slope stability has been made. The assessments have involved undertaking a back analysis of the existing slopes, using circular stability analysis and observations to determine the soil properties below the site. We have undertaken the stability analysis using the MacStars programme, which has limitations. The analysis takes into consideration the results from our site investigation, likely ground water conditions, and our observation of failure of surficial soils.

5.1 EXISTING SLOPE ANALYSIS

Our investigations demonstrate that the strengths of materials beneath the slope increase with depth. Based on these investigations we have modelled the existing slope with a looser upper layer over the first 2m and a denser lower layer below 2m deep.

We have assessed the upper layer properties based on observations and to reflect the upper mobile soil layer prone to surfical failures as c=0 kPa, ϕ = 30° and γ = 18 kN/m^3.

The lower layer properties have been assessed as c=5 kPa, ϕ = 40° and γ = 18 kN/m^3 by carrying out back analyses on the existing slope to arrive at a factor of safety of 1.

Our back analysis of the lower soil layer comprised of analysing three situations the first where there is no groundwater present in the slope, the second where the upper layer (top 2m) of soil is wet and the third where the groundwater level is raised to the base of the upper layer (from 2m down.) The second

situation where the upper 2m is wet is more likely than the raised groundwater situation.

During this analysis we found that the model always failed in the upper layer. To determine the soil properties in the lower layer it was necessary to prevent failure in the upper layer by assigning the same soil parameters to the upper layer as the lower layer. This prevented the model finding a failure surface in the upper layer and enabled us to undertake a back analysis of the lower layer. The results of our lower layer back analyses are summarised in the table below with actual results appended. (Appendix 2.)

Soil Properties S1=Upper Layer S2=Lower Layer	**Case 1 No Water FS**	**Case 2 Upper layer wet FS**	**Case 3 Raised Groundwater FS**	**Appendix 2 Printout Numbers**
Upper Layer Fixed				
S1 C= 5, ϕ = 40 S2 C= 5, ϕ = 40	FS = 1.63 S2 Fail	FS = 1.12 S1 Fail	FS = 1.26 S2 Fail	1,2,3
S1 C= 10, ϕ = 40 S2 C= 10, ϕ = 40	FS =1.79 S2 Fail	FS = 1.51 S1 Fail	FS = 1.36 S2 Fail	4,5,6

We have conservatively assessed the lower soil layer parameters based on the raised groundwater analysis where the Factor of Safety is 1.26 and the corresponding soil parameters of c=5 kPa, ϕ = 40° and γ = 18 kN/m³. The borelog information shows material at this depth has insitu shear strengths of around 150 kPa and could not be recovered with the hand auger.

Shallow failures have occurred on the site in recent years, in addition the back analysis for varying soil parameters in Case 2 where the upper soil layer is wet indicate surface failures are likely in wet conditions. The existing steep portion of the slope behind the proposed dwelling on the adjoining lot will be prone to shallow failures of the upper loose layer particularly in high groundwater conditions.

5.2 DEVELOPED ANALYSIS

We have modelled the developed situation with the soil parameters determined as described above, and a 5 Kpa surcharge applied over the building platform area to represent loads from the pole house.

During this analysis we found that the model failed in the upper / lower layer interface when the soil parameters used were those determined above. i.e Upper layer c=0 kPa, ϕ = 30°, Lower layer c=5 kPa, ϕ = 40°. The 2m high retaining wall set into the slope above the vehicle platform across part of the house will prevent failure in this location. To model this we assigned the same soil parameters to the upper layer as the lower layer. The results of our analysis are summarised in the table below with actual results appended. (Appendix 2.)

Soil Properties S1=Upper Layer S2=Lower Layer	Case 1 No Water FS	Case 2 Upper layer wet FS	Case 3 Raised Gnd Water FS	Case 4 Raised Gnd Water with horizontal Drainage	Appendix 2 Printout Numbers
S1 C=0,ϕ=30 S2 C=5,ϕ=40	FS=1.24 S2 Fail Printout 7	FS=0.99 S1 Fail Printout 8	FS= 1.19 S1 Fail Printout 9	FS= 1.24 S1 Fail Printout 10	7,8,9,10
S1 C=5,ϕ=40 S2 C=5,ϕ=40	FS=1.61 S2 Fail Printout 11	FS=1.40 S1 Fail Printout 12	FS= 1.25 S2 Fail Printout 13	FS= 1.54 S2 Fail Printout 14	11,12,13,14

Our analysis with no groundwater present in the developed situation gave a factor of safety of 1.24 (printout no 7), with a failure at the upper / lower layer interface. Modelled with the same soil parameters as the upper layer, the analysis gave a factor of safety of 1.61 (printout 11).

Our analysis with the upper layer wet in the developed situation gave a factor of safety of 0.99 (printout no 8), with a failure at the upper / lower layer interface. Modelled with the same soil parameters as the upper layer, the analysis gave a factor of safety of 1.40 (printout 12).

Our analysis with raised groundwater to the top of the lower layer in the developed situation gave a factor of safety of 1.19 (printout no 9), with a failure at the upper / lower layer interface. Modelled with the same soil parameters as the upper layer, the analysis gave a factor of safety of 1.25 (printout 13). Given the inherent unknowns on this site it would be prudent to install horizontal drains to minimise the possibility of adverse groundwater levels. Therefore we have remodelled the developed situation with a series of horizontal subsoil drains beneath the pole house to reduce the risk of groundwater rising to the top of the lower layer. Refer case 4 in the table above and section 5.3.

This analysis gave a factor of safety of 1.24 (printout 10) with a failure surface at the upper / lower soil layer interface. Modelled with the same soil parameters as the upper layer, the analysis gave a factor of safety of 1.54 (printout 14).

The retaining wall may not necessarily extend to the southern side of the house. By observation the combination of house piles, subsoil drains and the embedment depth of the debris wall should ensure stability levels are at least similar to the part of the house where there is a retaining wall.

5.3 PROPOSED DESIGN APPROACH

The piles for the pole house dwelling to be constructed on Lot 2 will be embedded approximately 5m below the existing surface. This embedment has been calculated to resist governing seismic loads and horizontal loads on piles caused by shallow failures.

The pole house includes a 2m high retaining wall set into the slope above the vehicle platform. This wall is designed to retain the slope above the vehicle platform beneath the pole house as an infinite slope. This is appropriate because shallow failures in the upper layers will be in the form of infinite slope (sheet) failures where the upper layer comes away from the lower firmer layer.

The pole house piles will have a positive effect on the slope stability.

No groundwater was encountered in the borelogs through the centre of the proposed dwelling. However given the discovery of groundwater during the driveway construction and groundwater found in borehole 1 undertaken in 2004 there are perched aquifers present on this site and groundwater will need to be controlled. The above analysis supports this.

A 2m deep vertical subsoil drain, is to be constructed across the length of the dwelling below vehicle deck level (shown as RL 54.0m) to minimise the potential of adverse groundwater levels. Care will need to be taken during construction to ensure this drain does not form a tension crack and undermine slope stability.

As discussed in 5.2 above the subsoil drainage measures should also include horizontal drains bored into the slope below the vehicle deck level (shown as RL 51.0m) back to the rear (southern) lot boundary. The length spacing and details of the drains will need to be confirmed in the specific design. Our preliminary design is 50mm diameter slotted uPVC subsoil drains in a geotextile sock at a maximum of 3m centres. The geotextile sock will need to be either banded onto the pipework and/or care taken during construction to ensure its effectiveness is not reduced. Horizontal drains will need to be flushed and inspected every 3 years to ensure they continue to operate satisfactorily.

The drains will need to be combined and connected to discharge into the stormwater reticulation system as described in 6.0 below.

Construction of the subsoil drainage system will be difficult and require specialised equipment. During construction of house piles the depth of groundwater will be determined and this will enable the most effective position of subsoil drainage to be determined. These activities should be undertaken under the direction of a Chartered Professional Engineer experienced in Geotechnical Engineering.

Preliminary designs for retaining walls above and below the driveway and in the vehicle turntable area are appended (Appendix 3). A pole spacing of 900mm has been used and pole sizes range from 125mm to 375mm with concrete encasement diameters ranging from 450mm to 650mm. Horizontal waling sizes range from single 150 by 50mm timbers in walls below the proposed driveway to two 150 by 50mm timbers in higher walls. Subject to specific design timber waling sizes will be able to be reduced in the upper parts of the higher walls.

In order to protect the dwelling from potential failure of the section at the existing upper portion of the slope, that could be prone to shallow failures, the construction of a debris retaining/deflection wall behind the proposed dwelling will be required. The debris wall will provide positive support to this slope. We have undertaken a preliminary design of a debris wall based on a volume of slip debris calculated from a 30 degree plane taken from the top of the debris wall to the slope above the house. Refer pages 30, 31 and 32 in the appended calculations (Appendix 3). The debris wall will be comprised of 225 mm dia poles encased in concrete in 500mm diameter holes at 1.2m centres. Horizontal walings will be two 150mm by 50 mm timbers.

The bottom waling shall be left off to allow stormwater to pass beneath the debris wall. The debris wall shall be monitored post construction to ensure backfilling by owners does not occur and any debris is cleaned out.

6.0 STORMWATER DISPOSAL

Introducing water to the ground has the potential to raise the pore water pressure and consequently lead to a loss of shear strength of soils, increasing the risk of slope failure. Our analyses, observations and involvement in construction of the driveway retaining walls have demonstrated the slope is sensitive to groundwater levels.

It is therefore essential that stormwater runoff from roofs and paved areas and from subsoil drains is collected via a piped system and discharged to the base of the slope below the existing driveway.

In addition a cut off drain shall be constructed above the proposed dwelling to collect any overland flow from the property above Lot 2. This drain can take the form of a walkway and will act as an overland flow path and divert stormwater to the proposed pole house driveway. Steps will need to be formed at the bottom of the walkway to ensure stormwater flows onto the driveway.

7.0 VEHICLE TURNTABLE SUPPORT

A preliminary design has been undertaken to support the vehicle turntable and calculations are appended (Appendix 3.)

The turntable supports consist of four 250mm diameter reinforced concrete piles extending 3m below the underside of a reinforced concrete slab. The preliminary design also provides a retaining wall with reinforced concrete piles 8m long and 600mm in diameter at 1.7m centres, with horizontal walings comprising of 150mm diameter timber to resist horizontal pressures.

8.0 EARTHWORKS AND CONSTRUCTION CONSIDERATIONS

To gain access for construction of the proposed dwelling it will be necessary to excavate into the existing slope. Excavated material shall be removed from the site so that it does not decrease the existing slope stability.

All earthworks operations, and construction of retaining walls, on this site will need to be undertaken over a short time period and preferably during dry weather to ensure cuttings and slopes remain stable during construction.

Drilling of piles for the proposed pole house will need to be undertaken from the platform created for the vehicle deck, using an excavator with a pile boring attachment capable of reaching the furtherest pile or other specialist machinery.

The drilling of the 8m deep piles to support the vehicle turntable will require specialist machinery. Alternatively when the specific design is undertaken another design solution may be found which requires shallower piles.

All construction including but not limited to, retaining walls, debris walls, vehicle turntable support system, ground conditions, and drainage trenches on this site shall be undertaken under the direction of the Chartered Professional Engineer experienced in Geotechnical Engineering who undertakes the specific design. This Chartered Professional Engineer shall provide a Producer Statement (PS4) for all Construction on this site.

9.0 CONCLUSIONS AND RECOMMENDATIONS

The proposed Lot 2 site is considered geotechnically suitable for residential development of a pole house dwelling as shown on drawings 011050-2-200 to 011050-2-205, subject to the following:

1. This report addresses the preliminary design of a pole house for Lot 2. The Lot 2 development shall be specifically designed by a Chartered Professional Engineer experienced in Geotechnical Engineering, including but not limited to, retaining walls, debris walls, vehicle turntable support

systems, slope stability, horizontal drainage systems, and drainage trenches.

2. The pile embedments for the pole house dwelling to be constructed on Lot 2 have been calculated to resist governing seismic loads and horizontal loads on piles caused by shallow failures. The specific design shall allow for these horizontal loads.

3. A carousel, vehicle turntable and support system are included in the pole house preliminary design to increase the practicality of vehicle manoeuvrability.

4. Preliminary designs for timber pole retaining walls above and below the driveway and in the vehicle platform turntable area have been prepared.

5. A debris wall shall be constructed behind the proposed Lot 2 dwelling, at the approximate position marked on drawing 011050-2-201. The bottom waling shall be left off the debris wall to allow stormwater to pass beneath the debris wall. The debris wall shall be monitored post construction to ensure backfilling by owners does not occur and any debris is cleaned out. (Refer section 10)

6. A 2m deep vertical drain, across the length of the dwelling below the vehicle deck (shown as RL 54.0m) at the rear of the building shall be constructed to drain potential groundwater. The position of this drain has been marked drawing 011050-2-201. Care will need to be taken during construction to ensure this drain does not form a tension crack and undermine slope stability.

7. It would be prudent to install horizontal drains to minimise the possibility of adverse groundwater levels. Therefore horizontal drains should be bored into the slope below the vehicle deck level (shown as RL 51.0m) to the rear (southern) lot boundary. The length spacing and details of the drains will need to be confirmed in the specific design. The preliminary design is 50mm diameter slotted uPVC subsoil drains in a geotextile sock at a maximum of 3m centres. The geotextile sock will need to be either banded onto the pipework and/or care taken during construction to ensure its effectiveness is not reduced during installation. Horizontal drains will need to be flushed and inspected every 3 years to ensure they are able to drain the slope. (Refer section 10).

8. Stormwater and collected groundwater from horizontal drains, subsoil drains, roofs, and paved areas should be collected via a piped system and discharged to the base of the slope below the existing driveway.

9. A cut-off drain shall be constructed above the proposed dwelling to collect any overland flow from the property above lot 2. The cut-off drain

can be formed as a walkway to form an overland flow path and divert stormwater via formed steps to the proposed pole house driveway.

10. Material from any excavations or pile boring shall be taken off the site.

11. All construction including but not limited to, retaining walls, debris walls, vehicle turntable support system, ground conditions, and drainage trenches and systems on this site shall be undertaken under the direction of the Chartered Professional Engineer experienced in Geotechnical Engineering who undertakes the specific design. This Chartered Professional Engineer shall provide a Producer Statement (PS4) for all Construction on this site.

12. Both Option 2 (where propped retaining structures form part of the dwelling) and Option 3 (to provide a level building platform on the existing slope by constructing a series of tied back retaining walls) will be subject to the above recommendations and further geotechnical analysis and report.

10.0 POST CONSTRUCTION SITUATION

The debris wall shall be monitored post construction to ensure backfilling by owners does not occur and any debris is cleaned out.

Horizontal drains will need to be flushed and inspected every 3 years to ensure they are able to drain the slope.

Monitoring requirements shall be confirmed upon completion of the site works, as part of the geotechnical certification required in item 11 of the conclusions and recommendations.

11.0 LIMITATIONS

This report has been prepared for the particular project described to us and its extent is limited to the scope of work agreed between the client and Harrison Grierson Consultants Limited. No responsibility is accepted by Harrison Grierson Consultants Limited or its directors, servants, agents, staff or employees for the accuracy of information provided by third parties and/or the use of any part of this report in any other context or for any other purposes.

This report addresses the preliminary design of a pole house for Lot 2. The Lot 2 dwelling will need to be specifically designed by a Chartered Professional Engineer experienced in Geotechnical Engineering. The preliminary design, calculations and drawings included in this report are not intended for use in a Building Consent Application or for construction purposes.

This report is for the use by Steven Thornton only, and should not be used or relied upon by any other person or entity or for any other project.

N:\1510\011050\Phase 1\400 Tech\Site Suitability - Pole House - Report For Subdivision June 2007, FINAL.doc

APPENDIX 1

Site Investigation Site Investigation Data: Borelogs and Scala Penetrometers

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laboratory services

CLIENT: Thornton

PROJECT: , 24 Wainui Road, Ohope

BOREHOLE No: HA1

Sheet 1 of 1

Drill Type: Exposed cut and 50mm hand auger
Drilled By: Mike
Date Started: 20/5/04
Date Finished: 20/5/04
Project No:
Coordinates:
Ground Elevation:
Water Level: 2.0m
Logged By: MAC
Checked By:
Shear Vane No:

GROUND WATER	DEPTH (m)	GRAPHIC LOG	SOIL DESCRIPTION (MAIN\minor components, strength, colour structure, weathering)
	0.0		TOPSOIL, black moist, with root fragments
			silt SAND (fg) light brown to brown
	0.5		sand SILT, with rusty brown patches surrounding soft rock
			TOPSOIL, black and moist with root fragments
			sand SILT, (fg) light brown
	1.0		At 1.2m rusty brown patches were present
			At 1.3m orangey brown, sand SILT (fg) with traces of angular 5mm soft rock gravels, which could be crushed with finger nails
	1.5		At 1.5m mixied gravels from 5mm to 10mm angular shape, grey could not be crushed by fingers
			At 1.7m rusty bown, patches present
Groundwater Hit	2.0		At 2.2m on removal < 10% of core remained and was hard too auger
			END OF BORE. 2.2 METRES. Groundwater hit, too hard to hand auger
	2.5		
	3.0		

DEPTH (m)

NATURAL WATER CONTENT △
LIQUID LIMIT ×
PLASTIC LIMIT □
50 100 150 (%)

SHEAR STRENGTH O v
REMOULDED SHEAR ⊙ r
POCKET PENETROMETER O p
50 100 150 (kPa)

LABORATORY TESTS

SOIL BH.GPJ GEOLAB.GDT 20/05/04

Phone: 07 578 0023

geolab
air, soil & water
laboratory services

CLIENT: Thornton

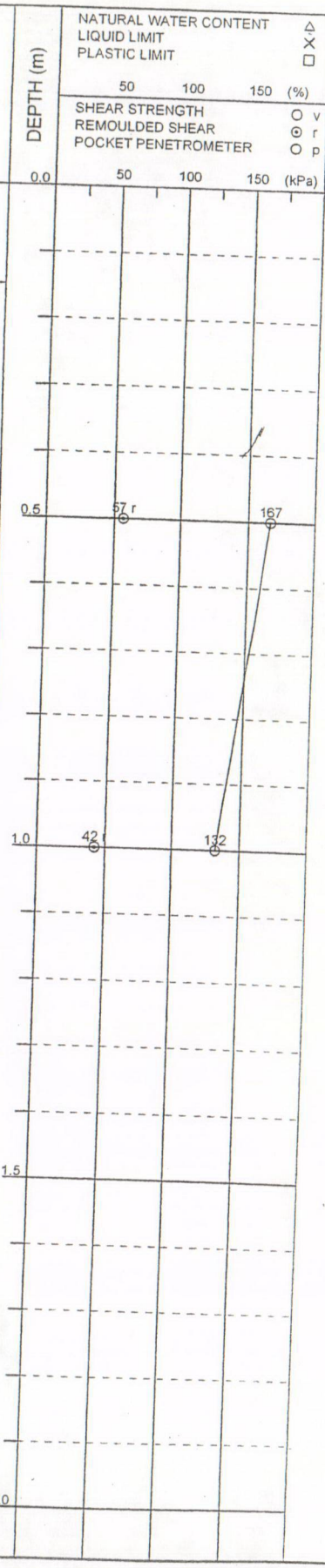
PROJECT: , 24 Wainui Road, Ohope

BOREHOLE No: HA 2

Sheet 1 of 1

Drill Type:	50 mm Hand Auger	Project No:		Logged By:	MAC
Drilled By:	Mike	Coordinates:		Checked By:	
Date Started:	27/5/04	Ground Elevation:		Shear Vane No:	
Date Finished:	27/5/04	Water Level:			

GROUND WATER	DEPTH (m)	GRAPHIC LOG	SOIL DESCRIPTION MAIN\minor components, strength, colour structure, weathering
	0.0		TOPSOIL, dark black, moist
			sandy SILT, slightly moist, low plasticity, crumbly
	0.5		
	1.0		topsoil SILT, light brown, with some traces of topsoil, and tree roots ranging from 30mm to 10mm in length
			SILT with traces of 5mm gravels (angular) light brown, crumbly
	1.5		with a large gravel 20mm in length (smooth) and specks of white mouable sand (fg) SILT
			END OF BORE. 1.5 METRES. Something. solid hit, too hard too penetrate
	2.0		



LABORATORY TESTS

SOIL BH.GPJ GEOLAB.GDT 28/05/04

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SCALAPENETROMETER RESULT SHEET

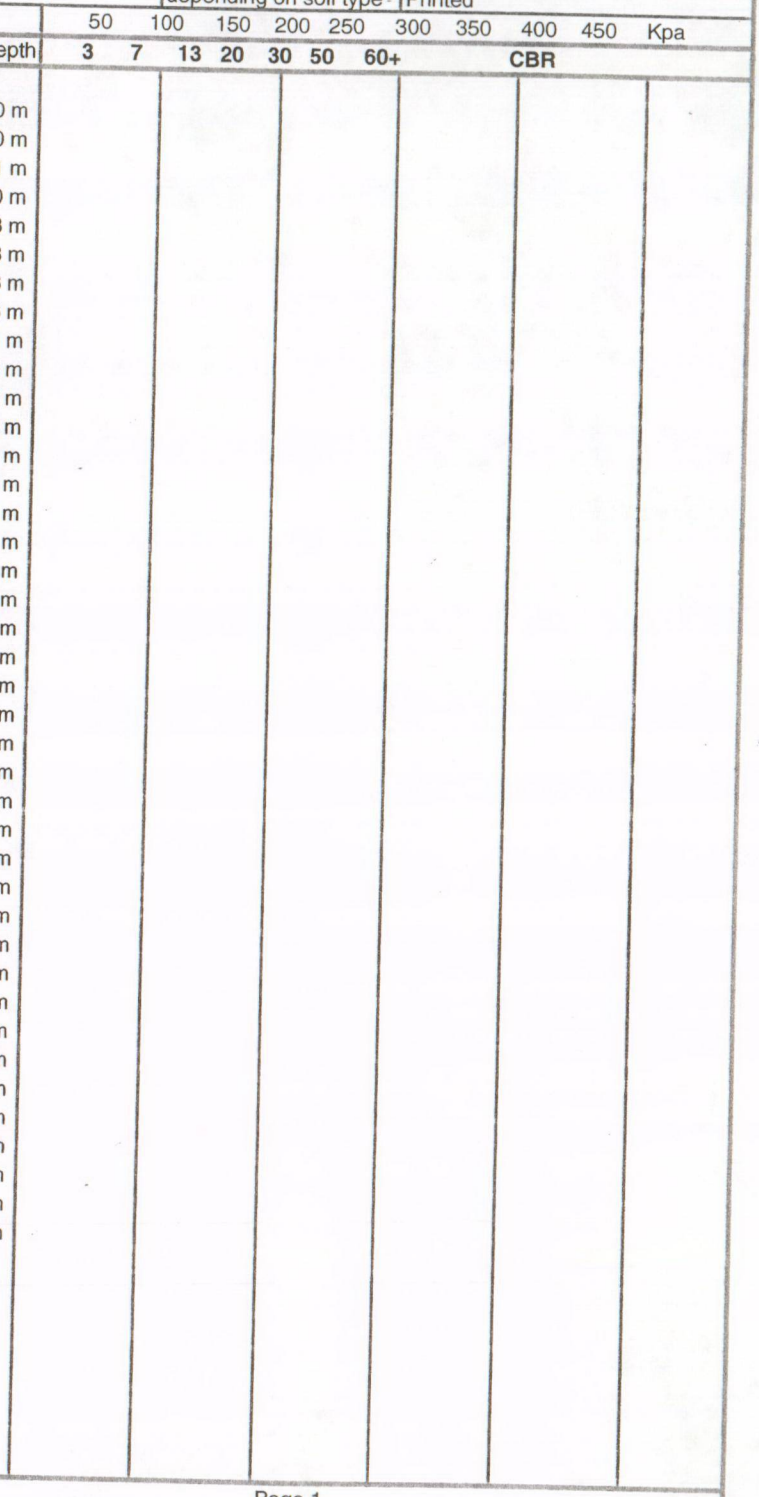
CLIENT: Thornton

PROJECT: 24 Wainui Road

NB safety factor 1.6 -- 5. depending on soil type

File No 71 11050
Date tested 20/05/04
Tested by MC
Printed

Reading	Blows	diff	Pen/blow	Bearing	Depth
P1 at 1m					
0.86	0		ROD		1.00 m
0.76	10	0.100	10 mm		1.10 m
0.65	20	0.110	6 mm		1.21 m
0.56	20	0.090	5 mm		1.30 m
0.43	20	0.130	7 mm		1.43 m
0.33	20	0.100	5 mm		1.53 m
1.40	0	NEW	ROD		1.53 m
1.17	20	0.230	12 mm		1.76 m
0.92	20	0.250	13 mm		2.01 m
0.92	1	0.005	5 mm		2.02 m
0.71	20	0.205	10 mm		2.22 m
0.59	20	0.120	6 mm		2.34 m
0.40	30	0.190	6 mm		2.53 m
0.27	20	0.130	7 mm		2.66 m
1.27	0	NEW	ROD		2.66 m
1.14	20	0.130	7 mm		2.79 m
0.96	30	0.180	6 mm		2.97 m
0.84	20	0.120	6 mm		3.09 m
0.66	30	0.180	6 mm		3.27 m
0.55	20	0.110	6 mm		3.38 m
1.55	0	NEW	ROD		3.38 m
1.39	20	0.160	8 mm		3.54 m
1.28	20	0.110	5 mm		3.65 m
1.16	20	0.120	6 mm		3.77 m
1.04	20	0.120	6 mm		3.89 m
0.93	20	0.110	6 mm		4.00 m
0.81	20	0.120	6 mm		4.12 m
0.71	20	0.100	5 mm		4.22 m
0.60	20	0.110	6 mm		4.33 m
0.50	20	0.100	5 mm		4.43 m
0.40	20	0.100	5 mm		4.53 m
0.30	20	0.100	5 mm		4.63 m
1.10	0	NEW	ROD		4.63 m
0.94	30	0.160	5 mm		4.79 m
0.85	20	0.090	5 mm		4.88 m
0.75	20	0.100	5 mm		4.98 m
0.65	20	0.100	5 mm		5.08 m
0.55	20	0.100	5 mm		5.18 m
0.46	20	0.090	5 mm		5.27 m
0.37	20	0.090	5 mm		5.36 m



This spreadsheet has been developed with reference to the following publication

"DETERMINATION OF ALLOWABLE BEARING PRESSURE UNDER SMALL STRUCTURES"

Author : M,J, Stockwell B,E, C,ENG. M.I.C.E. (Member)
Published by New Zealand Engineering (32,6) 15 June 1977

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SCALAPENETROMETER RESULT SHEET

CLIENT: Thornton

PROJECT: 24 Wainui Road

NB safety factor 1.6 -- 5. depending on soil type

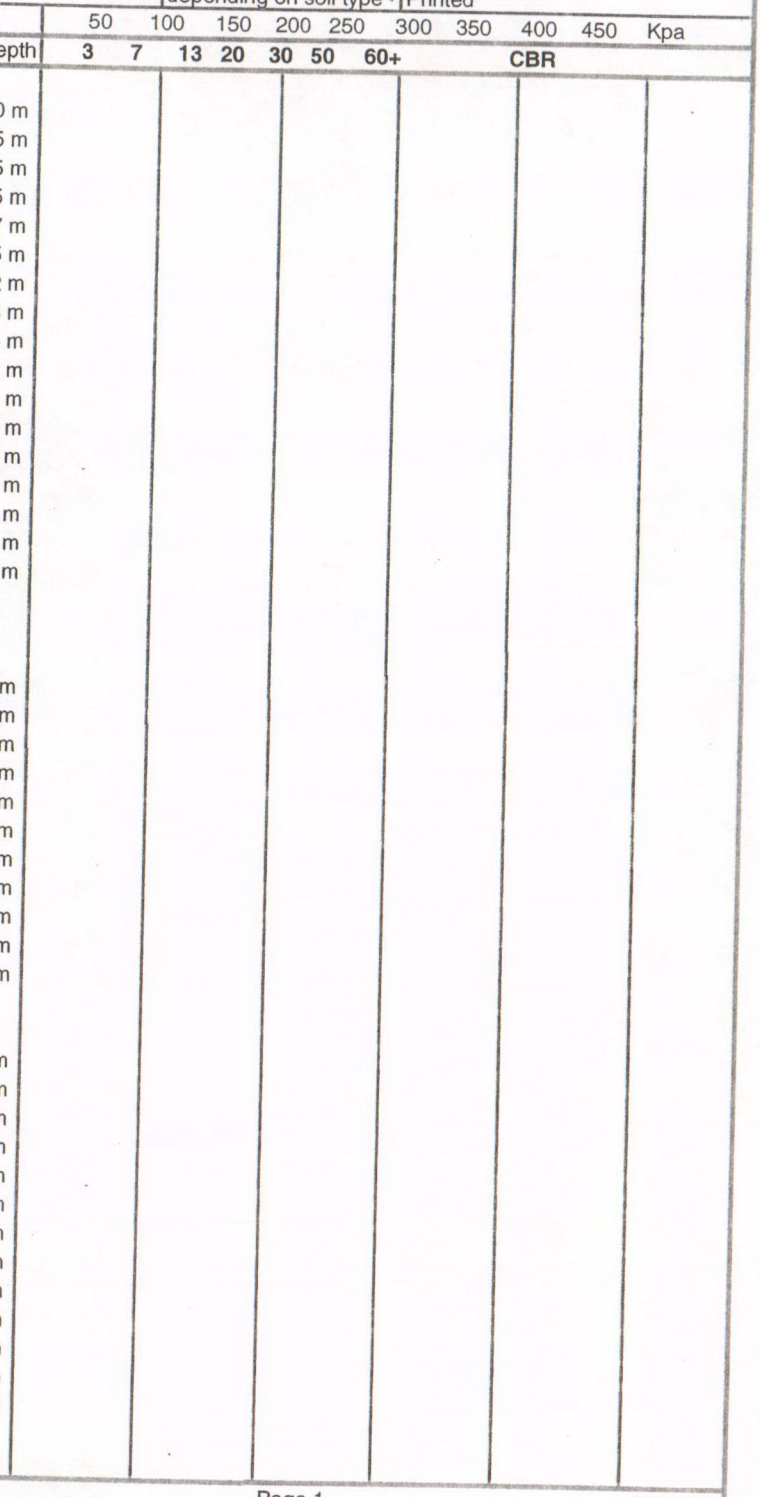
File No 71 11050

Date tested 27/05/04

Tested by MC

Printed

Reading	Blows	diff	Pen/blow	Bearing	Depth
P1 at 1.5m					
0.40	0		ROD		1.50 m
0.35	10	0.050	5 mm		1.55 m
0.25	10	0.100	10 mm		1.65 m
1.25	0	NEW	ROD		1.55 m
1.13	20	0.120	6 mm		1.67 m
1.05	20	0.080	4 mm		1.75 m
0.88	20	0.170	9 mm		1.92 m
0.67	20	0.210	11 mm		2.13 m
0.54	20	0.130	7 mm		2.26 m
0.43	20	0.110	6 mm		2.37 m
0.27	15	0.160	11 mm		2.53 m
0.24	5	0.030	6 mm		2.56 m
1.24	0	NEW	ROD		2.56 m
1.00	30	0.240	8 mm		2.80 m
0.82	30	0.180	6 mm		2.98 m
0.72	20	0.100	5 mm		3.08 m
0.55	30	0.170	6 mm		3.25 m
P2 alongside P1					
0.88	0		ROD		0.00 m
0.73	1	0.150	150 mm		0.15 m
0.66	1	0.070	70 mm		0.22 m
0.53	3	0.130	43 mm		0.35 m
0.41	5	0.120	24 mm		0.47 m
0.30	10	0.110	11 mm		0.58 m
1.30	0	NEW	ROD		0.58 m
1.24	5	0.060	12 mm		0.64 m
1.03	15	0.210	14 mm		0.85 m
0.80	15	0.230	15 mm		1.08 m
0.63	15	0.170	11 mm		1.25 m
P3 above P1 at top of scarp					
0.80	0		ROD		0.00 m
0.60	1	0.200	200 mm		0.20 m
0.40	1	0.200	200 mm		0.40 m
0.32	1	0.080	80 mm		0.48 m
0.24	1	0.080	80 mm		0.56 m
1.15	0	NEW	ROD		0.56 m
0.90	5	0.250	50 mm		0.81 m
0.58	11	0.320	29 mm		1.13 m
0.42	5	0.160	32 mm		1.29 m
0.26	6	0.160	27 mm		1.45 m
0.25	1	0.010	10 mm		1.46 m
0.24	1	0.010	10 mm		1.47 m
0.23	1	0.010	10 mm		1.48 m



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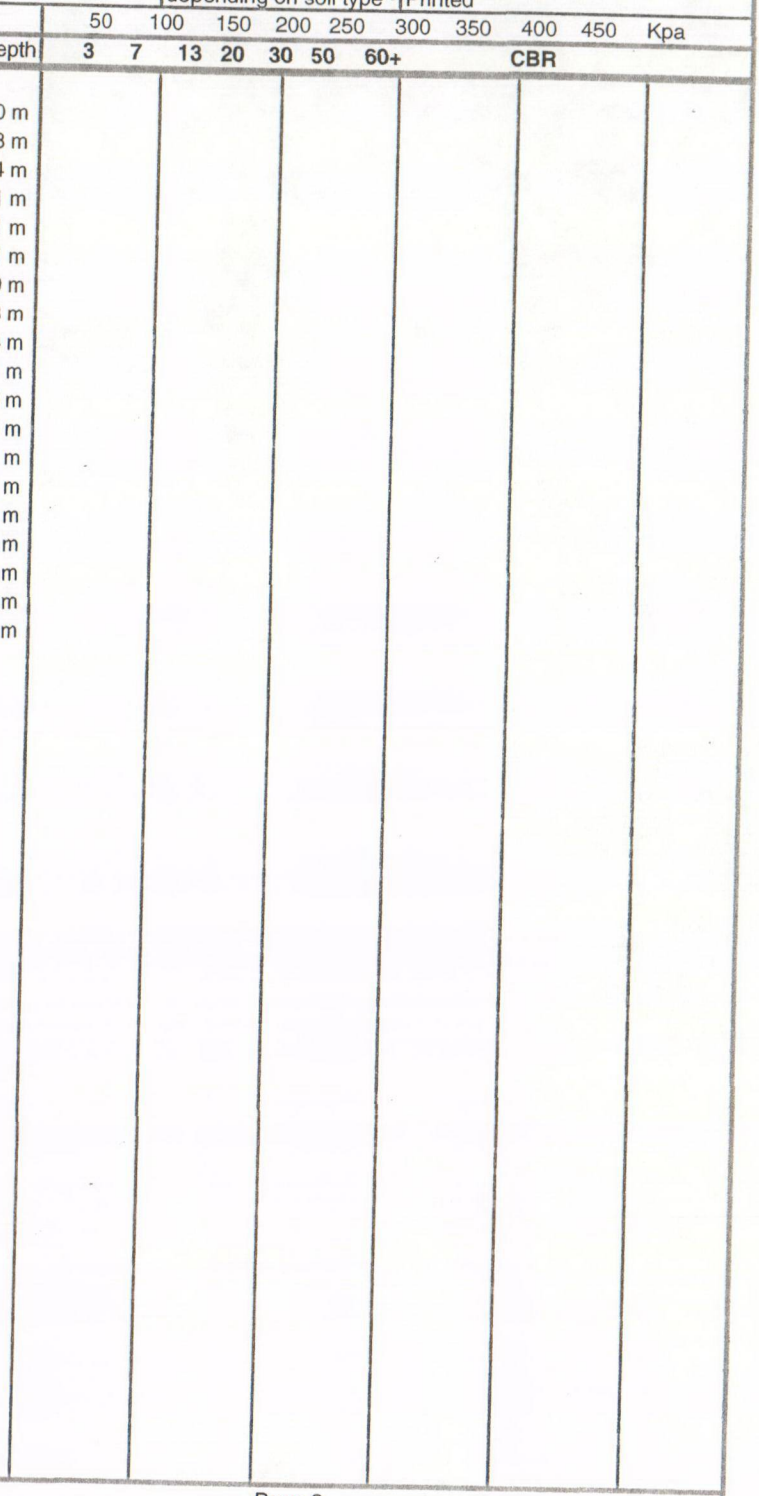
CLIENT: Thornton

PROJECT: 24 Wainui Road

NB safety factor 1.6 -- 5. depending on soil type

File No 71 11050
Date tested 27/05/04
Tested by MC
Printed

Reading	Blows	diff	Pen/blow	Bearing	Depth
P4 below P1 at top of scarp					
0.93	0		ROD		0.00 m
0.80	1	0.130	130 mm		0.13 m
0.69	1	0.110	110 mm		0.24 m
0.42	3	0.380	127 mm		0.51 m
0.22	3	0.200	67 mm		0.71 m
1.22	0	NEW	ROD		0.71 m
0.94	5	0.280	56 mm		0.99 m
0.55	9	0.390	43 mm		1.38 m
0.39	7	0.160	23 mm		1.54 m
0.32	1	0.070	70 mm		1.61 m
0.28	1	0.040	40 mm		1.65 m
1.28	0	NEW	ROD		1.65 m
1.08	10	0.200	20 mm		1.85 m
1.01	5	0.070	14 mm		1.92 m
0.87	10	0.140	14 mm		2.06 m
0.75	10	0.120	12 mm		2.18 m
0.72	2	0.030	15 mm		2.21 m
0.68	2	0.040	20 mm		2.25 m
0.66	2	0.020	10 mm		2.27 m



This spreadsheet has been developed with reference to the following publication

"DETERMINATION OF ALLOWABLE BEARING PRESSURE UNDER SMALL STRUCTURES"

Author : M,J, Stockwell B,E, C,ENG. M.I.C.E. (Member)
Published by New Zealand Engineering (32,6) 15 June 1977

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CLIENT: Steve Thornton

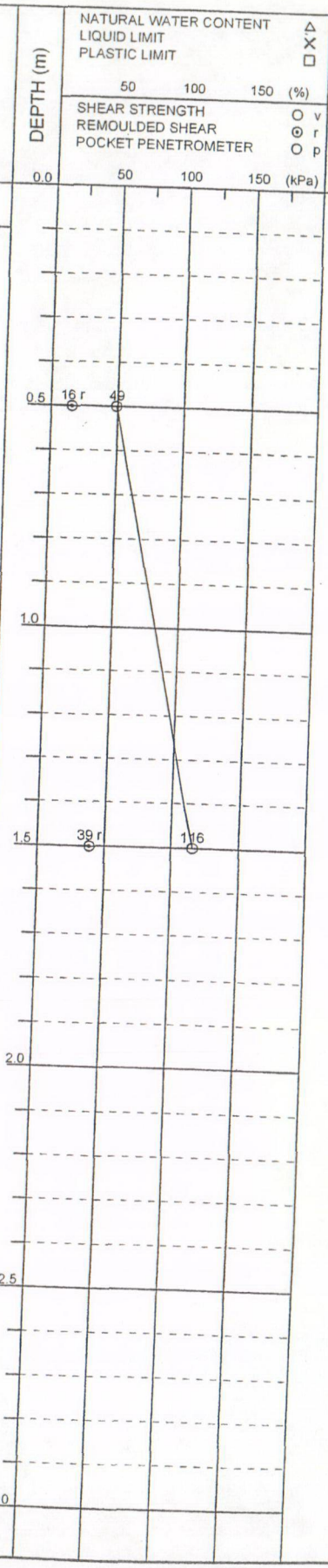
PROJECT: , Subdivison of Lot DP 327498, Wainui Rd, Ohope

BOREHOLE No: HA 3

Sheet 1 of 1

Drill Type:	50 mm Hand Auger	Project No:	1510 011050 01	Logged By:	MAC
Drilled By:	MAC	Coordinates:		Checked By:	
Date Started:	26/5/05	Ground Elevation:		Shear Vane No:	
Date Finished:	26/5/05	Water Level:			

GROUND WATER	DEPTH (m)	GRAPHIC LOG	SOIL DESCRIPTION MAIN\minor components, strength, colour structure, weathering
	0.0		TOPSOIL black soft
			SAND silt with rusty brown patches, (fg) light brown, moist
	0.5		
	1.0		Gravel hit therefore shear vane not possible to penetrate effectively
			SILT sand with gravels minor rusty brown surface staining, (Gravels some circular and subangular 10mm in longest dimension) light brown,
	1.5		SILT sand with minimal gravels 5mm subangular, wet, light brownish white
	2.0		SAND silt, firming up at 2.0, moist, hard to auger and very hard to remove auger. Light brown, Cannot penetrate shear at 2.0 and 2.5m
	2.5		END OF BORE. 2.5 METRES. Minimial Recovery, Too Hard to Remove Hard Auger
	3.0		



LABORATORY TESTS

SOIL BH2.GPJ GEOLAB.GDT 24/08/05

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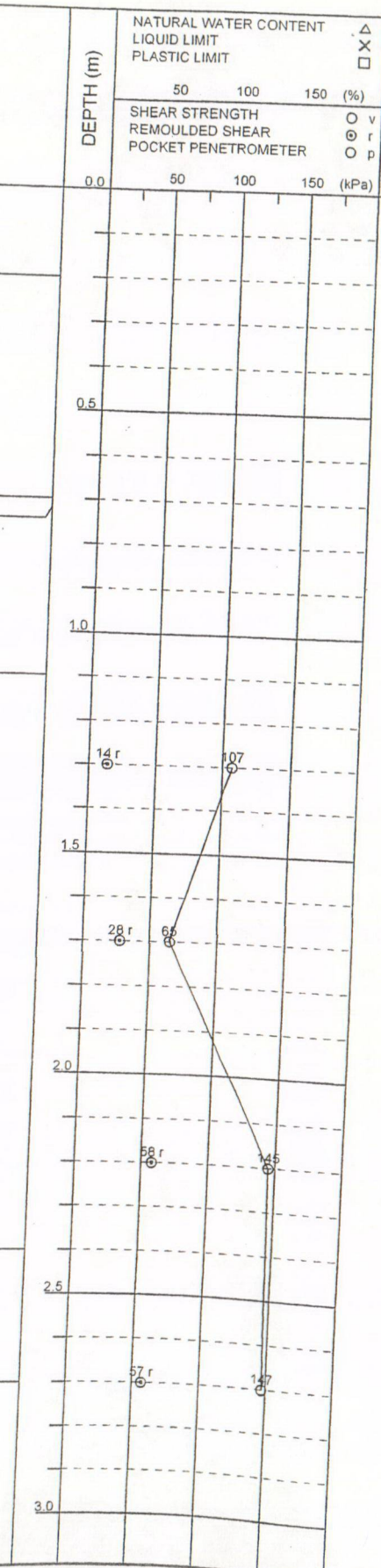
PROJECT: , Subdivison of Lot DP 327498, Wainui Rd, Ohope

BOREHOLE No: HA 4

Sheet 1 of 1

Drill Type:	50 mm Hand Auger	Project No:	1510 011050 01	Logged By:	MAC
Drilled By:	MAC	Coordinates:		Checked By:	
Date Started:	26/5/05	Ground Elevation:		Shear Vane No:	
Date Finished:	26/5/05	Water Level:			

GROUND WATER	DEPTH (m)	GRAPHIC LOG	SOIL DESCRIPTION MAIN\minor components, strength, colour structure, weathering
	0.0		TOPSOIL
			SAND with topsoil (fg) grey
	0.5		
			SAND with topsoil greyish light brown
			TOPSOIL black moist soft
	1.0		
			SAND silt with topsoil odour, grey
	1.5		
	2.0		
	2.5		SILT sand light brown, bands occourring at 2.4m becoming more consistent at 2.5m END OF BORE. 2.5 METRES. Minimial Recovery, Too Hard to Remove Hard Auger
	3.0		



LABORATORY TESTS

SOIL_BH2.GPJ GEOLAB.GDT 24/08/05

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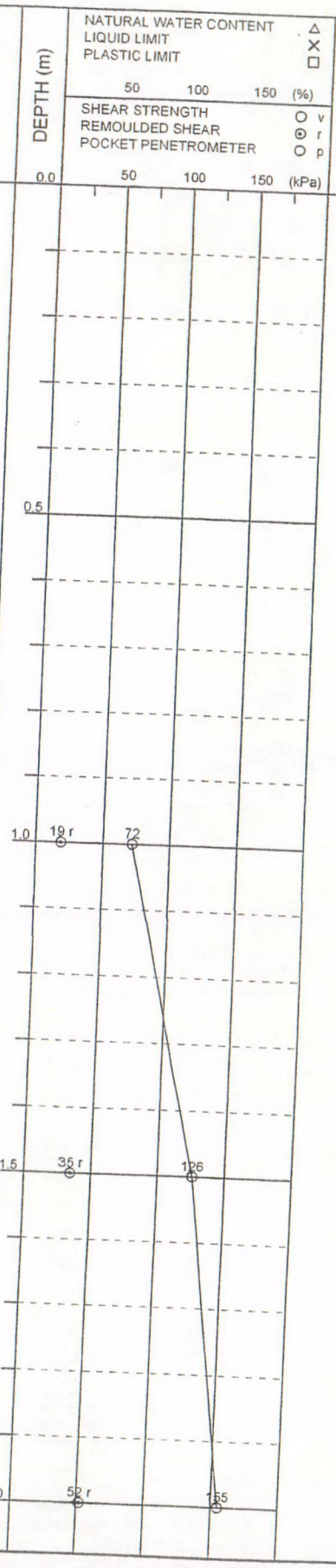
PROJECT: , Subdivison of Lot DP 327498, Wainui Rd, Ohope

BOREHOLE No: HA 5

Sheet 1 of 1

Drill Type:	50 mm Hand Auger	Project No:	1510 011050 01	Logged By:	MAC
Drilled By:	MAC	Coordinates:		Checked By:	
Date Started:	26/5/05	Ground Elevation:		Shear Vane No:	
Date Finished:	26/5/05	Water Level:			

GROUND WATER	DEPTH (m)	GRAPHIC LOG	SOIL DESCRIPTION MAIN\minor components, strength, colour structure, weathering
	0.0		TOPSOIL black, moist
	0.5		SAND silt light brown (fg) moist
	1.0		
	1.5		
	2.0		END OF BORE. 2.0 METRES. Minimial Recovery, Too Hard to Remove Hard Auger



LABORATORY TESTS

SOIL_BH2.GPJ GEOLAB.GDT 24/08/05

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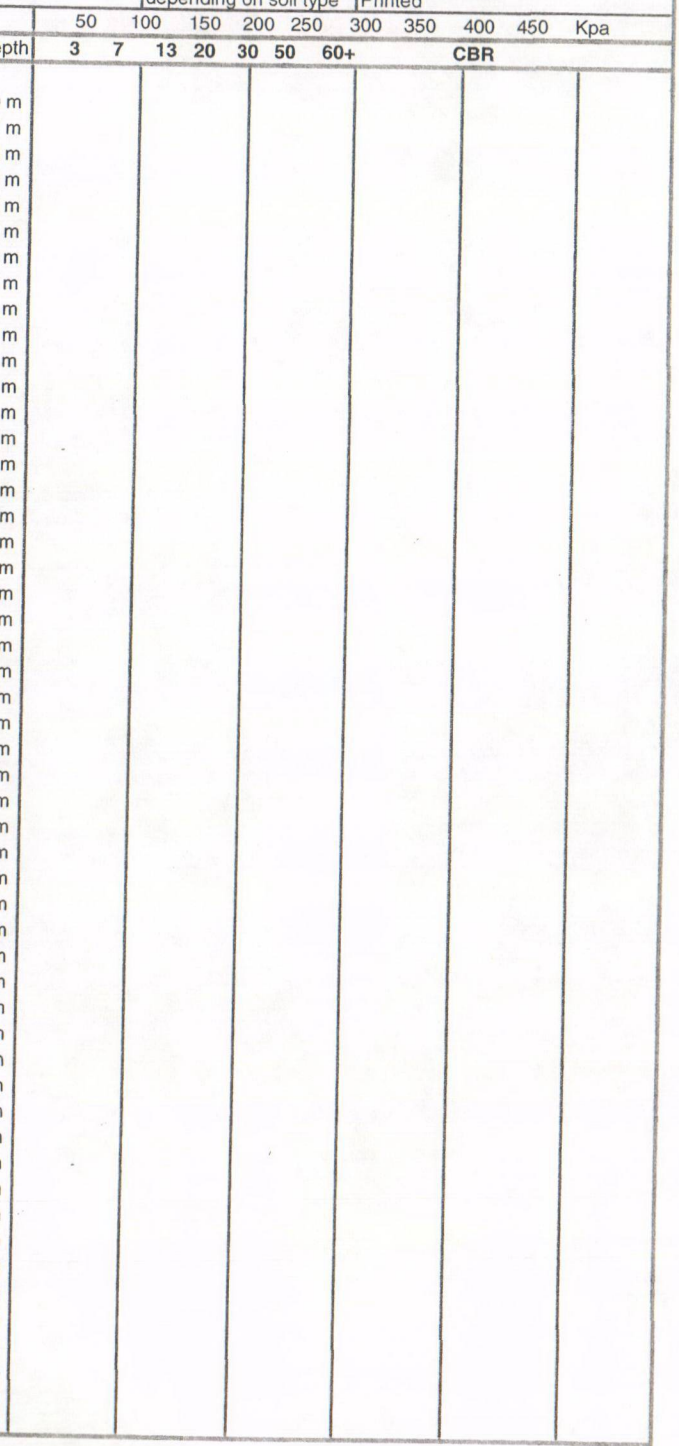
CLIENT: Steve Thornton

PROJECT: Soil Investigation, Wainui Rd, Ohope

NB safety factor 1.6 -- 5. depending on soil type

File No 1510 011050
Date tested 27/05/05
Tested by MC
Printed

Reading	Blows	diff	Pen/blow	Bearing	Depth
P3					
1.64	0		ROD		0.00 m
1.53	1	0.110	110 mm		0.11 m
1.40	1	0.130	130 mm		0.24 m
1.27	1	0.130	130 mm		0.37 m
1.20	1	0.070	70 mm		0.44 m
1.10	1	0.100	100 mm		0.54 m
1.05	1	0.050	50 mm		0.59 m
0.97	1	0.080	80 mm		0.67 m
0.90	1	0.070	70 mm		0.74 m
0.80	2	0.100	50 mm		0.84 m
0.75	2	0.050	25 mm		0.89 m
0.69	2	0.110	55 mm		0.95 m
0.60	2	0.090	45 mm		1.04 m
0.51	3	0.090	30 mm		1.13 m
0.46	3	0.050	17 mm		1.18 m
0.43	3	0.030	10 mm		1.21 m
0.36	4	0.070	18 mm		1.28 m
0.30	4	0.060	15 mm		1.34 m
1.22	0	NEW	ROD		1.34 m
1.14	4	0.080	20 mm		1.42 m
1.08	2	0.060	30 mm		1.48 m
1.02	5	0.060	12 mm		1.54 m
0.96	5	0.060	12 mm		1.60 m
0.90	6	0.060	10 mm		1.66 m
0.83	4	0.070	18 mm		1.73 m
0.77	5	0.060	12 mm		1.79 m
0.62	10	0.150	15 mm		1.94 m
0.52	10	0.100	10 mm		2.04 m
0.39	10	0.130	13 mm		2.17 m
1.31	0	NEW	ROD		2.17 m
1.21	10	0.100	10 mm		2.27 m
1.13	10	0.080	8 mm		2.35 m
1.06	10	0.070	7 mm		2.42 m
0.98	10	0.080	8 mm		2.50 m
0.90	10	0.080	8 mm		2.58 m
0.82	10	0.080	8 mm		2.66 m
0.74	10	0.080	8 mm		2.74 m
0.68	10	0.060	6 mm		2.80 m
0.61	10	0.070	7 mm		2.87 m
0.54	10	0.070	7 mm		2.94 m
0.49	10	0.050	5 mm		2.99 m
1.29	0	NEW	ROD		2.99 m
1.17	15	0.120	8 mm		3.11 m
1.04	20	0.130	6 mm		3.24 m
0.95	15	0.090	6 mm		3.33 m
0.85	20	0.100	5 mm		3.43 m
0.80	10	0.050	5 mm		3.48 m
0.73	15	0.070	5 mm		3.55 m
0.64	15	0.090	6 mm		3.64 m
0.57	15	0.070	5 mm		3.71 m
0.50	15	0.070	5 mm		3.78 m
0.40	15	0.100	7 mm		3.88 m



This spreadsheet has been developed with reference to the following publication

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Published by New Zealand Engineering (32,6) 15 June 1977

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File No 1510 011050
Date tested 27/05/05
Tested by MC
Printed

CLIENT: Steve Thornton
PROJECT: Soil Investigation, Wainui Rd, Ohope

NB safety factor 1.6 -- 5. depending on soil type

Reading	Blows	diff	Pen/blow	Bearing	Depth
P4					
1.74	0		ROD		0.00 m
1.55	1	0.190	190 mm		0.19 m
1.20	1	0.350	350 mm		0.54 m
1.04	1	0.160	160 mm		0.70 m
0.86	1	0.180	180 mm		0.88 m
0.71	1	0.150	150 mm		1.03 m
0.60	2	0.110	55 mm		1.14 m
0.35	2	0.250	125 mm		1.39 m
0.26	2	0.090	45 mm		1.48 m
1.16	0	NEW	ROD		1.48 m
1.06	3	0.100	33 mm		1.58 m
1.00	3	0.060	20 mm		1.64 m
0.91	5	0.090	18 mm		1.73 m
0.86	4	0.050	13 mm		1.78 m
0.80	5	0.060	12 mm		1.84 m
0.74	5	0.060	12 mm		1.90 m
0.65	6	0.090	15 mm		1.99 m
0.59	5	0.060	12 mm		2.05 m
0.50	6	0.090	15 mm		2.14 m
0.41	6	0.090	15 mm		2.23 m
0.35	4	0.060	15 mm		2.29 m
1.22	0	NEW	ROD		2.29 m
1.16	4	0.060	15 mm		2.35 m
1.10	5	0.060	12 mm		2.41 m
1.00	10	0.100	10 mm		2.51 m
0.95	5	0.050	10 mm		2.56 m
0.86	10	0.090	9 mm		2.65 m
0.78	11	0.080	7 mm		2.73 m
0.69	10	0.090	9 mm		2.82 m
0.60	10	0.090	9 mm		2.91 m
0.51	10	0.090	9 mm		3.00 m
0.42	10	0.090	9 mm		3.09 m
0.34	10	0.080	8 mm		3.17 m
1.00	0	NEW	ROD		3.17 m
0.93	10	0.070	7 mm		3.24 m
0.81	10	0.120	12 mm		3.36 m
0.75	10	0.060	6 mm		3.42 m
0.68	10	0.070	7 mm		3.49 m
0.60	10	0.080	8 mm		3.57 m
0.52	10	0.080	8 mm		3.65 m
0.46	10	0.060	6 mm		3.71 m
0.40	10	0.060	6 mm		3.77 m
0.35	10	0.050	5 mm		3.82 m
0.32	5	0.030	6 mm		3.85 m

50	100	150	200	250	300	350	400	450	Kpa
3	7	13	20	30	50	60+		CBR	

This spreadsheet has been developed with reference to the following publication

"DETERMINATION OF ALLOWABLE BEARING PRESSURE UNDER SMALL STRUCTURES"

Author : M,J, Stockwell B,E, C,ENG. M.I.C.E. (Member)
Published by New Zealand Engineering (32,6) 15 June 1977

HARRISON GRIERSON CONSULTANTS LTD

SCALAPENETROMETER RESULT SHEET

CLIENT: Steve Thornton

PROJECT: Soil Investigation, Wainui Rd, Ohope

NB safety factor 1.6 -- 5. depending on soil type

File No 1510 011050
Date tested 27/05/05
Tested by MC
Printed

						50	100	150	200	250	300	350	400	450	Kpa
Reading	Blows	diff	Pen/blow	Bearing	Depth	3	7	13	20	30	50	60+		CBR	
P5															
1.57	0		ROD		0.00 m										
1.38	1	0.190	190 mm		0.19 m										
1.15	1	0.230	230 mm		0.42 m										
1.02	1	0.130	130 mm		0.55 m										
0.90	1	0.120	120 mm		0.67 m										
0.78	1	0.120	120 mm		0.79 m										
0.71	1	0.070	70 mm		0.86 m										
0.65	1	0.060	60 mm		0.92 m										
0.61	1	0.040	40 mm		0.96 m										
0.58	1	0.030	30 mm		0.99 m										
0.52	2	0.060	30 mm		1.05 m										
0.44	3	0.080	27 mm		1.13 m										
0.36	3	0.080	27 mm		1.21 m										
1.18	0	NEW	ROD		1.21 m										
1.00	10	0.180	18 mm		1.39 m										
0.86	10	0.140	14 mm		1.53 m										
0.72	10	0.140	14 mm		1.67 m										
0.56	10	0.160	16 mm		1.83 m										
0.50	5	0.060	12 mm		1.89 m										
0.42	5	0.080	16 mm		1.97 m										
0.36	5	0.060	12 mm		2.03 m										
1.27	0	NEW	ROD		2.03 m										
1.11	12	0.160	13 mm		2.19 m										
0.98	10	0.130	13 mm		2.32 m										
0.87	10	0.110	11 mm		2.43 m										
0.79	6	0.080	13 mm		2.51 m										
0.67	10	0.120	12 mm		2.63 m										
0.55	10	0.120	12 mm		2.75 m										
0.44	10	0.110	11 mm		2.86 m										
0.34	10	0.100	10 mm		2.96 m										
1.25	0	NEW	ROD		2.96 m										
1.14	10	0.110	11 mm		3.07 m										
1.05	10	0.090	9 mm		3.16 m										
0.97	10	0.080	8 mm		3.24 m										
0.89	10	0.080	8 mm		3.32 m										
0.83	10	0.060	6 mm		3.38 m										
0.79	10	0.040	4 mm		3.42 m										
0.73	10	0.060	6 mm		3.48 m										
0.70	5	0.030	6 mm		3.51 m										
0.67	5	0.030	6 mm		3.54 m										
0.62	5	0.050	10 mm		3.59 m										
0.57	5	0.050	10 mm		3.64 m										
0.52	5	0.050	10 mm		3.69 m										
0.48	5	0.040	8 mm		3.73 m										
0.45	3	0.030	10 mm		3.76 m										
0.42	3	0.030	10 mm		3.79 m										
0.38	5	0.040	8 mm		3.83 m										
0.35	5	0.030	6 mm		3.86 m										

This spreadsheet has been developed with reference to the following publication

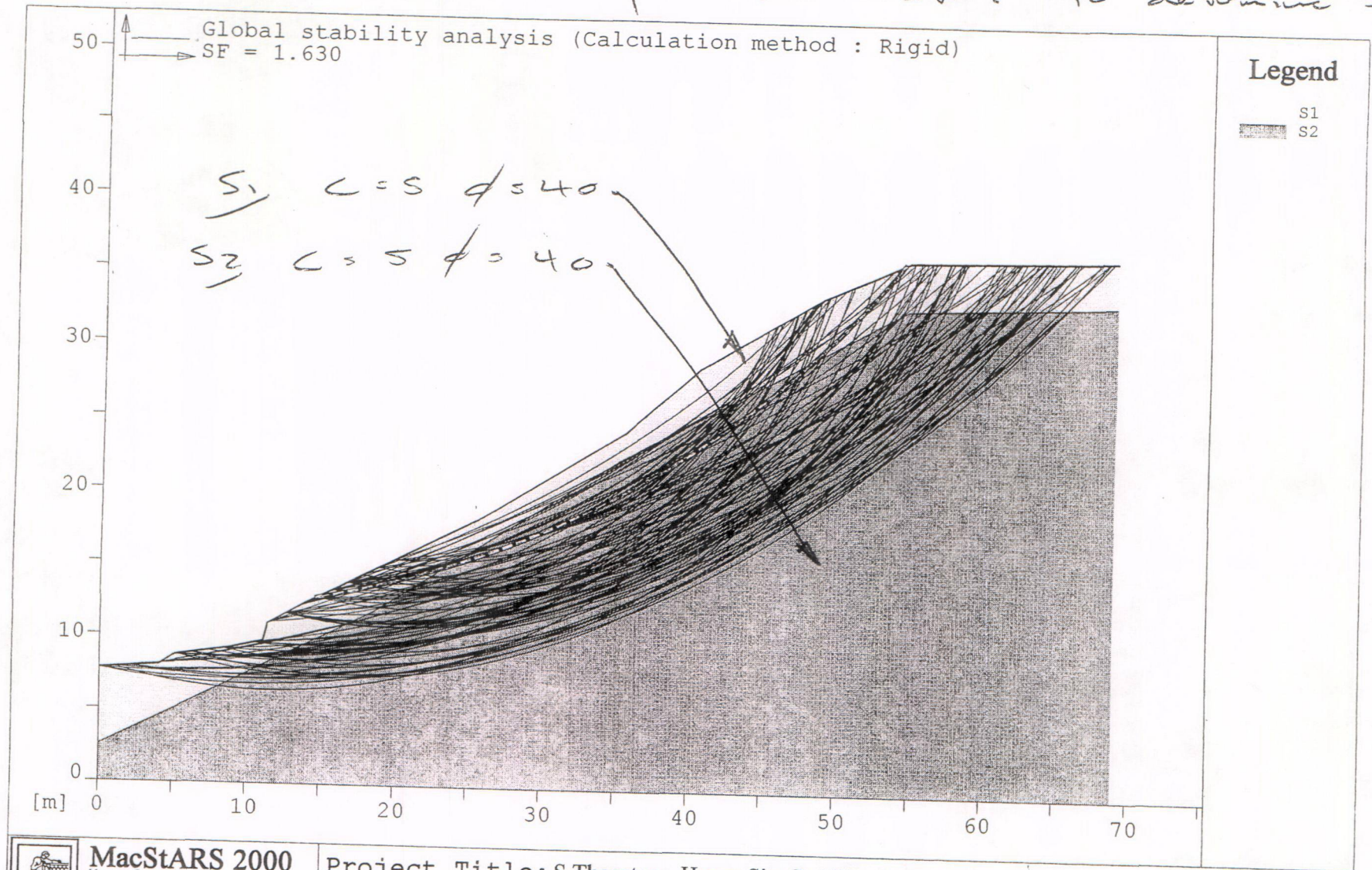
"DETERMINATION OF ALLOWABLE BEARING PRESSURE UNDER SMALL STRUCTURES"

Author : M,J, Stockwell B,E, C,ENG. M.I.C.E. (Member)
Published by New Zealand Engineering (32,6) 15 June 1977

APPENDIX 2

Stability Analysis Printouts

Back Analysis - No water. To determine S2 Properties



MacStARS 2000
Maccaferri
Stability Analysis
of Reinforced Slopes

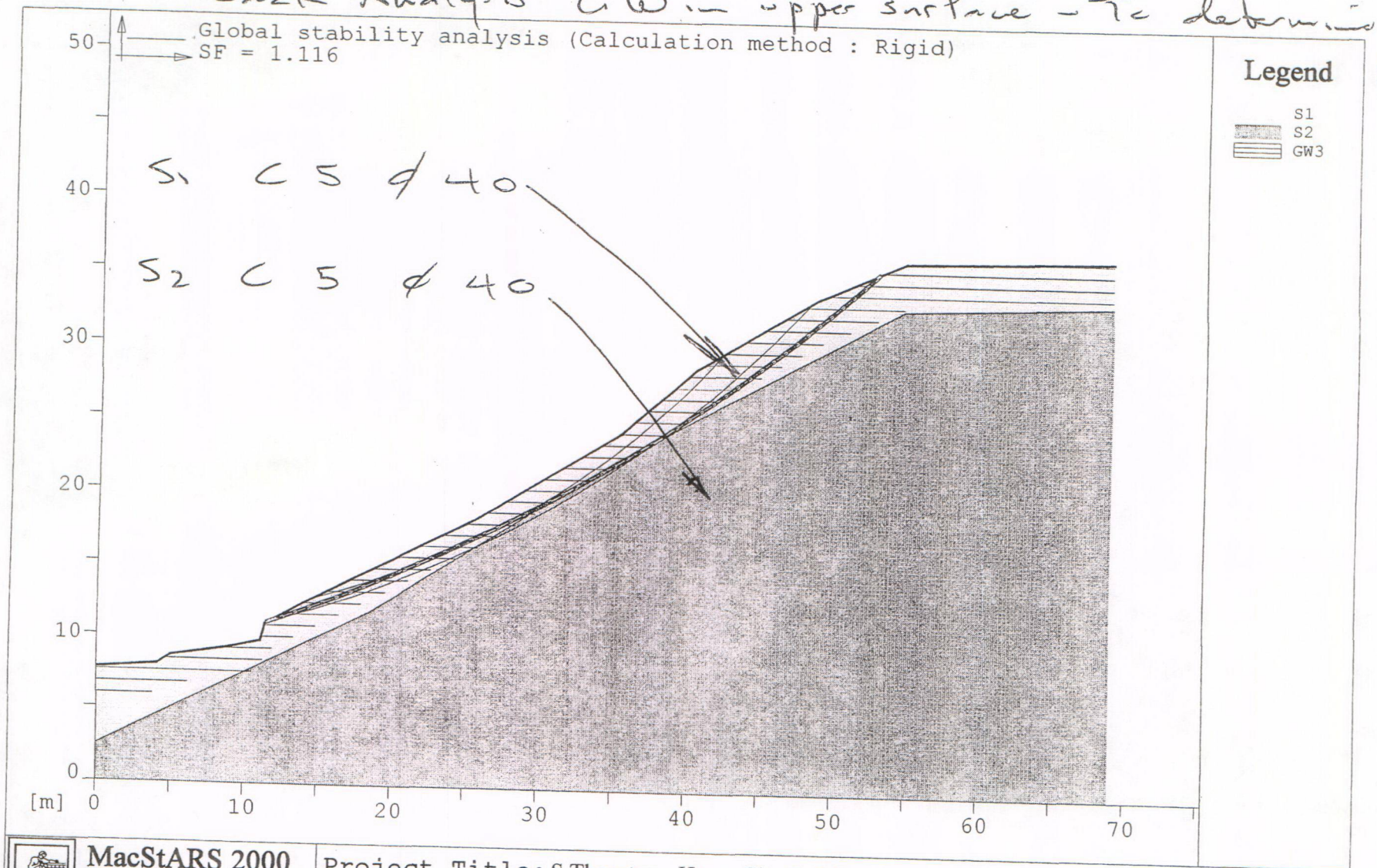
Date: 06/18/2007
Folder:

Project Title: S Thornton - House Site Stability Analysis

CrossSection: Section 7 - Existing
Site: 24 Wainui Road, Ohope File: 2007 Section 7 Back An june07.gdm.mac

1

Back Analysis GW in upper surface - To determine S2 Properties



MacStARS 2000
Maccaferri
Stability Analysis
of Reinforced Slopes

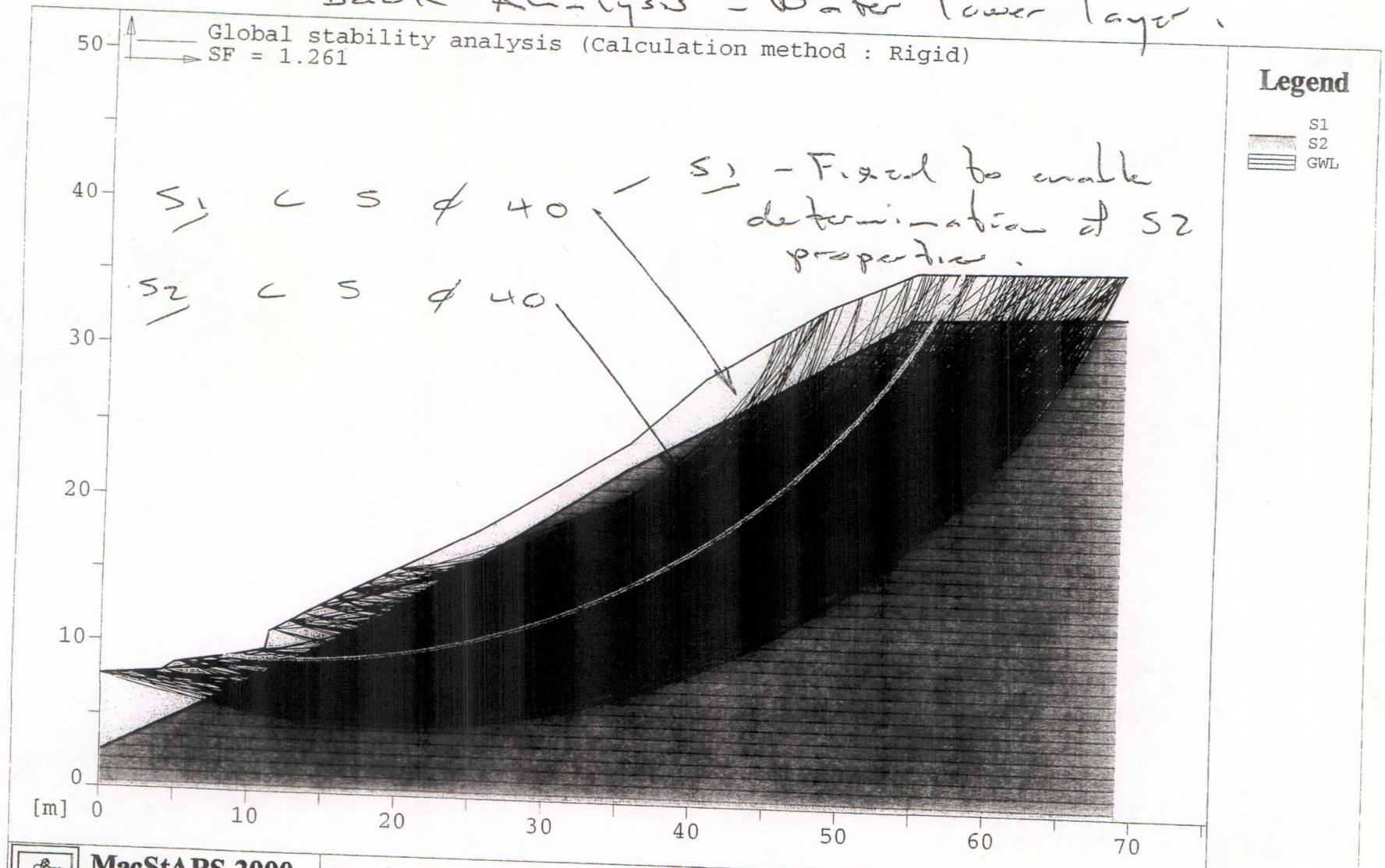
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Folder:

Project Title: S Thornton - House Site Stability Analysis

CrossSection: Section 7 - Existing
Site: 24 Wainui Road, Ohope
File: 2007 Section 7 Back An june07 no drainage.gdm.mac

2

Back Analysis - water lower layer.



MacStARS 2000
Maccaferri Stability Analysis of Reinforced Slopes

Date: 06/18/2007
Folder:

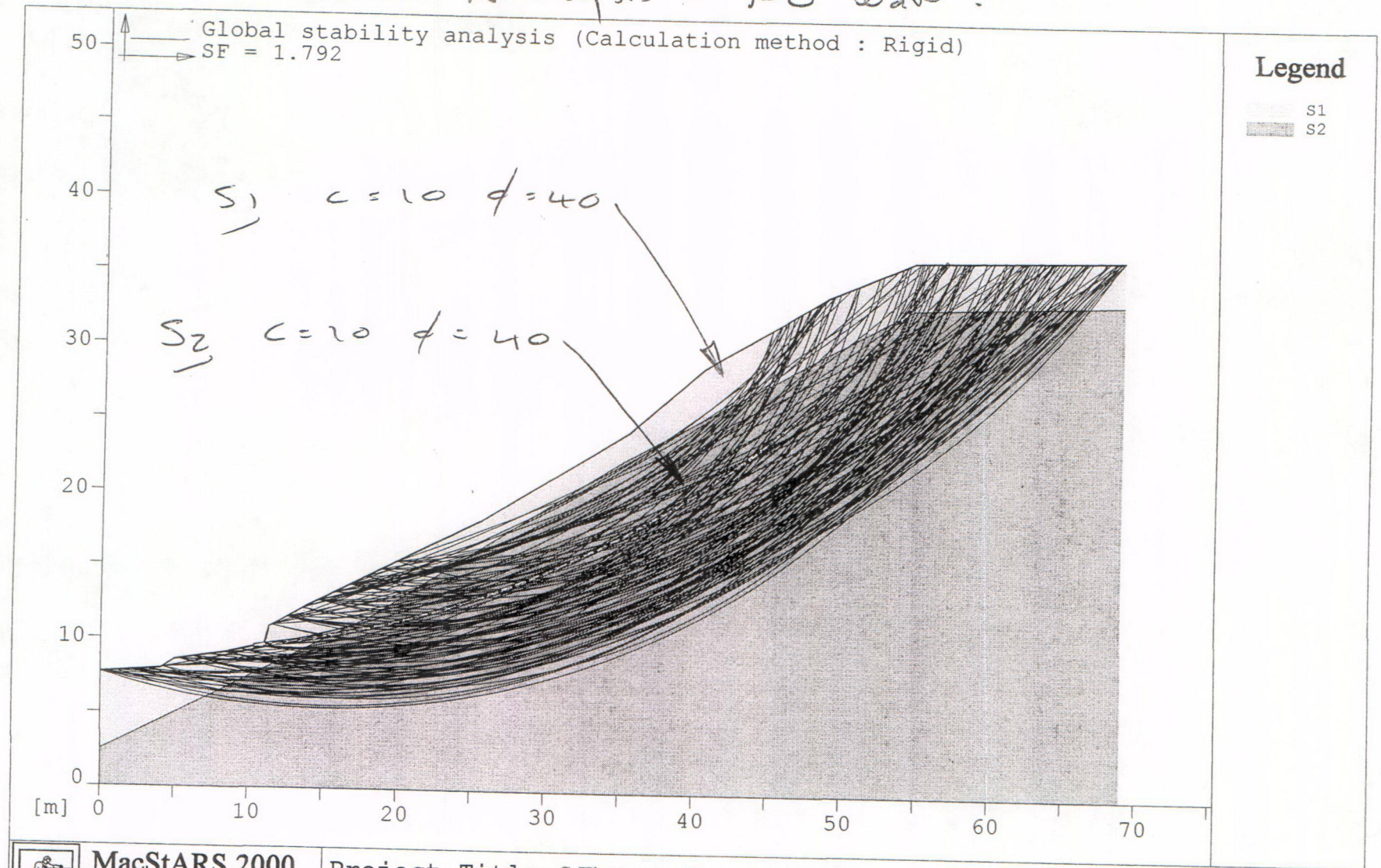
Project Title: S Thornton - House Site Stability Analysis

CrossSection: Section 7 - Existing

Site: 24 Wainui Road, Ohope **File:** 2007 Section 7 Back An Raised GW june07.gdm.mac

W

Back Analysis - No water.



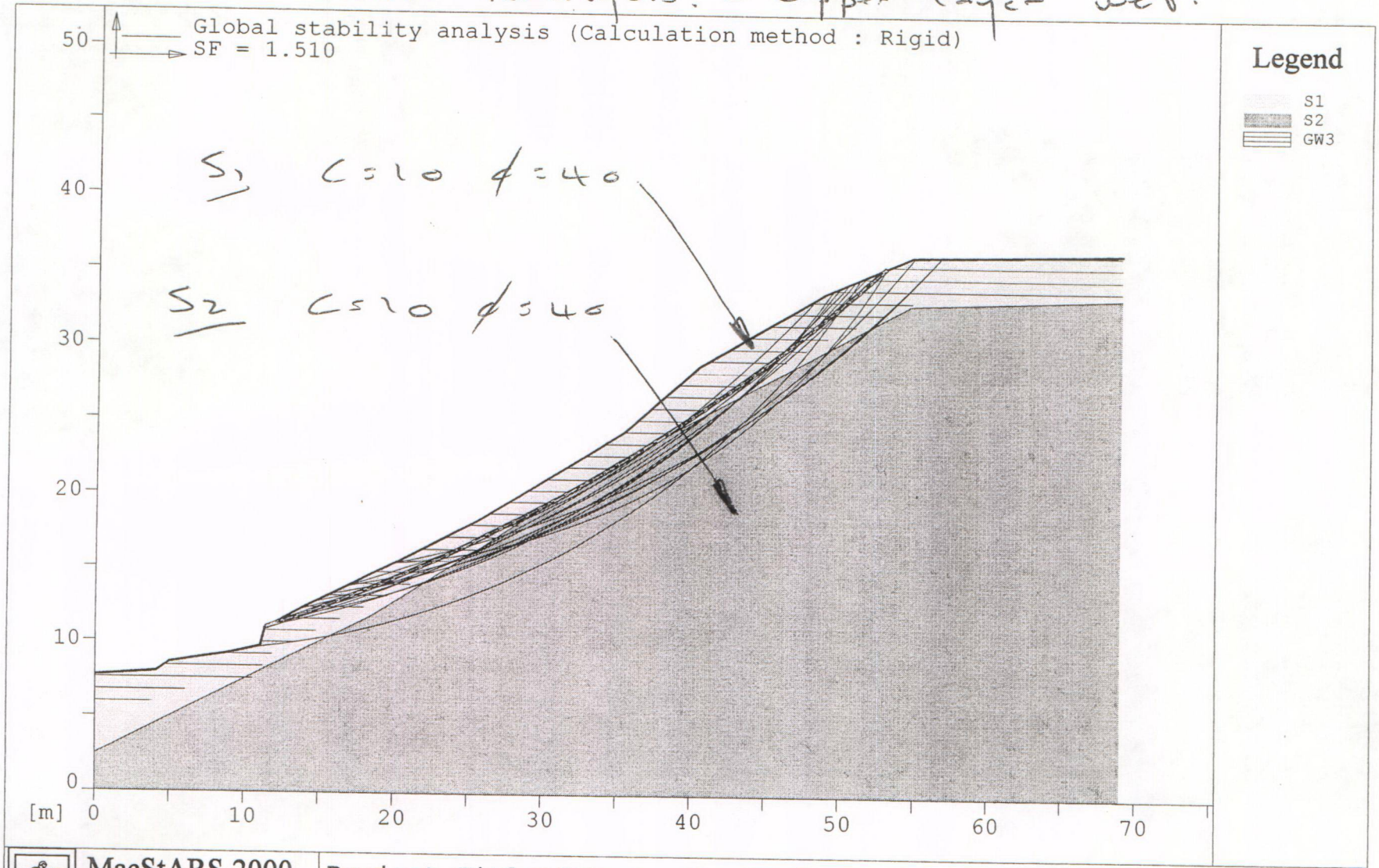
MacStARS 2000
Maccaferri
Stability Analysis
of Reinforced Slopes

Date: 06/18/2007
Folder:

Project Title: S Thornton - House Site Stability Analysis

CrossSection: Section 7 - Existing
Site: 24 Wainui Road, Ohope
File: 2007 Section 7 Back An june07.gdm.mac

Back analysis. - Upper layer wet.



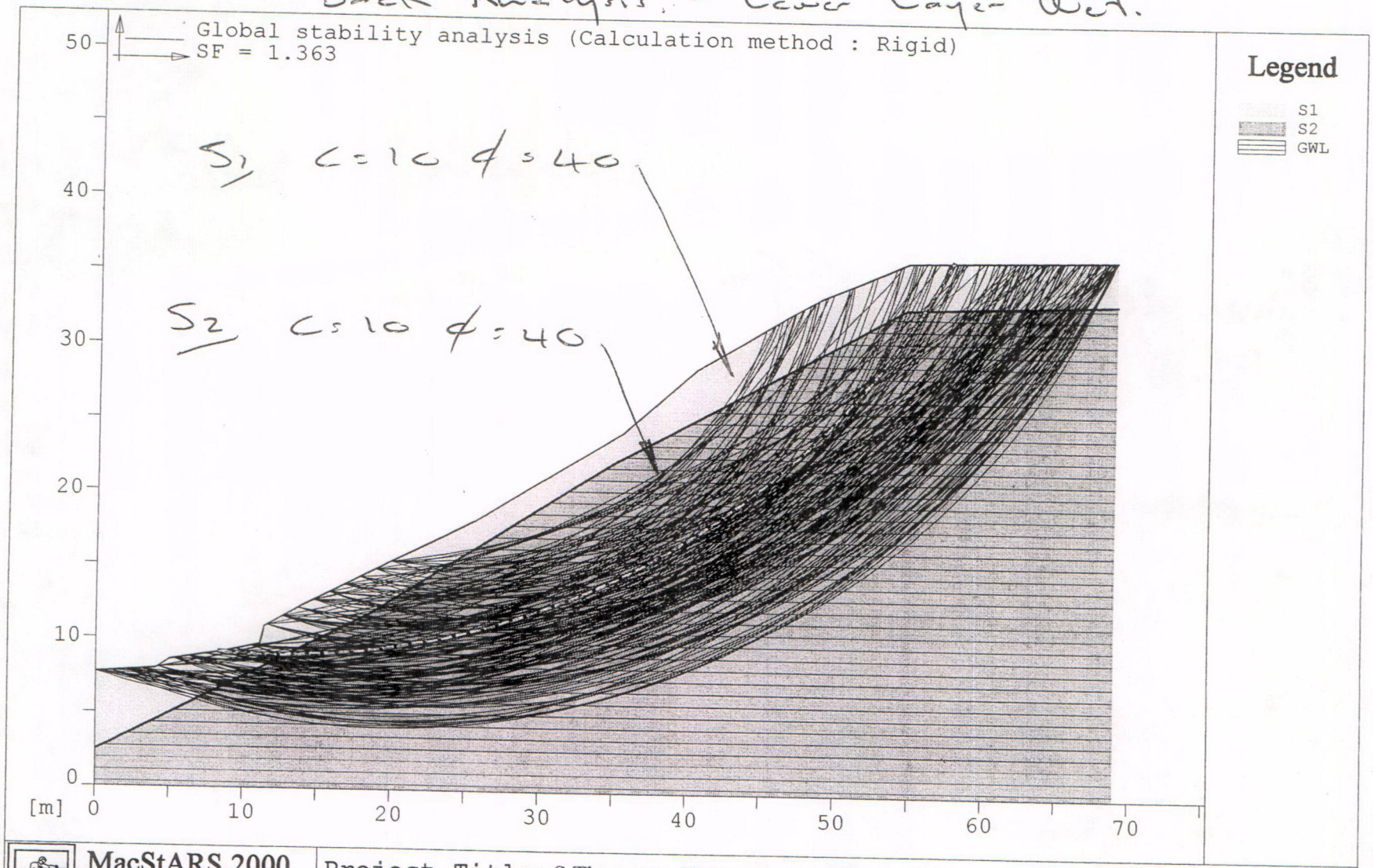
MacStARS 2000
Maccaferri
Stability Analysis
of Reinforced Slopes

Date: 06/18/2007
Folder:

Project Title: S Thornton - House Site Stability Analysis

CrossSection: Section 7 - Existing
Site: 24 Wainui Road, Ohope
File: 2007 Section 7 Back An june07 no drainage.gdm.mac

Back Analysis - Lower Layer Wet.



MacStARS 2000
Maccaferri
Stability Analysis
of Reinforced Slopes

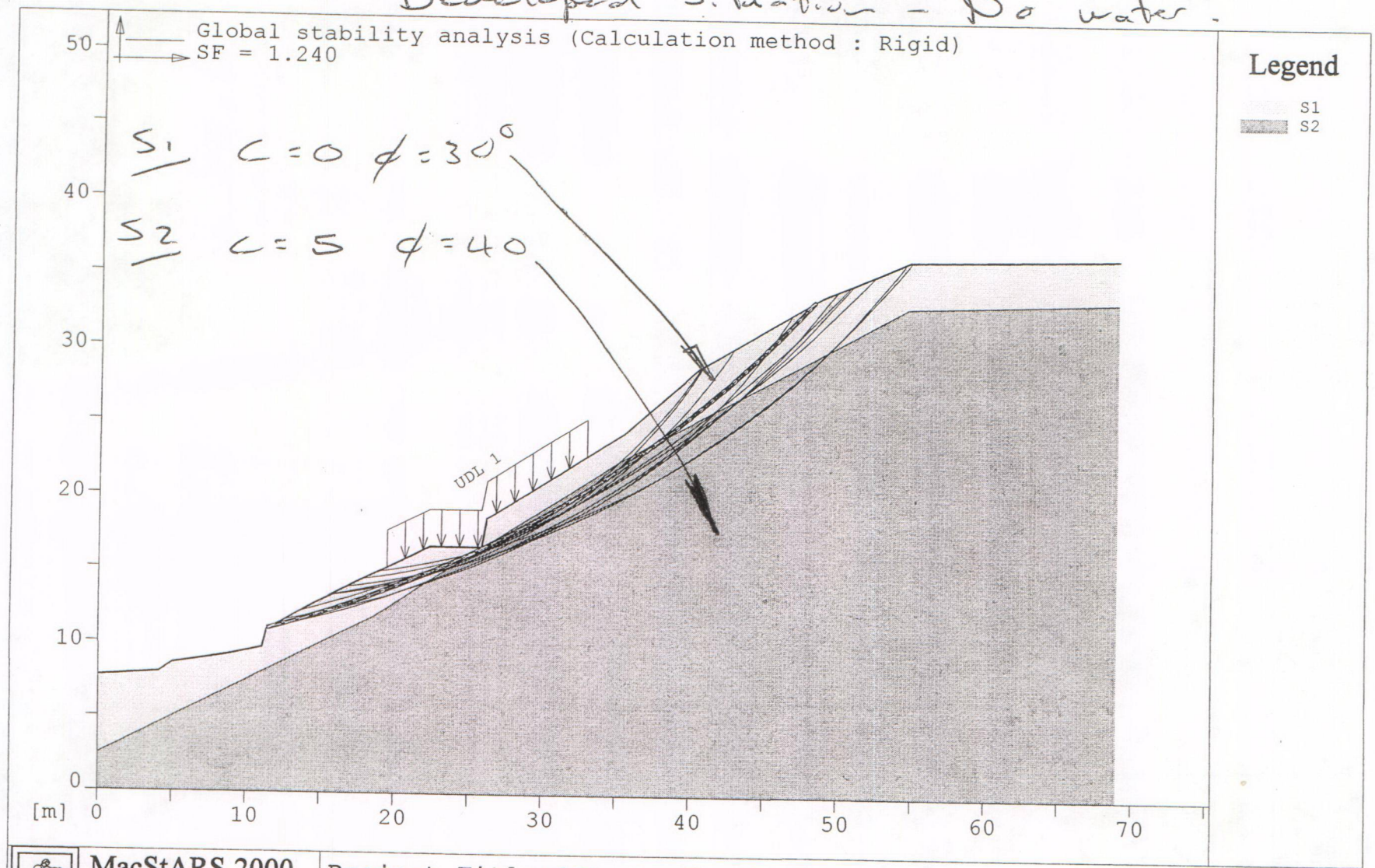
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Folder:

Project Title: S Thornton - House Site Stability Analysis

CrossSection: Section 7 - Existing
Site: 24 Wainui Road, Ohope File: 2007 Section 7 Back An Raised GW june07.gdm.mac

7

Developed situation - No water.



MacStARS 2000
Maccaferri
Stability Analysis
of Reinforced Slopes

Date: 06/18/2007
Folder:

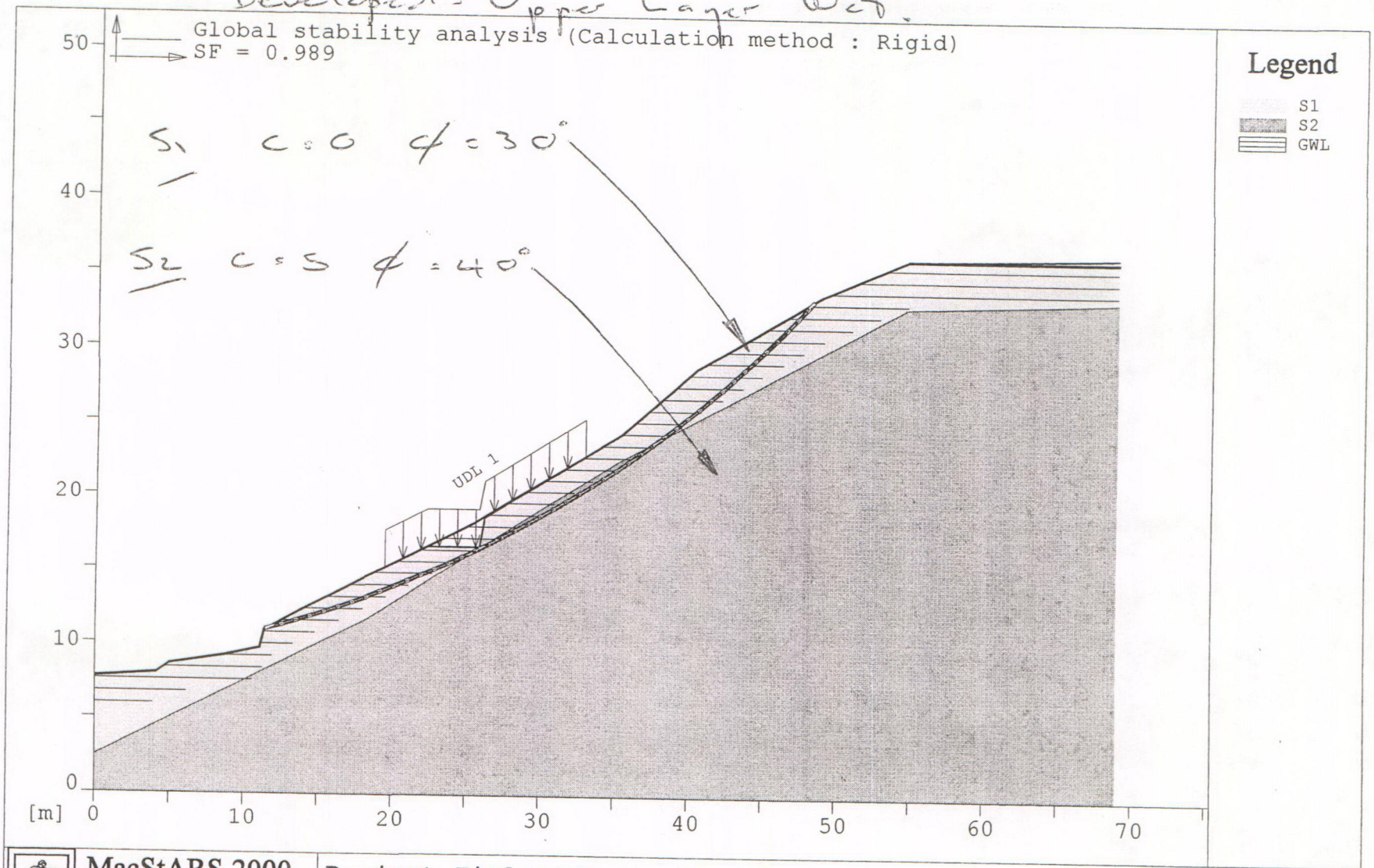
Project Title: S Thornton - House Site Stability Analysis

CrossSection: Section 7 - Existing

Site: 24 Wainui Road, Ohope

File: 2007 Section 7 June07 developed.gdm.mac

Developed - Upper Layer Wet.



MacStARS 2000
Maccaferri
Stability Analysis
of Reinforced Slopes

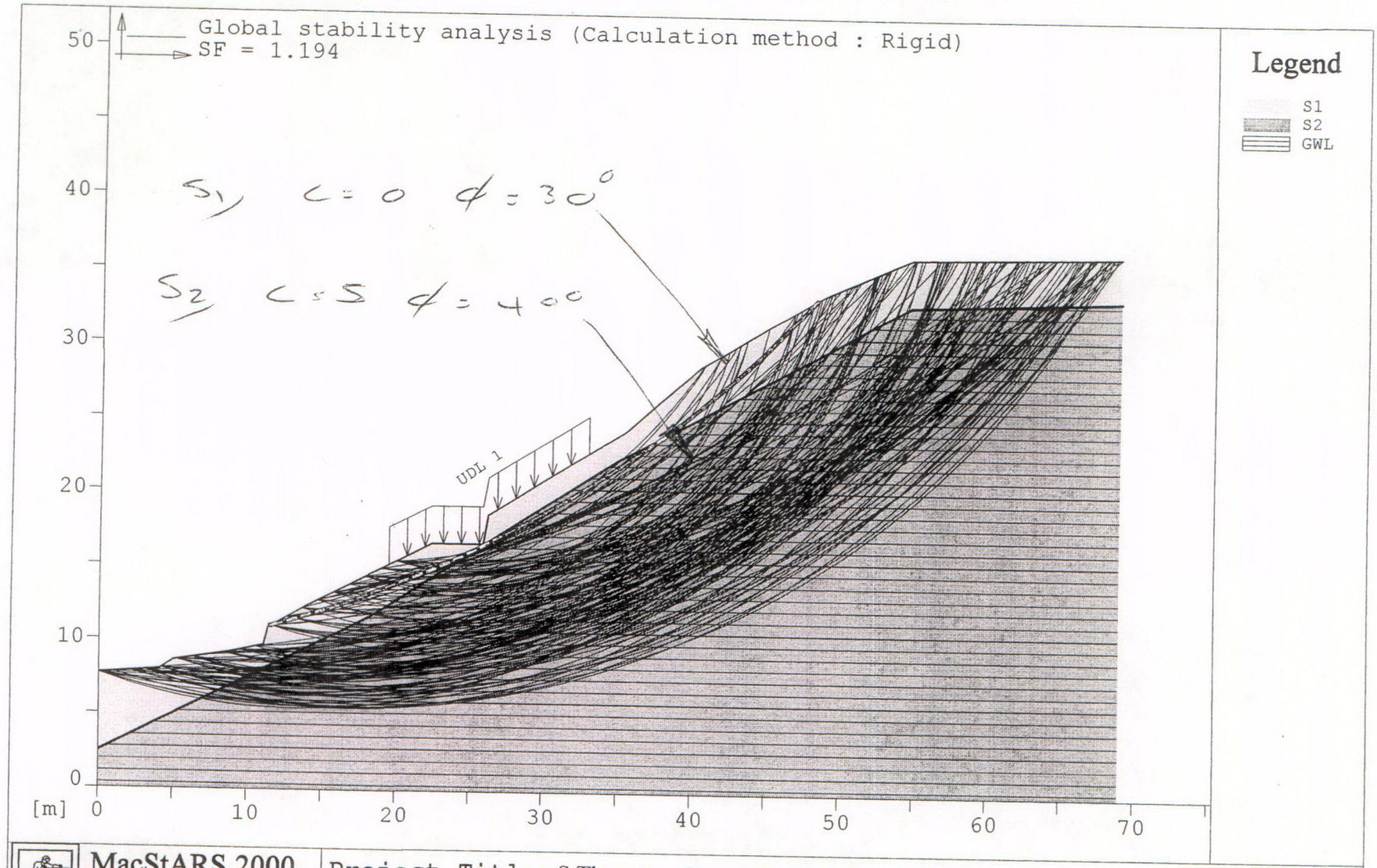
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Project Title: S Thornton - House Site Stability Analysis

CrossSection: Section 7 - Existing

Site: 24 Wainui Road, Ohope

File: 2007 Section 7 June07 developedupper layer wet.gdm.mac



MacStARS 2000
Maccaferri
Stability Analysis
of Reinforced Slopes

Date: 06/18/2007
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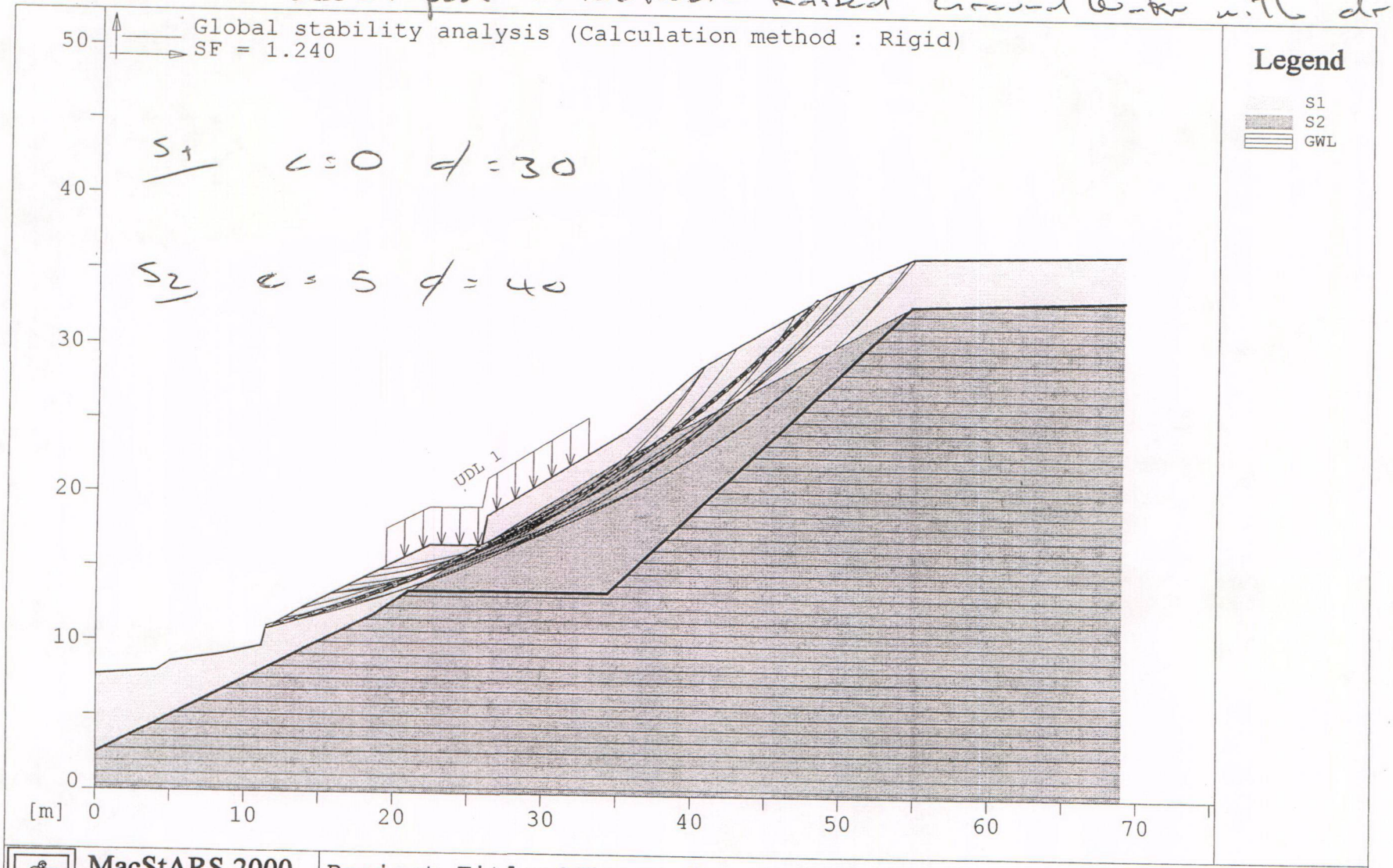
Project Title: S Thornton - House Site Stability Analysis

CrossSection: Section 7 - Existing

Site: 24 Wainui Road, Ohope

File: 2007 Section 7 June07 developed.gdm.mac

Developed Situation - Raised Ground Water with drainage



MacStARS 2000
Maccaferri Stability Analysis of Reinforced Slopes

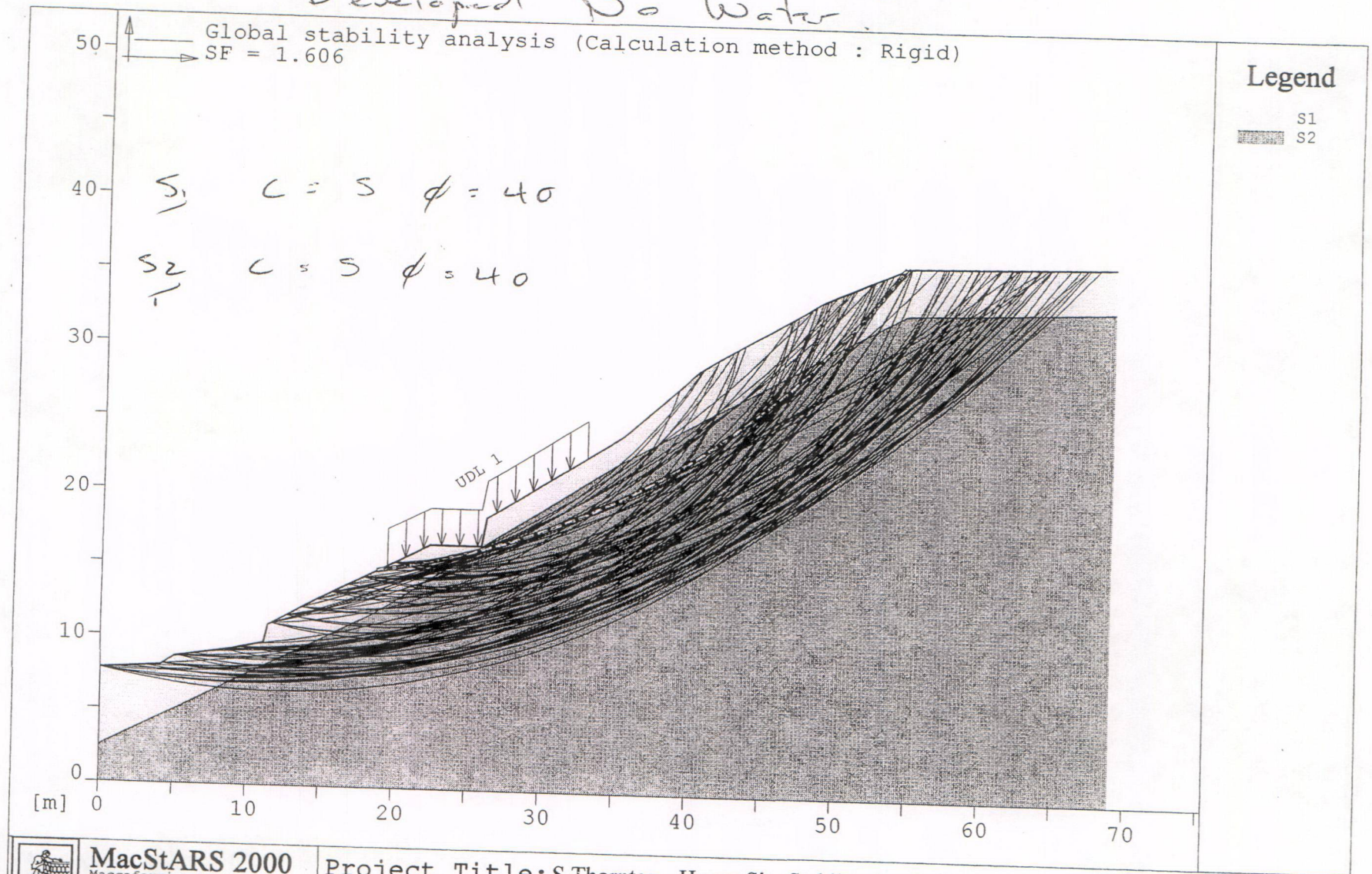
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Folder:

Project Title: S Thornton - House Site Stability Analysis

CrossSection: Section 7 - Existing
Site: 24 Wainui Road, Ohope File: 2007 Section 7 June07 developed with drainage.gdm.mac

10

Developed No Water.



MacStARS 2000
Maccaferri
Stability Analysis
of Reinforced Slopes

Project Title: S Thornton - House Site Stability Analysis

Date: 06/18/2007

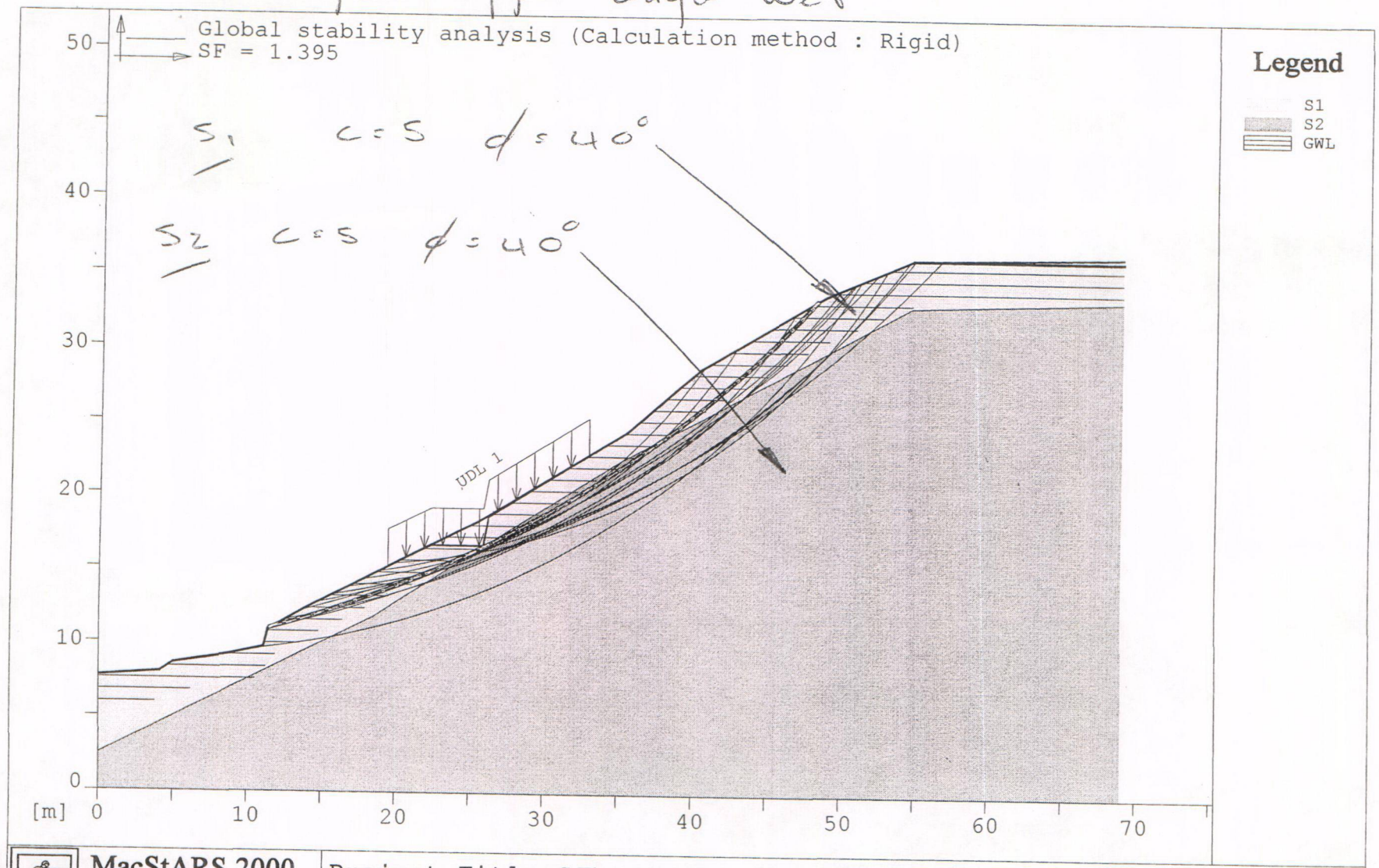
Folder:

CrossSection: Section 7 - Existing

Site: 24 Wainui Road, Ohope

File: 2007 Section 7 June07 developed.gdm.mac

developed Upper Layer Wet



MacStARS 2000
Maccaferri
Stability Analysis
of Reinforced Slopes

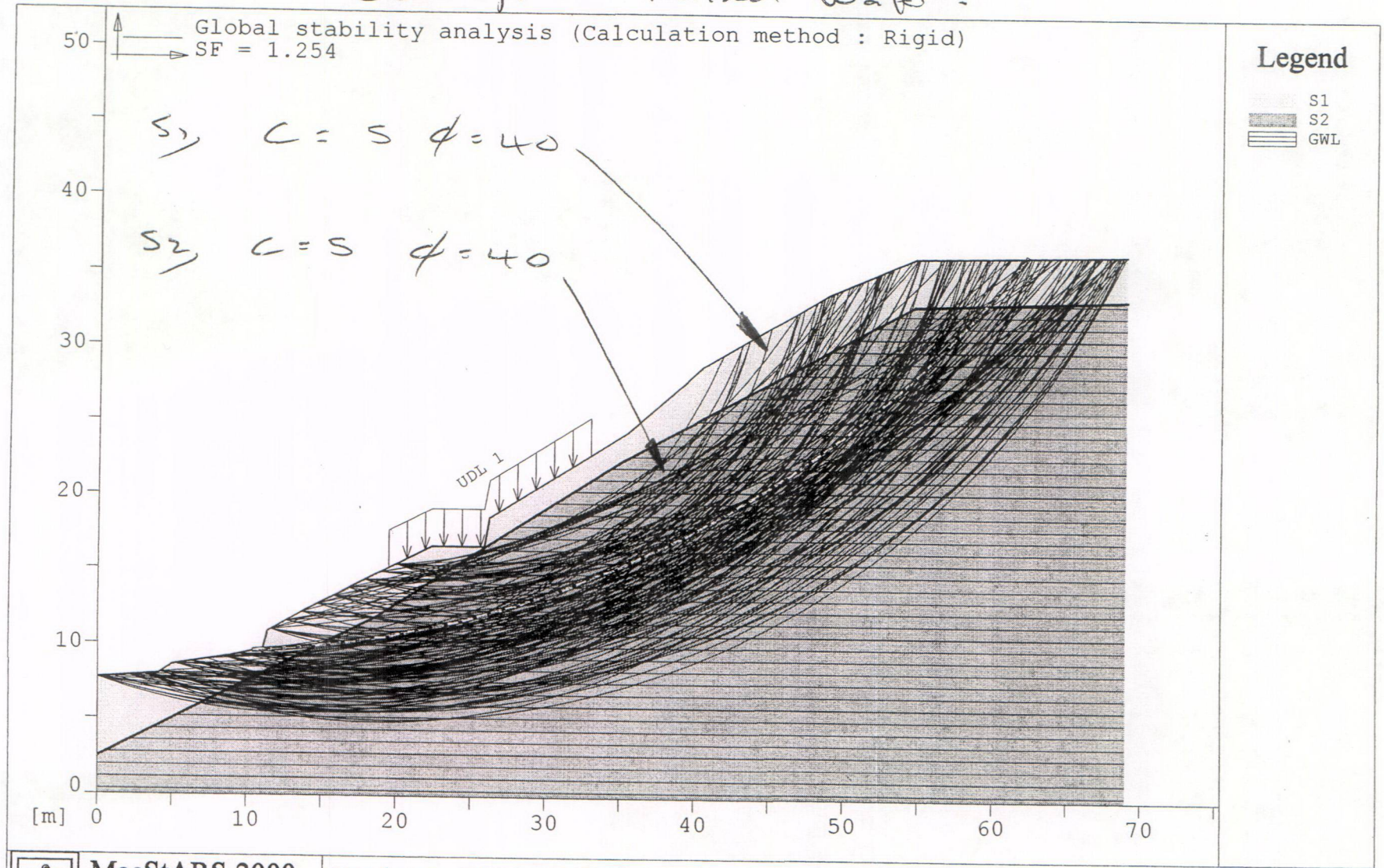
Date: 06/18/2007
Folder:

Project Title: S Thornton - House Site Stability Analysis

CrossSection: Section 7 - Existing
Site: 24 Wainui Road, Ohope File: 2007 Section 7 June07 developedupper layer wet.gdm.mac

12

Developed - Raised Water.



MacStARS 2000
Maccaferri
Stability Analysis
of Reinforced Slopes

Date: 06/18/2007
Folder:

Project Title: S Thornton - House Site Stability Analysis

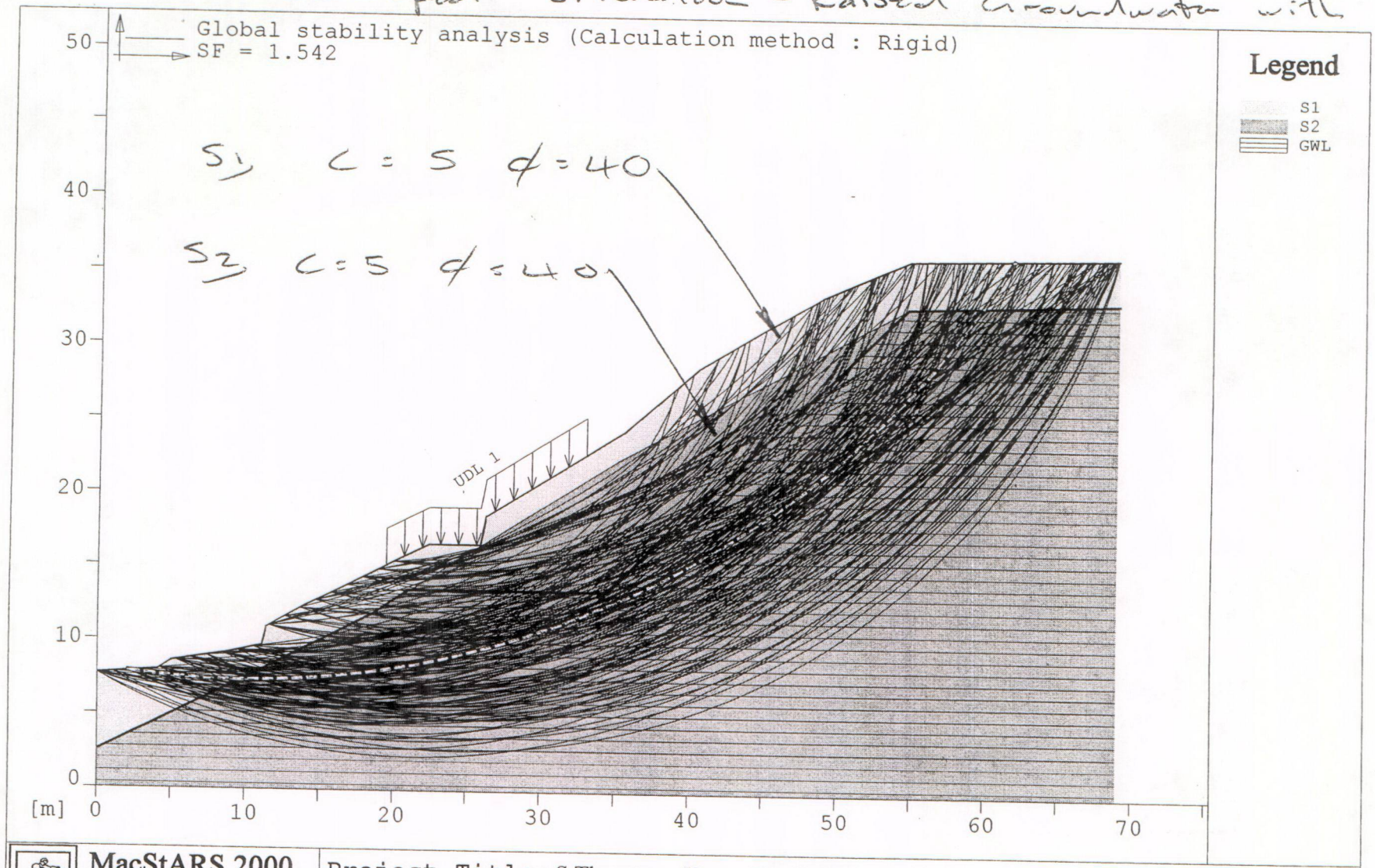
CrossSection: Section 7 - Existing

Site: 24 Wainui Road, Ohope

File: 2007 Section 7 June07 developed.gdm.mac

TW

Developed Situation - Raised Groundwater with drainage.



MacStARS 2000
Maccaferri Stability Analysis of Reinforced Slopes

Date: 06/18/2007
Folder:

Project Title: S Thornton - House Site Stability Analysis

CrossSection: Section 7 - Existing
Site: 24 Wainui Road, Ohope
File: 2007 Section 7 June07 developed with drainage.gdm.mac

APPENDIX 3

Pole House Structural Calculations

Structural Calculations for Pole House
Preliminary Design

Contents

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HARRISON GRIERSON

Job Name	Theatre	Page No.
Client	S Theatre	1.
Job No.	[illegible]	Prepared By GDH.
Date	18 May 2007	Checked By

Work Sheet:

Pole House Option

(1) General

These calculations are for a preliminary design for a pole house option at the Theatre House site 28 Kauri St Otaipe. The purpose of the calculations is to demonstrate that a pole house is a feasible option. Further refinements will change the sizes used.

(2) Retaining Walls

Timber pole walls have been developed as retaining walls since the mid 1960's. The drawings have the details for

- 1.5m high below driveway
- 1.8m high below driveway
- 2.4m high flat vehicle parking
- 3.0m high Turntable/driveway
- ~~3.0m high Turntable/driveway~~

Wall calculations are shown on the attached spreadsheets.

Timber Pole Vertical Retaining Wall

Job No: 1510-011050-01

DESIGN: Up to 1m High With Vehicle surcharge Date: 18 May 07

CLIENT: Thornton

ADDRESS: Wainui Road, Ohope Prepared by: GDM Checked by:

Step 1: Input Design Parameters

Surcharge (s)	**5**	kPa
Wall Height (h)	**1.0**	m
Pole Spacing (Crs)	**0.9**	m
Soil Density (γ)	**18**	kN/m^3
Shear Res. Angle (ϕ)	**30**	degs
Angle in Radians (ϕ)	0.524	rads
Active Earth Press (P_A)	3.00	kN/m
Surcharge Pressure (P_S)	1.67	kN/m

K_O =	0.50	Earth Pressure at Rest
K_A =	0.33	Active Earth Pressure
K_P =	3.00	Passive Earth Pressure

Step 2: Forces and Moments

	Force (P)	Load Factor	Fact. Load (P*)	Arm (l)	Moment (M*)
Earth Pressure	3.00	**1.6**	4.80	0.33	1.60
Surcharge	1.67	**1.6**	2.67	0.50	1.33
Total	4.67		7.47	0.83	2.93

Step 3: Broms Method ($H^* \le \phi H_U$)

Hole Diameter (d)	**0.45**	m
Embedment Depth (L)	**1.7**	m
H* (per post) =	6.72	kN
ϕHu =	7.13	kN
Design is	OK!	

$$\phi Hu = \phi(\gamma * d * L^3 * K_P) * PSF \,/\, 2*(f + L)$$

Pile Spacing Ratio =	2.00
Pile Spacing Factor (PSF) =	0.50
f =	0.39
ϕ =	**0.5**

Step 4: Pole Bending ($M^* \le \phi M_n$)

Pole diameter	**125**	mm
Section Modulus (Z) =	191748	mm^3
M* (per post) =	2.64	kNm
ϕM_n =	2.68	kNm
Design is	OK!	

$$\phi M_n = \phi * k_1 * k_4 * k_5 * k_8 * f_b * Z * k_{20} * k_{21}$$

k_1 =	**0.6**	f_b =	**38.0**
k_4 =	**1.0**	k_{20} =	**0.9**
k_5 =	**1.0**	k_{21} =	**0.85**
k_8 =	**1.0**	ϕ =	**0.8**

Step 5: Wailings Design

Wailing Depth (d)	**146**	mm
Wailing Width (b)	**49**	mm
No. of Wailings	**1**	
Section Modulus (Z) =	58424	mm^3
Force on lowest slat (w) =	1.79	kN/m
$M^* = wL^2/8$ =	0.18	kNm
ϕM_n =	0.33	kNm
Design is	OK!	

$$\phi M_n = \phi * k_1 * k_4 * k_5 * k_8 * f_b * Z$$

k_1 =	**0.6**	f_b =	**11.7**
k_4 =	**1.0**	ϕ =	**0.8**
k_5 =	**1.0**		
k_8 =	**1.0**		

SUMMARY:

Wall Height:	**1.0**	**m**
Embedment Depth:	**1.7**	**m**
Pole Size:	**125**	**mm dia**
Hole Diameter:	**0.45**	**m**
Pole Spacing:	**0.9**	**m**
Waling Size:	**146** by **49**	**mm**

Timber Pole Vertical Retaining Wall

Job No: 1510-011050-01

DESIGN: Up to 1.5m High With Vehicle surcharge Date: 18 May 07

CLIENT: Thornton

ADDRESS: Wainui Road, Ohope Prepared by: GDM Checked by:

Step 1: Input Design Parameters

Surcharge (s)	**5**	kPa
Wall Height (h)	**1.5**	m
Pole Spacing (Crs)	**0.9**	m
Soil Density (γ)	**18**	kN/m^3
Shear Res. Angle (ϕ)	**30**	degs
Angle in Radians (ϕ)	0.524	rads
Active Earth Press (P_A)	6.75	kN/m
Surcharge Pressure (P_S)	2.50	kN/m

K_O =	0.50	Earth Pressure at Rest
K_A =	0.33	Active Earth Pressure
K_P =	3.00	Passive Earth Pressure

Step 2: Forces and Moments

	Force (P)	Load Factor	Fact. Load (P*)	Arm (l)	Moment (M*)
Earth Pressure	6.75	**1.6**	10.80	0.50	5.40
Surcharge	2.50	**1.6**	4.00	0.75	3.00
Total	9.25		14.80	1.25	8.40

Step 3: Broms Method ($H^* \le \phi H_U$)

Hole Diameter (d)	**0.45**	m
Embedment Depth (L)	**2.4**	m
H* (per post) =	13.32	kN
ϕHu =	14.15	kN
Design is	OK!	

$$\phi Hu = \phi(\gamma * d * L^3 * K_P) * PSF \,/\, 2*(f + L)$$

Pile Spacing Ratio =	2.00
Pile Spacing Factor (PSF) =	0.50
f =	0.57
ϕ =	**0.5**

Step 4: Pole Bending ($M^* \le \phi M_n$)

Pole diameter	**200**	mm
Section Modulus (Z) =	785398	mm^3
M* (per post) =	7.56	kNm
ϕM_n =	10.96	kNm
Design is	OK!	

$$\phi M_n = \phi * k_1 * k_4 * k_5 * k_8 * f_b * Z * k_{20} * k_{21}$$

k_1 =	**0.6**	f_b =	**38.0**
k_4 =	**1.0**	k_{20} =	**0.9**
k_5 =	**1.0**	k_{21} =	**0.85**
k_8 =	**1.0**	ϕ =	**0.8**

Step 5: Wailings Design

Wailing Depth (d)	**146**	mm
Wailing Width (b)	**49**	mm
No. of Wailings	**1**	
Section Modulus (Z) =	58424	mm^3
Force on lowest slat (w) =	2.49	kN/m
$M^* = wL^2/8$ =	0.25	kNm
ϕM_n =	0.33	kNm
Design is	OK!	

$$\phi M_n = \phi * k_1 * k_4 * k_5 * k_8 * f_b * Z$$

k_1 =	**0.6**	f_b =	**11.7**
k_4 =	**1.0**	ϕ =	**0.8**
k_5 =	**1.0**		
k_8 =	**1.0**		

SUMMARY:

Wall Height:	**1.5**	**m**	
Embedment Depth:	**2.4**	**m**	
Pole Size:	**200**	**mm dia**	
Hole Diameter:	**0.45**	**m**	
Pole Spacing:	**0.9**	**m**	
Waling Size:	**146**	**by**	**49** **mm**

Timber Pole Vertical Retaining Wall

Job No: 1510-011050-01

DESIGN: Up to 2m High Backslope of 30 degrees — Date: 18 May 07

CLIENT: Thornton

ADDRESS: Wainui Road, Ohope — Prepared by: GDM — Checked by:

Step 1: Input Design Parameters

Surcharge (s)		kPa
Wall Height (h)	**2.0**	m
Pole Spacing (Crs)	**0.9**	m
Soil Density (γ)	**18**	kN/m^3
Shear Res. Angle (ϕ)	**30**	degs
Angle in Radians (ϕ)	0.524	rads
Active Earth Press (P_A)	19.44	kN/m
Surcharge Pressure (P_S)	0.00	kN/m

K_O =	0.50	Earth Pressure at Rest
K_A =	0.33	Active Earth Pressure
K_P =	3.00	Passive Earth Pressure
K_A =	0.54	For Backslope ex Ret wall Des notes

Step 2: Forces and Moments

	Force (P)	Load Factor	Fact. Load (P*)	Arm (l)	Moment (M*)
Earth Pressure	19.44	**1.6**	31.10	0.67	20.74
Surcharge	0.00	**1.6**	0.00	1.00	0.00
Total	19.44		31.10	1.67	20.74

Step 3: Broms Method ($H^* \le \phi H_U$)

Hole Diameter (d)	**0.45**	m
Embedment Depth (L)	**3.4**	m
H* (per post) =	27.99	kN
ϕHu =	29.36	kN
Design is	OK!	

$$\phi Hu = \phi(\gamma * d * L^3 * K_P) * PSF \,/\, 2*(f + L)$$

Pile Spacing Ratio =	2.00
Pile Spacing Factor (PSF) =	0.50
f =	0.67
ϕ =	**0.5**

Step 4: Pole Bending ($M^* \le \phi M_n$)

Pole diameter	**250**	mm
Section Modulus (Z) =	1533981	mm^3
M* (per post) =	18.66	kNm
ϕM_n =	21.40	kNm
Design is	OK!	

$$\phi M_n = \phi * k_1 * k_4 * k_5 * k_8 * f_b * Z * k_{20} * k_{21}$$

k_1 =	**0.6**	f_b =	**38.0**
k_4 =	**1.0**	k_{20} =	**0.9**
k_5 =	**1.0**	k_{21} =	**0.85**
k_8 =	**1.0**	ϕ =	**0.8**

Step 5: Wailings Design

Wailing Depth (d)	**146**	mm
Wailing Width (b)	**49**	mm
No. of Wailings	**2**	
Section Modulus (Z) =	233697	mm^3
Force on lowest slat (w) =	4.54	kN/m
$M^* = wL^2/8$ =	0.46	kNm
ϕM_n =	1.31	kNm
Design is	OK!	

$$\phi M_n = \phi * k_1 * k_4 * k_5 * k_8 * f_b * Z$$

k_1 =	**0.6**	f_b =	**11.7**
k_4 =	**1.0**	ϕ =	**0.8**
k_5 =	**1.0**		
k_8 =	**1.0**		

SUMMARY:

Wall Height:	**2.0**	**m**	
Embedment Depth:	**3.4**	**m**	
Pole Size:	**250**	**mm dia**	
Hole Diameter:	**0.45**	**m**	
Pole Spacing:	**0.9**	**m**	
Waling Size:	**146**	**by**	**98** **mm**

Timber Pole Vertical Retaining Wall

Job No: 1510-011050-01

DESIGN: Up to 3m High Backslope of 30 degrees Date: 18 May 07

CLIENT: Thornton

ADDRESS: Wainui Road, Ohope Prepared by: GDM Checked by:

Step 1: Input Design Parameters

Surcharge (s)		kPa
Wall Height (h)	**3.0**	m
Pole Spacing (Crs)	**0.9**	m
Soil Density (γ)	**18**	kN/m^3
Shear Res. Angle (ϕ)	**30**	degs
Angle in Radians (ϕ)	0.524	rads
Active Earth Press (P_A)	43.74	kN/m
Surcharge Pressure (P_S)	0.00	kN/m

K_O =	0.50	Earth Pressure at Rest
K_A =	0.33	Active Earth Pressure
K_P =	3.00	Passive Earth Pressure
K_A =	0.54	For Backslope ex Ret wall Des notes

Step 2: Forces and Moments

	Force (P)	Load Factor	Fact. Load (P*)	Arm (l)	Moment (M*)
Earth Pressure	43.74	**1.6**	69.98	1.00	69.98
Surcharge	0.00	**1.6**	0.00	1.50	0.00
Total	43.74		69.98	2.50	69.98

Step 3: Broms Method ($H^* \le \phi H_U$)

Hole Diameter (d)	**0.65**	m
Embedment Depth (L)	**5**	m
H* (per post) =	62.99	kN
ϕHu =	63.28	kN
Design is	OK!	

$$\phi Hu = \phi(\gamma * d * L^3 * K_P) * PSF \,/\, 2*(f + L)$$

Pile Spacing Ratio =	1.38
Pile Spacing Factor (PSF) =	0.35
f =	1.00
ϕ =	**0.5**

Step 4: Pole Bending ($M^* \le \phi M_n$)

Pole diameter	**375**	mm
Section Modulus (Z) =	5177185	mm^3
M* (per post) =	62.99	kNm
ϕM_n =	72.24	kNm
Design is	OK!	

$$\phi M_n = \phi * k_1 * k_4 * k_5 * k_8 * f_b * Z * k_{20} * k_{21}$$

k_1 =	**0.6**	f_b =	**38.0**
k_4 =	**1.0**	k_{20} =	**0.9**
k_5 =	**1.0**	k_{21} =	**0.85**
k_8 =	**1.0**	ϕ =	**0.8**

Step 5: Wailings Design

Wailing Depth (d)	**146**	mm
Wailing Width (b)	**49**	mm
No. of Wailings	**2**	
Section Modulus (Z) =	233697	mm^3
Force on lowest slat (w) =	6.81	kN/m
$M^* = wL^2/8$ =	0.69	kNm
ϕM_n =	1.31	kNm
Design is	OK!	

$$\phi M_n = \phi * k_1 * k_4 * k_5 * k_8 * f_b * Z$$

k_1 =	**0.6**	f_b =	**11.7**
k_4 =	**1.0**	ϕ =	**0.8**
k_5 =	**1.0**		
k_8 =	**1.0**		

SUMMARY:

Wall Height:	**3.0**	**m**	
Embedment Depth:	**5**	**m**	
Pole Size:	**375**	**mm dia**	
Hole Diameter:	**0.65**	**m**	
Pole Spacing:	**0.9**	**m**	
Waling Size:	**146**	**by**	**98** **mm**

HARRISON GRIERSON

Job Name		Page No. 1.
Client		
Job No.	Prepared By	
Date	Checked By	

Work Sheet:

(3) Bearers to Support Floor Levels.

Try bearer clear span of 2.4m + Pile Cs 2.5m.

Case 1 - Above Garage.

	G	Q
Load.		
Roof $\frac{6.5}{2}$ (0.4G + 0.25Q)	1.3	0.81
Floor $3/2$ (0.5G + 1.5Q)	0.75	2.25
Wall 2.5 (0.3G)	0.75	
Self weight	0.19	
	2.95	3.06

Case 2 - Between two levels.

	G	Q
Load.		
Roof $\frac{6.5+6.7}{2}$ (0.4G + 0.25Q)	2.64	1.65
Floor $3/2$ (0.5G + 1.5Q)	0.75	2.25
Wall 4.5 (0.3G)	1.35	
Self 0.2 kN/m	0.2	
	4.94	3.90

Case 2 - Corner case.

HARRISON GRIERSON

Job Name		Page No. 8
Client		
Job No.	Prepared By	
Date	Checked By	

Work Sheet:

Check deflection

$$I_{required} = \frac{5\left(2\times 4.94\times10^{3} + 0.7\times 3.9\times10^{3}\right)\times 2.4^{4}}{384\times 5.4\times10^{9}\times 2.4/400}$$

$I_{req} = 33.626\times10^{-6}\ m^4$ (12610.)

$\Rightarrow 33.626\times10^{6}\ mm^4$.

250 × 50 $I \Rightarrow 31.7\times10^{6}$.

∴ 2/200 × 50 $I \Rightarrow 2\times 25.9\times10^{6}$

$= 51.8\times10^{6}$.

check bending.

$M^* = 1.2G + 1.6Q$.

$= 1.2(4.94) + 1.6(3.90)$

$= 12.17$ kNm.

check 250 × 50.

$\phi M_{uo} = \phi f_{sy} k_1 k_2 k_3 k_4 Z$

$= 0.9\times 0.8\times 1\times 1\times 1\times 14\times \frac{46\times 250^{3}}{6}$

$= 26.25$ kNm.

$12.17 < 26.25$ ∴ ok

USE 250 × 50 UNG 8 bearers.

HARRISON GRIERSON

Job Name		Page No. 9.
Client		
Job No.	Prepared By	
Date	Checked By	

Work Sheet:

(4) Floor Joists.

ex 425 3604 - 4548.

140 x 45 @ 450 crs span 3.1m.

" " 240 x 90 @ 450 crs.

And.

140 x 35 @ 450 crs span 1.8m

(5) Vehicle Deck Members.

5.1 Loading

* Crucial [illegible] has a

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

5.2 Joists

[illegible]

HARRISON GRIERSON

Job Name		Page No. 10.
Client		
Job No.	Prepared By	
Date	Checked By	

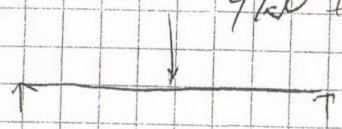
Work Sheet:

self wt. of beam = 0.15 kN/m

assume load to centre

worst case load to single joist.

$9kN + 1.5 \times 0.15 = 9.23kN$.



$I_{reqd.} = \frac{PL^3}{4 \times E \Delta} = \frac{2 \times 9.23 \times 10^3 \times 1.5^3}{48 \times 4.4 \times 10^9 \times 2.4/400}$

$= 49.165 \times 10^6 mm^4$

$300 \times 100 \Rightarrow I = 181 \times 10^6 mm^4$.

$\therefore$ OK to use 300×100.

check bending.

$M^* = 1.2G + 1.6Q$

$= 1.2(1.5 \times 0.15) + 1.6 \times 9$

$M^* = \frac{PL}{4} = \frac{14.67 \times 1.5}{4} = 5.501 kNm$.

$\phi M_{us} = 0.7 \times 0.85 \times 1 \times 1 \times 11.7 \times \frac{95 \times 295^2}{6}$

$= 11.608 kNm > 5.501$ ✓.

$\therefore$ OK.

use 300×100 @ 2/300 c/c

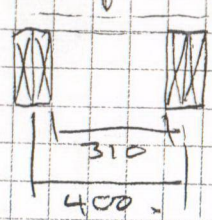
HARRISON GRIERSON

Job Name		Page No. 11.
Client		
Job No.	Prepared By	
Date	Checked By	

Work Sheet:

S.3 Decking for vehicle bay.

T+J Joists at 400 crs



$M^* = \frac{14.67 \times 0.31}{4}$

$= 1.14 kNm$

⇒ Clear span ⇒ 310 mm

Use 100x100 Decking.

$\phi M_w = 0.9 \times 0.8 \times 1 \times 1 \times 1 \times 11.7 \times \frac{95 \times 95^2}{6}$

$= 1.204 kNm$.

∴ ok for bending.

Deflection. $P^* = 9.23 kN$.

$I_{req'd} = \frac{2 \times 9.23 \times 10^3 \times 0.31^3}{48 \times 4.4 \times 10^9 \times 0.31} / 400$

$= 3.36 \times 10^6 mm^4$.

$I_{100 \times 100} = \frac{95 \times 95^3}{12} = 6.79 \times 10^6 mm^4$

∴ ok for deflection.

∴ Decking 100 x 100

Joists @ 400 crs.

HARRISON GRIERSON

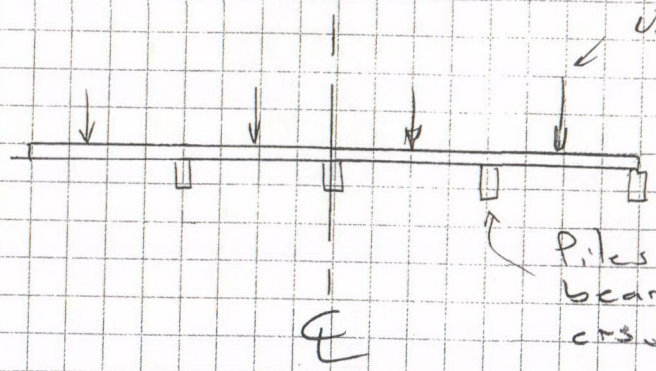
Job Name		Page No. 12.
Client		
Job No.	Prepared By	
Date	Checked By	

Work Sheet:

5.4 Bearers beneath Vehicle area.

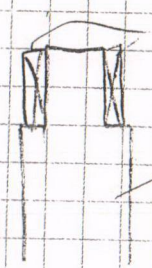
Piles @ 1.5m crs as well.

Consider worst case.



Worst case bearer has 9kN point load @ central span. ∴ use 2/300x50 as per Joist design.

i.e.



Summary. Bearers 2/300x50 1.5m Span.

Joists 2/300x50 @ 400 crs 1.5m Span.

Decking 100x100.

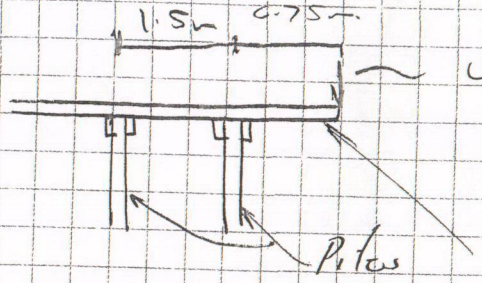
All timber Grade VSG8.

HARRISON GRIERSON

Job Name		Page No. 13
Client		
Job No.	Prepared By	
Date	Checked By	

Work Sheet:

5.5 Cantilevered Vehicle Area Joists Next to Turntable.



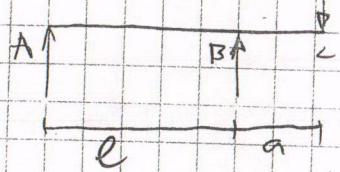
$M^* = 14.67 \times 0.75$
$= 11.003$ kNm.

$\phi M_n = 11.608$ kNm > 11.003 kNm

(ex pg 10. 300x100

$\therefore$ ok for bending.

Check deflection.



$\Delta c = \frac{Pa^2}{3EI}(\ell + a)$

$K_2 = 1$ as brief loads while drying across.

$$\text{Deflection} = \frac{9.23 \times 10^3 \times 0.75^2}{3 \times 4.4 \times 10^9 \times 1.81 \times 10^{-4}}$$

$= 0.002$ m Span/345. = ok.

HARRISON GRIERSON

Job Name		Page No. 14
Client		
Job No.	Prepared By	
Date	Checked By	

Work Sheet:

6 Pile Bracing For House.

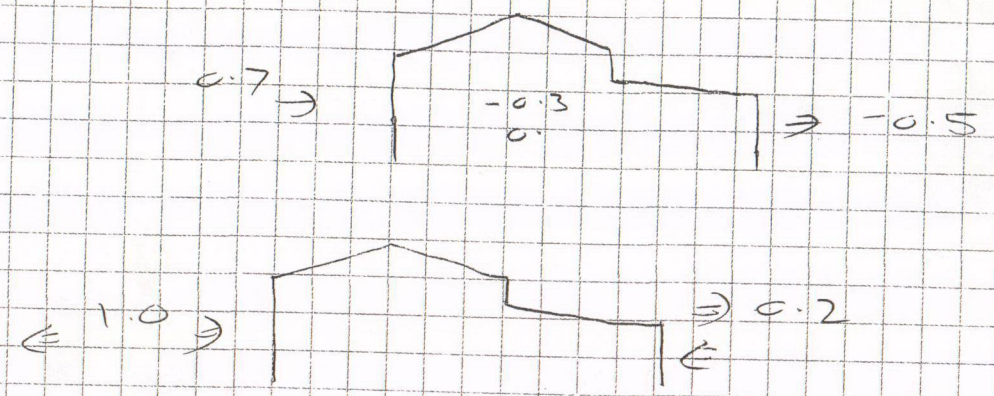
6.1 Wind loads - Calculation.

Wind → Ultimate

$V_{(z)} = V \, M_d \, M_{(z\,cat)} \, M_s \, M_t \, M_r$

$= 42 \times 0.93 \times 1 \times 1 \times 1.23 \times 1$

$V_{(z)} = 48.04$ m/sec



Total wind load across = $C_{pn} = 1.2$.

$7.5\text{m} \times 10\text{m} \times 1.2 \times (0.6 \times 10^{-3} \times 48^2)$

$= 124.42$ kN

Wind load along.

$((4.5 \times 3) + (3 \times 6.5)) \times 2 \times 1.2 \times (0.6 \times 10^{-3} \times 48^2)$

$= 109.49$ kN

6.2 EQ Loads - Calculation.

$C = C_h(T_1) S_p R Z L_u$

$C = 0.8 \times 0.67 \times 1.0 \times 1.2 \times 1$

$C_{ult.} = 0.643$. ultimate

HARRISON GRIERSON

Job Name		Page No. 15
Client		
Job No.	Prepared By	
Date	Checked By	

Work Sheet:

Weight of building - based on loads to assess if EQ or wind Governs

		Wt.
Floor.	(11 × 10 × 0.4)	44
Roof	(11 × 10 × 0.5)	55
Walls.	((4.5 × 3) + (3 × 6.5)) × 0.3 × 2	19.8
	+ (11 × 7.5 × 0.3)	24.5.
Internal Walls.	(3 × 2.4 × 10 × 0.3)	21.60
	(2 × 2.4 × 11 × 0.3)	15.84
Piles.	46 × 11 × 0.3² × 3m × 500 (assumed) / 4 (our length) × 9.81 / 1000	47.84 kN
		228 kN.

228 × 0.64 = 146.3 kN

146.3 > 124.42 kN.

EQ > Wind

∴ EQ Governs

HARRISON GRIERSON

Job Name		Page No. 16.
Client		
Job No.	Prepared By	
Date	Checked By	

Work Sheet:

6.3 Bracing across House

Refer pg 17 sketch of proposed pile / cross bracing layout.

The intent of these calculations is to demonstrate a pole house can be constructed on this slope by demonstrating typical pile embedment depths and bracing requirements to resist lateral loads.

Consider Bracing line B :- Worst case.

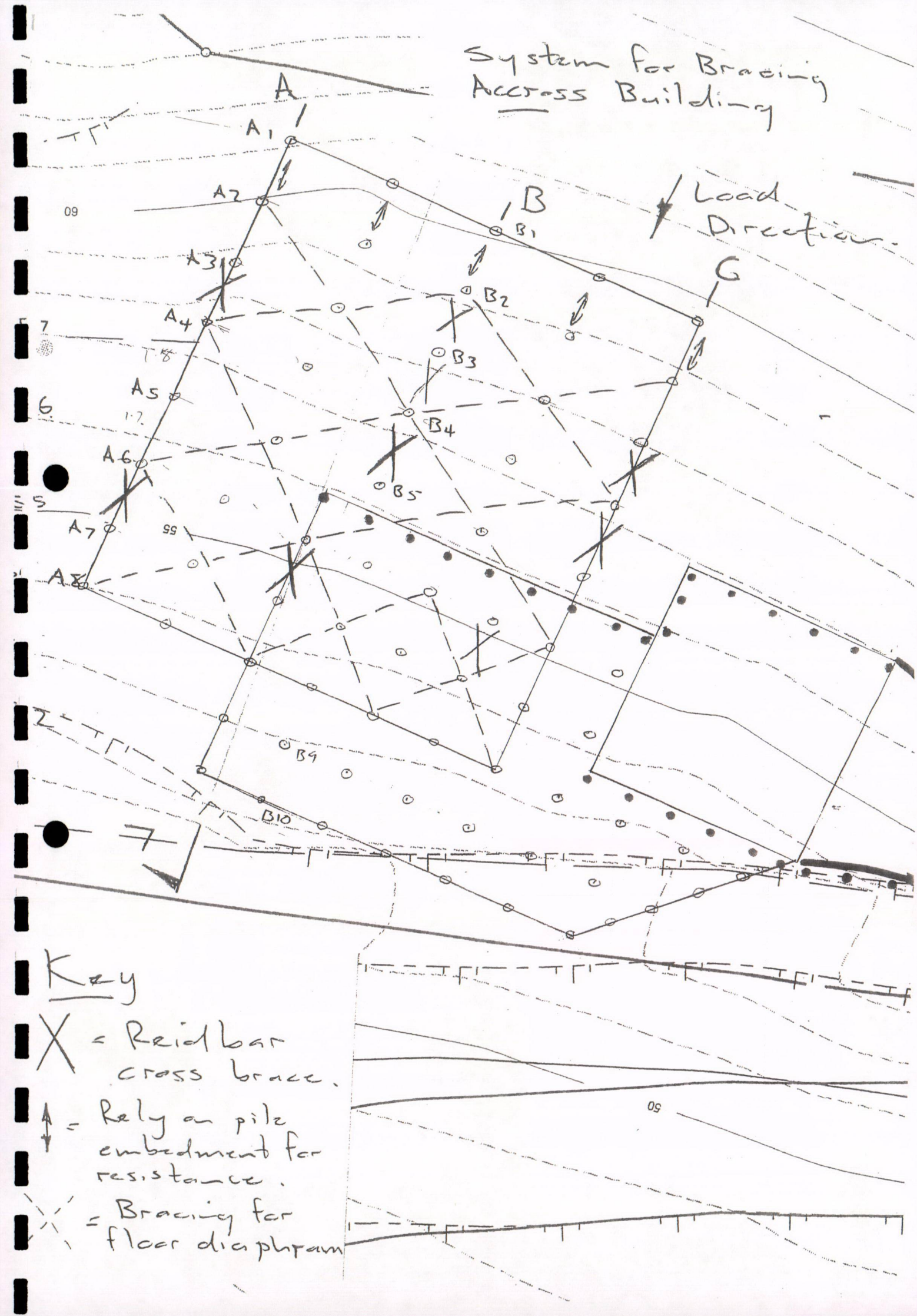
Piles B1 → B5 ∴ See Layout next page.

Load to B1.

		Wt.	C=0.64 Load
Floor	(2.5×0.75×0.5) + (2.5×0.75×1.5G×0.4)	= 2.06	1.32
Ext Wall	2.5×2.5×0.3G	1.88	1.20
Roof	(4.5/2×0.4G×2.5)	2.25	1.44
	Plus sc.		3.96 kN

Load to B2.

		Wt	Load
Floor	(5×1.5×0.5) + (5×1.5×1.5G×0.4)	8.25	5.28
Int wall	(1.2×5×0.3G) + (2×2.4×0.3G) assessed.	3.24	2.07
			7.35 kN


System for Bracing Accross Building
A
B
G
Load Direction
A1
A2
A3
A4
A5
A6
A7
A8
B1
B2
B3
B4
B5
B9
B10
Key
X = Reid bar cross brace.
= Rely on pile embedment for resistance.
= Bracing for floor diaphram

HARRISON GRIERSON

Job Name		Page No. 17
Client		
Job No.	Prepared By	
Date	Checked By	

Work Sheet:

Load to B3

Floor $(5 \times 1.5 \times 0.5G) + (5 \times 1.5 \times 1.5Q \times 0.4)$

Wt	Load
8.25	5.28

Load to B4

Floor $(5 \times 1.7 \times 0.5G) + (5 \times 1.7 \times 1.5Q \times 0.4)$

Ext wall/Int wall $(5 \times 0.3G)$

Roof $\frac{(4.5+6.5)}{2} \times 0.4G \times 5$

Wt	Load
9.35	5.98
1.5	0.96
11	7.04
	13.98

Load to B5

Floor $(5 \times 1.8 \times 0.5G) + (5 \times 1.8 \times 1.5Q \times 0.4)$

Wt	Load
5.4	3.46kN

Consider the area above the parking bays as a seperate area supported by pile embedment. - This is a conservative approach as this area will be tied into the rest of the house by the floor diaphragm. - Calculations to follow.

HARRISON GRIERSON

Job Name		Page No. 18
Client		
Job No.	Prepared By	
Date	Checked By	

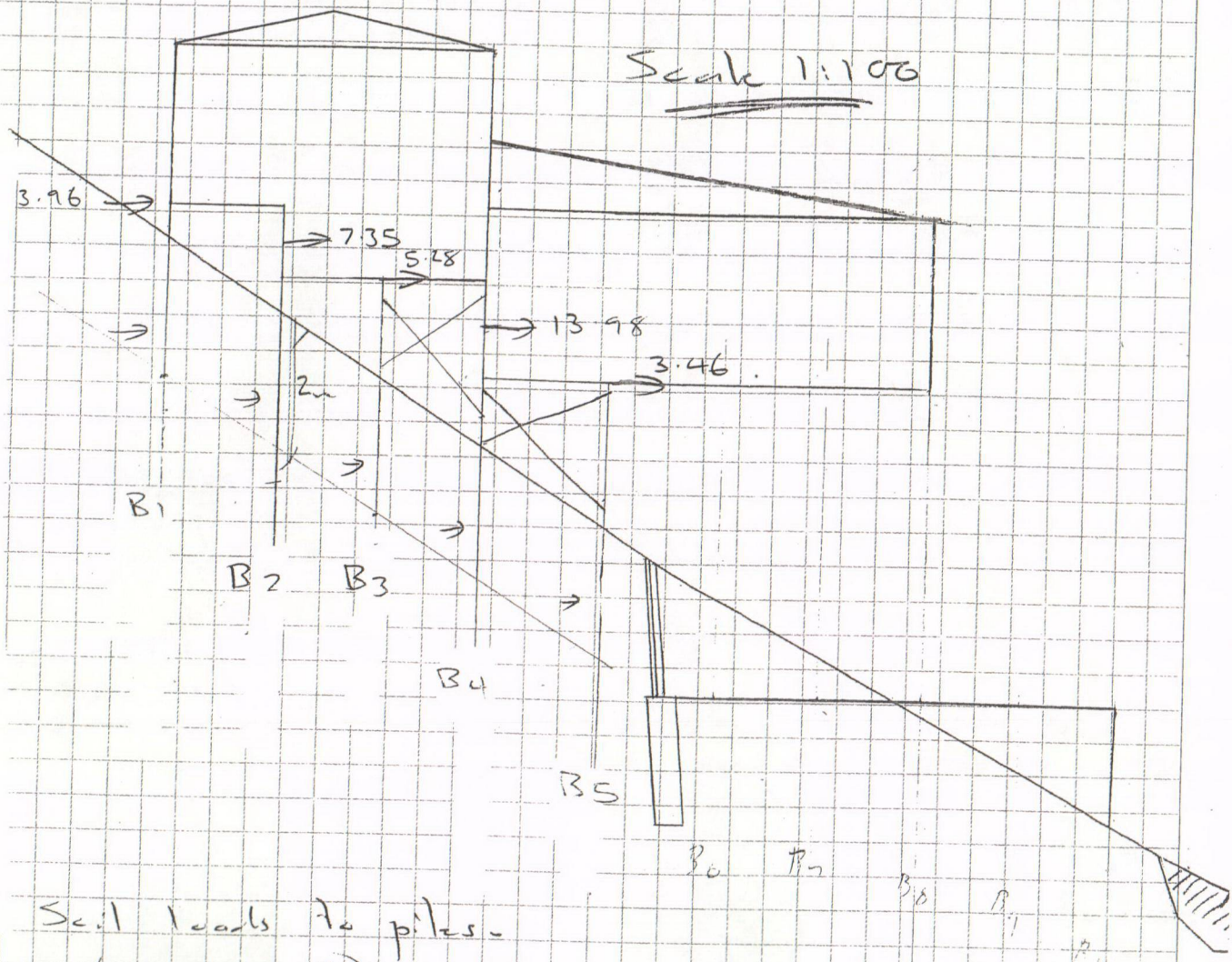
Work Sheet:

Loads to piles ex EG summarised as below.

Also. Soil load to each pile to allow for movement of upper 2m of soil slump over 3 pile diameters. Say pile dia = 0.65m.

3 dia = 1.95m.

Scale 1:100



Soil loads to piles.

$(\frac{1}{2} K_a \gamma h^2) \times 1.6$ EP.

$(\frac{1}{2} \times 0.33 \times 18 \times 2^2) \times 1.6 = 19.01$ kN/m

$19.01 \times 1.95 = 37.07$ kN / pile.

@ 0.67m.

HARRISON GRIERSON

Job Name		Page No. 19
Client		
Job No.	Prepared By	
Date	Checked By	

Work Sheet:

Assess resultant load and point of application for each pile.

	Load	Lever Arm	Moment.
B1.	13.96	3m (2.5m + 0.5m for slope.)	41.88.
	37.07	0.67 + 0.5m. : 1.17m.	43.37
	51.03.		85.25

use 51.03 @ 85.25 / 51.03 = 1.67.

B-dams. : $\phi H_i = \frac{\phi \gamma d L^3 k_p (PSF)}{2(e + L)}$

for 2.5m spacing 0.65m dia PSF = 0.962

use 3.1m embedment.

$\phi H_i = \frac{0.5 \times 18 \times 0.65 \times 3.2^3 \times 3 \times 0.96}{2(1.67 + 3.1)}$

= 52.70. > 51.03 ∴ ok

use 650ϕ 3.2m embedment (5.2m total)

Further pile embedments calculated by spreadsheet.

HARRISON GRIERSON

Job Name		Page No. 2C.
Client		
Job No.	Prepared By	
Date	Checked By	

Work Sheet:

B2

Load	Lever Arm	Moment
7.35	3.5m (3+0.5m)	25.73
37.07	1.17	43.37
44.42.		69.1 kNm.

use 44.42 @ 69.1/44.42 = 1.56m.

use 650 dia @ 3 m embedment. (5m Total).

$\phi H_1 = 49.96 > 44.42$.

B3

Load	Lever Arm	Moment
5.28	4.0m (3.5+0.5)	21.12
37.07	1.17m (0.67+0.5)	43.37
13.14	2.8m (2.3+0.5)	39.14
56.33.		103.63.

103.63/56.33 = 1.84m.

56.33 @ 1.84m

use 650ϕ @ 3.3m embedment (= 2m + 1.3m)

giving $\phi H_1 = 58.99 > 56.33$.

use 750ϕ 58.99 / 1.50 ϕHi embed 3.2m

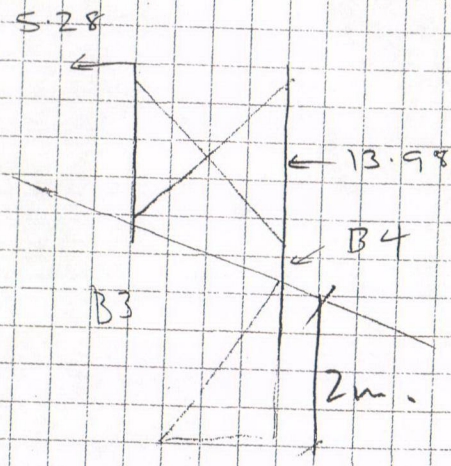
HARRISON GRIERSON

Job Name		Page No. 21
Client		
Job No.	Prepared By	
Date	Checked By	

Work Sheet:

B4 Consider load in other direction as 13.98 taken to B3 in previous calc.

i.e.



Load.	Lever Arm	Moment.
← 5.28.	3.0 (2.5+0.5)	15.84
← 13.98.	4.1 (3.6+0.5)	57.32
→ 3.01	1.17	43.37.
17.81.		= 29.81 kN

73.16 / 19.26 = 3.8m.

29.8 / 17.81 = 1.67m.

17.81 @ 1.67m.

2m embedment with 650ϕ pile. (4m total)

ϕH = 18.39

HARRISON GRIERSON

Job Name		Page No. 22
Client		
Job No.	Prepared By	
Date	Checked By	

Work Sheet:

BS

	Force	Arm	Moment
Case 1	3.46	4.5	15.57
		(4 + 0.5)	
	37.07	1.17m.	43.37
	40.53		58.94

58.94 / 40.53 = 1.45.

40.53 @ 1.45m.

CR. In other direction.

Case 2	3.46 ←	4.5	15.57
	13.98 ←	2.7	37.75
	− 37.07	1.17	− 43.37
	− 19.63		9.95

9.95 / 19.63 = 0.51m. 19.63 @ 0.51m.

∴ Case 1 governs.

40.53 kN @ 1.45m.

Use 650 ϕ @ 2.8 m centres (4.8 total)

ϕMi = 43.58 > 40.53 ∴ ok.

Check pile bending

ϕMm = 0.8 k1 k4 k5 k8 fb Z k2 k2)

where k1 = 0.8 which is conservative as earth and eq loads would be temporary Could use k1 = 1.0

HARRISON GRIERSON

Job Name		Page No. 23
Client		
Job No.	Prepared By	
Date	Checked By	

Work Sheet:

Largest moment = 103.63 kNm
in pile B3. This moment
is conservative

However a 400 dia pile has the following
capacity

$\phi P_{uc} = 0.8 \times 0.8 \times 1 \times 1 \times 1 \times 35 \times 0.9 \times 0.85 * 628318.5 \text{ mm}^3$
$= 116.9$ kNm.

In pile B3 the concrete dia may
need to be increased to 750 mm.

⇒ Pile embedment would
be 3.2m embedment (5.2m total)
as previous.

2.124 kN @ 2.5m.

NOTE

The self weight of the piles themselves
has been omitted from the above calculations
adding this weight as corresponding
force will make little difference to
the pile embedment. See calc below
for pile B3 which is the worst case

$\left(\frac{\pi \times 0.4^2}{4} \times 500 \times 9.81 / 1000\right) * 4\text{m} \times 2\text{m}$
lever arm.

$= 4.931$ kNm. i.e 2.466 @ 2m

HARRISON GRIERSON

Job Name		Page No. 24.
Client		
Job No.	Prepared By	
Date	Checked By	

Work Sheet:

Therefore total for B3

56.33 + 2.466 = 58.8 kN.

Moment = 103.63 + 4.931
= 108.56 kNm

116.9 kNm > 108.56 kNm ∴ pile dia
ok.

Revise embedment for B3 = 3.3m (total 5.3).

ΦH = 61.01 > 58.8.

∴ 650φ 3.3m embed ok.

Given these calculations are to demonstrate the pile house option is achievable the above is satisfactory. ie Max embedment is 5.3m ⇒ only 0.1m embedment added with pile self weight added.

Pile	Embedment (Total)	Dia
B1	5.2m	650φ
B2	5.0m	650φ
B3	5.2 → 5.3.	750φ
B4	4m	650φ
B5	4.8m	650φ

HARRISON GRIERSON

Job Name		Page No. 25
Client		
Job No.	Prepared By	
Date	Checked By	

Work Sheet:

6.4 Lateral Support for Area above Vehicle Parking

Consider Total seismic weight.

		Wt	kN
Ext Wall:	$(6\times2.4\times0.3)+(4.3\times2.8\times0.3)$	8.08	5.17
Roof	$6.5/2\times0.4\text{a}\times6$	7.8	5
Piles	$15\times4.7\text{m long (concrete)}\times\pi\times0.4^2/4\times500\times9.81/1000$	43.46	27.81
Floor:	$(4.\times6\times0.5\text{a})+(4\times6\times1.5\text{a}\times0.4)$	26.4	16.9
			54.88.

$C = 0.64$

$54.88\ \text{kN} / 15\ \text{piles} = 3.66\ \text{kN}.$

acting at top of pile (which is considered) 4.5 m lever arm for each pile.

Also soil loads.

Consider Single Pile with soil loads.

Load	Arm	Moment
3.66	4.5	16.47
37.07	1.17	43.37
40.73.		59.84

$59.84/40.33 = 1.47\text{m}$ ∴ 40.73 kN @ 1.47m.

HARRISON GRIERSON

Job Name		Page No. 26.
Client		
Job No.	Prepared By	
Date	Checked By	

Work Sheet:

3m embedment 650ϕ. (Sm total)

$\phi H_1 = 50.96 > 40.73$ kN.

Pile bending $M^* = 54.84$.

use 325ϕ.

$\phi M_{uc} = 0.8 \times 0.8 \times 1 \times 1 \times 1 \times 38 \times 337.6156 \times 0.85 \times 0.9$

$= 62.07$ kNm

$\therefore$ ok.

6.5. Bracing Along House

Consider bracing line F. - most conservative.

c.c. 0.64.

Load to F1 and F5.

		wt	Load
Ext wall.	$5 \times 3 \times 0.36$	4.5	2.88
Ext/Int wall	$5 \times 1.25 \times 0.36$	1.88	1.20
Floor.	$(5 \times 1.25 \times 0.5) + (5 \times 1.5 \times 1.5 \times 0.4)$	7.65	4.9
Roof.	$5 \times 0.5 \times 0.25$	0.625	0.4
Pile Self Weight.	$\frac{\pi \times 0.4^2}{4} \times 2.5 \times 500 \times 9.81 / 1000$	1.54	0.99
			10.37

Load to F2, F3, and F4.

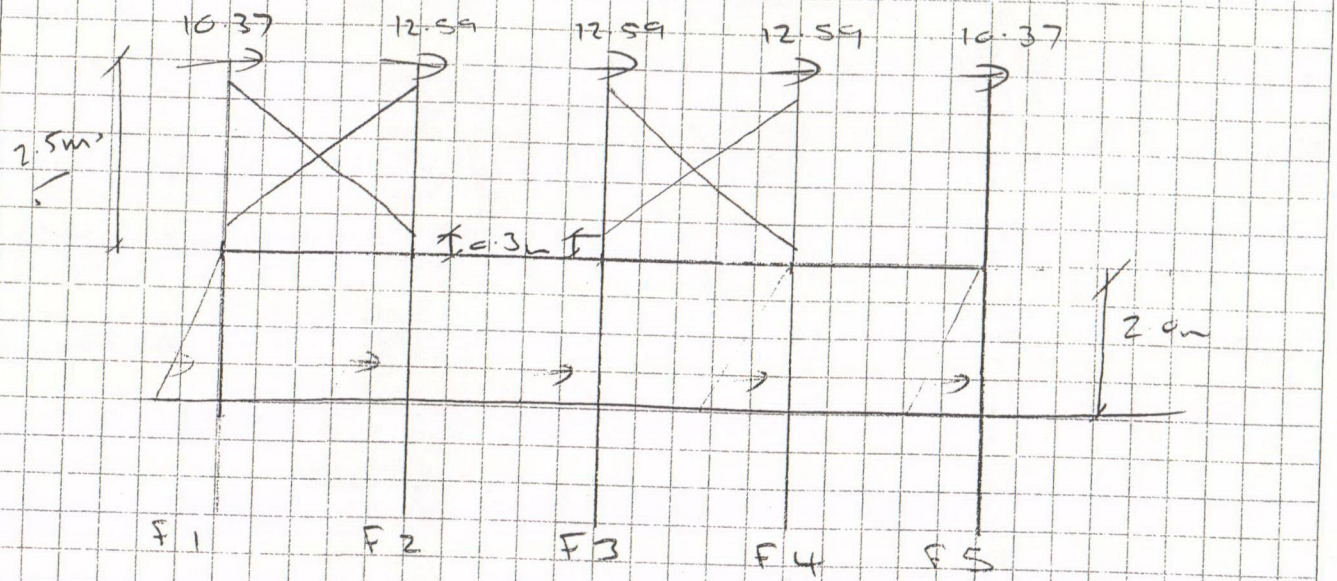
	wt	Load
Floor	$(2.5 \times 5 \times 0.5) + (2.5 \times 5 \times 1.5 \times 0.4)$	7.5	4.8
Ext/Int wall.	$5 \times 2.5 \times 0.3$.	3.75	2.4.
Roof.	$5 \times 0.4 \times 2.5$.	5	3.2
other int wall assumed.	$2.5 \times 2.5 \times 0.36$.	1.88	1.203
Pile weight.	$\frac{\pi \times 0.4^2}{4} \times 2.5 \times 500 \times 9.81 / 1000$	1.54	0.99.
			12.59

HARRISON GRIERSON

Job Name		Page No. 27.
Client		
Job No.	Prepared By	
Date	Checked By	

Work Sheet:

Piles Layout



Consider pile F3 only - as worst case.

Force	Arm	Moment.
12.59	4.5 m	56.66
12.59	2.3 m	28.96
37.07	c·67 m	24.84
62.25 kN.		110.46.

110·46 / 62.25 = 1.77m.

62.25m @ 1.77m.

use 750 dia. pile @ 4.2 m embedment.

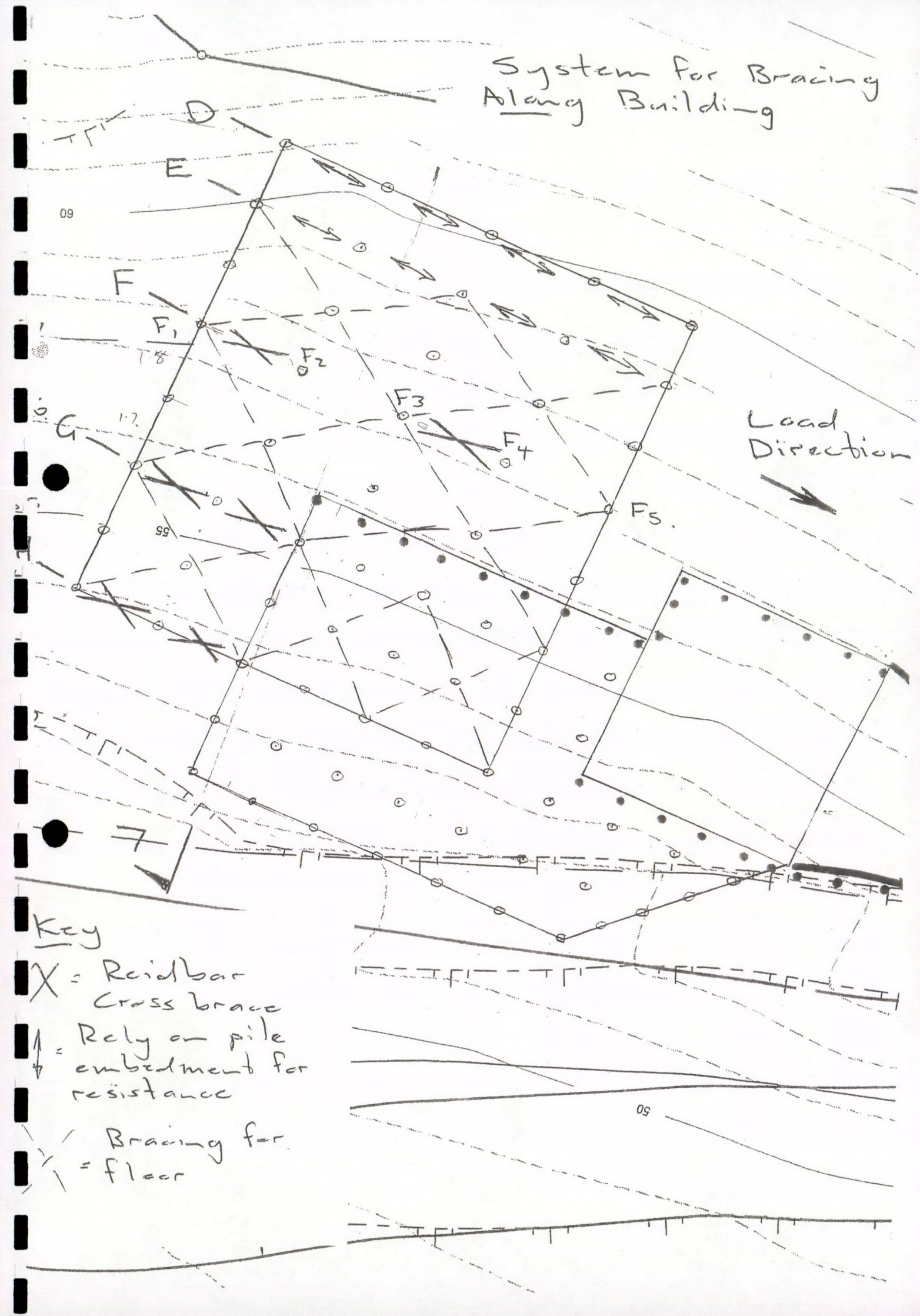
(6.2 m 1.1.1 embedment)

ϕH_i = 66.15 kN > 62.25 kN ∴ ok

$M^* = 110.46$.

use 400 dia pile ϕM_{in} = 116.9 kNm → previous pg 23.

System for Bracing Along Building



Key

X = Reidbar Cross brace

↕ = Rely on pile embedment for resistance

/ = Bracing for floor

HARRISON GRIERSON

Job Name		Page No. 28.
Client		
Job No.	Prepared By	
Date	Checked By	

Work Sheet:

6.6. Lateral Stability of Vehicle Bay Area.

Assess middle row of piles for cube vehicle parking area as most conservative.

Potentially there could be 2 vehicles parked here.

C+C+C+T.

Use 2.5kPa Lin Load.

$2(1.6G + 2.5Q) = 1.2 \quad @ \quad 5.0$

62kN/m per length of beam.

1.5m beam per pile $1.5 \times 62 = 9.3$kN/m.

Eq Load $= 9.3 \times 0.64$

$= 5.95$kN/pile.

Load	Arm	Moment.
5.95	(1.7+2.5)	24.99.
	4.2	
37.07	1.17	43.37
43.02		68.36

$68.36 / 43.02 = 1.59$m.

43.02 @ 1.59m.

Use 650ϕ piles @ 3.6m embedment

(5.6m total)

This is achievable.

HARRISON GRIERSON

Job Name		Page No. 24.
Client		
Job No.	Prepared By	
Date	Checked By	

Work Sheet:

The above calculations demonstrate timber piles encased in concrete can be constructed to provide support for a pile beam on this site. - The pile depths are achievable.

Member Size Summary

* Bearers for House. Max Span = 2.4m. 250x50.
* Joists for House 200x50 @ 450crs Max Span 3.1m.
* Joists for House. 150x50 @ 450crs Max Span 1.9m.
* Joists for Vehicle Deck. 2/300x50 Max Span 1.5m. @400crs.
* Bearers for Vehicle Deck 2/300x50 Max Span 1.5m.
* Decking for Vehicle Deck 100x100 Span between Joists @ 400crs.
* Piles ⇒ Typical all embedded 5m. 650ϕ.
  ⇒ Some will need to be 750ϕ 5.3m.
  ⇒ Typical timber dia 325mm
  ⇒ Some will need to be 400mm dia / 750ϕ core
    ↳ Pile Line B. (Specifically pile B3)
    ↳ Pile Line F (Specifically pile F3)

HARRISON GRIERSON

Job Name		Page No. 30.
Client		
Job No.	Prepared By	
Date	Checked By	

Work Sheet:

7.0 Preliminary Debris Wall Design Above Poke House.

1) The sketch on the next page demonstrates the height of Debris wall required for a shallow failure on the slope above the Poke House.

The debris area on the sketch is 2.78 m^2.

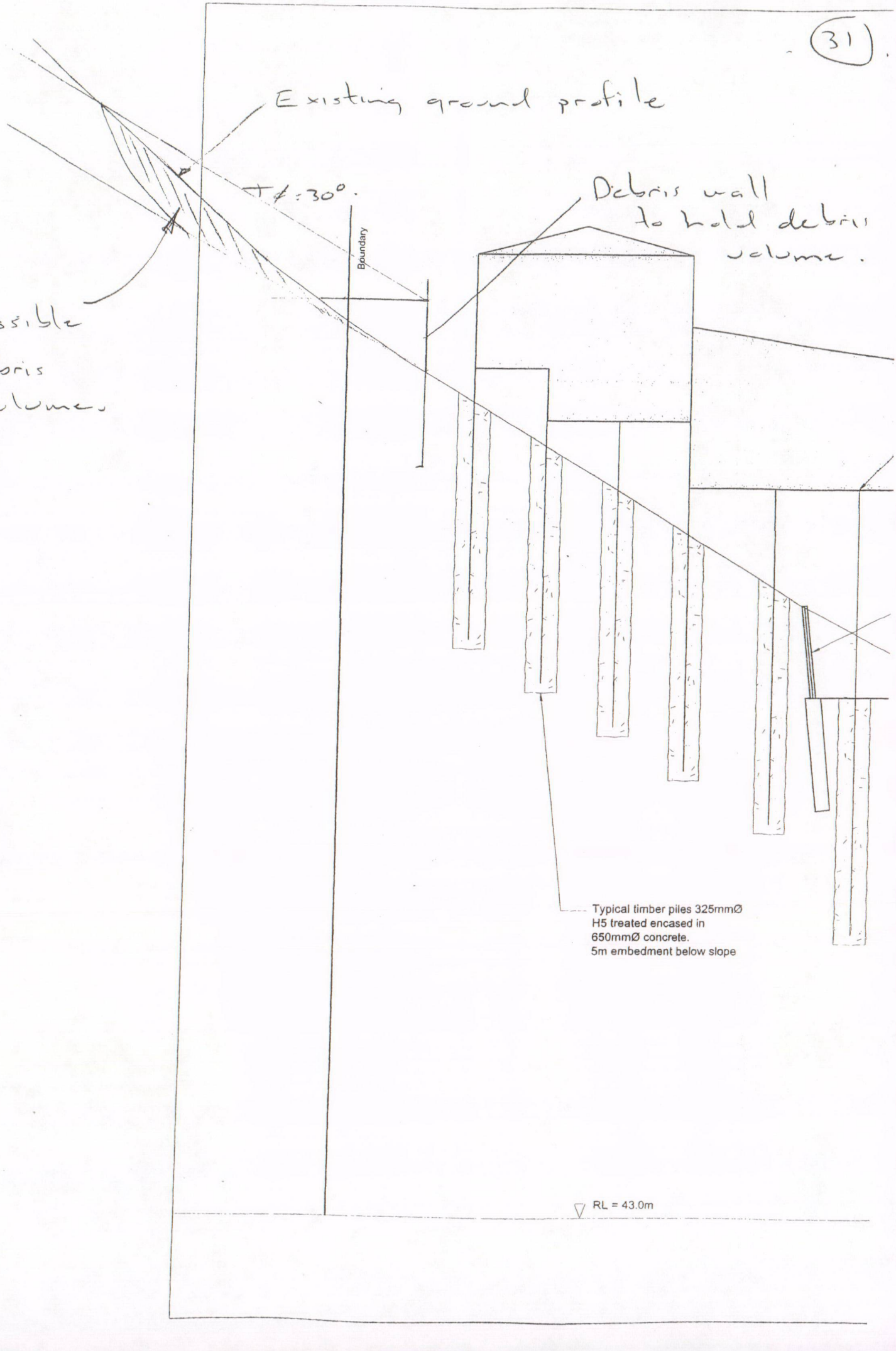
The volume able to be held behind a 1.8 m wall is 2.85 m^2.

∴ Design for 2 m of debris wall.

2) The 2 m debris wall will be designed as would a normal timber pole wall with poles designed to withstand debris weight and using a Kd for pole strength of 0.6 which is conservative as wall will only be temporary until it is removed.

Slats have been designed for full loading

Refer summary at back of spreadsheet


Existing ground profile
$\phi = 30°$.
Debris wall to hold debris volume.
Possible Debris Volume.
Boundary
Typical timber piles 325mmØ
H5 treated encased in
650mmØ concrete.
5m embedment below slope
RL = 43.0m

Timber Pole Vertical Retaining Wall

Job No: 1530-010931-01

DESIGN: 2m Debris Wall

Date: **8/5/2007**

CLIENT: Thornton

ADDRESS: 2B Kowhai Street, Ohope

Prepared by: **GDM**
Checked by:

Step 1: Input Design Parameters

Surcharge (s)	**0**	kPa
Wall Height (h)	**2.0**	m
Pole Spacing (Crs)	**1.2**	m
Soil Density (γ)	**18**	kN/m^3
Shear Res. Angle (ϕ)	**30**	degs
Angle in Radians (ϕ)	0.524	rads
Active Earth Press (P_A)	12.00	kN/m
Surcharge Pressure (P_S)	0.00	kN/m

K_O =	0.50	Earth Pressure at Rest
K_A =	0.33	Active Earth Pressure
K_P =	3.00	Passive Earth Pressure

Step 2: Forces and Moments

	Force (P)	Load Factor	Fact. Load (P*)	Arm (l)	Moment (M*)
Earth Pressure	12.00	**1.6**	19.20	0.67	12.80
Surcharge	0.00	**1.6**	0.00	1.00	0.00
Total	12.00		19.20	1.67	12.80

Step 3: Broms Method ($H^* \le \phi H_U$)

Hole Diameter (d)	**0.50**	m
Embedment Depth (L)	**2.7**	m
H* (per post) =	23.04	kN
ϕHu =	23.68	kN
Design is	OK!	

$$\phi Hu = \phi(\gamma * d * L^3 * K_P) * PSF \,/\, 2*(f + L)$$

Pile Spacing Ratio =	2.40
Pile Spacing Factor (PSF) =	0.60
f =	0.67
ϕ =	**0.5**

Step 4: Pole Bending ($M^* \le \phi M_n$)

Pole diameter	**225**	mm
Section Modulus (Z) =	1118272	mm^3
M* (per post) =	15.36	kNm
ϕM_n =	15.60	kNm
Design is	OK!	

$$\phi M_n = \phi * k_1 * k_4 * k_5 * k_8 * f_b * Z * k_{20} * k_{21}$$

k_1 =	**0.6**	f_b =	**38.0**
k_4 =	**1.0**	k_{20} =	**0.9**
k_5 =	**1.0**	k_{21} =	**0.85**
k_8 =	**1.0**	ϕ =	**0.8**

Step 5: Wailings Design

Wailing Depth (d)	**146**	mm
Wailing Width (b)	**49**	mm
No. of Wailings	**2**	
Section Modulus (Z) =	233697	mm^3
Force on lowest slat (w) =	2.80	kN/m
M* = wL^2/8 =	0.50	kNm
ϕM_n =	1.31	kNm
Design is	OK!	

$$\phi M_n = \phi * k_1 * k_4 * k_5 * k_8 * f_b * Z$$

k_1 =	**0.6**	f_b =	**11.7**
k_4 =	**1.0**	ϕ =	**0.8**
k_5 =	**1.0**		
k_8 =	**1.0**		

SUMMARY:

Wall Height:	**2.0**	**m**			
Embedment Depth:	**2.7**	**m**			
Pole Size:	**225**	**mm dia**			
Hole Diameter:	**0.50**	**m**			
Pole Spacing:	**1.2**	**m**			
Wailing Size:	**146**	**by**	**98**	**mm**	

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HARRISON GRIERSON

STEVEN THORNTON

Wainui Road, Ohope

Structural Design

8.0 Vehicle Turntable Support.

[redacted]

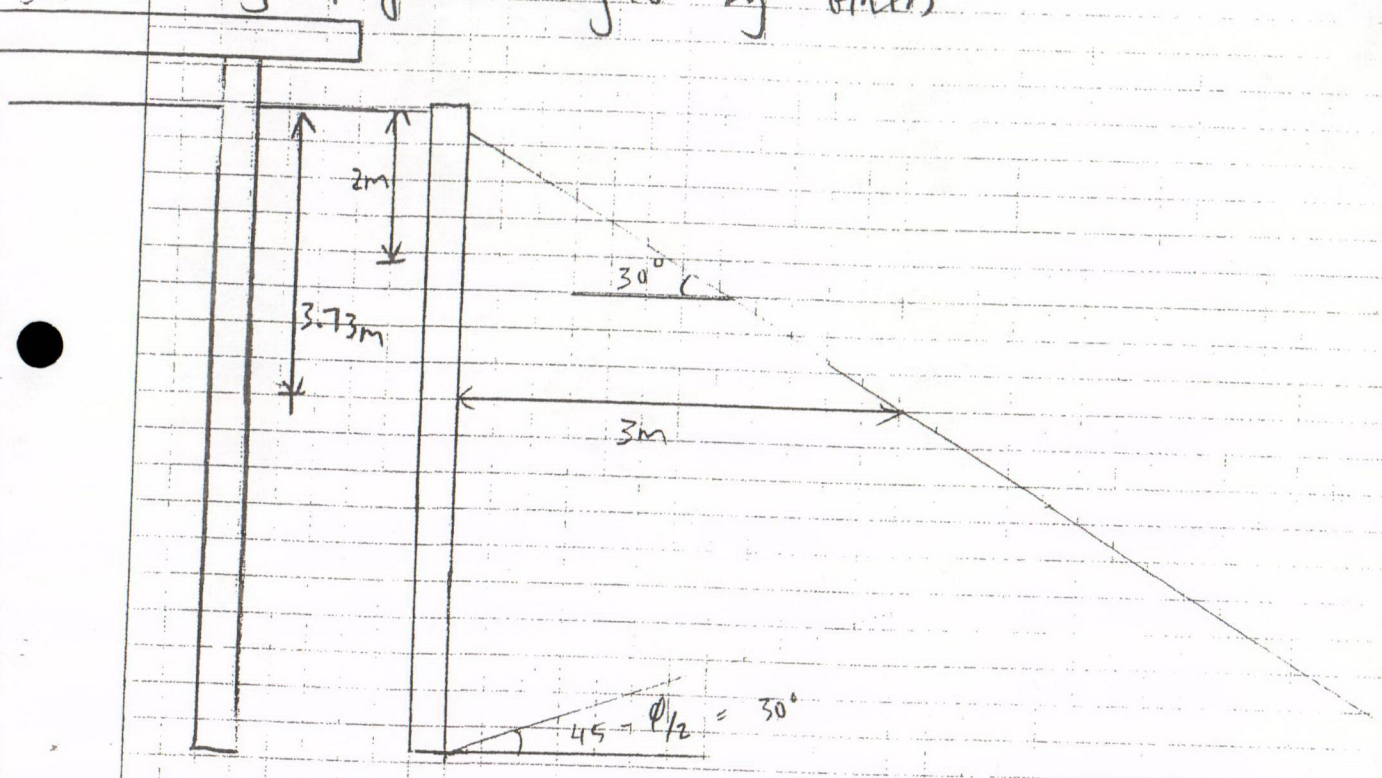
June 2007
Reference 1510-011050-01

HARRISON GRIERSON

Job Name	Wainui Rd, Ohope		Page No.
Client	Steven Thornton		
Job No.	1510 011050 01	Prepared By	KAP
Date	June 07	Checked By	AGT

Work Sheet:
Retaining Wall Design

Car turning platform designed by others



Retaining height = 2m

Actual retaining height = 2m + 3 x tan 30° = 3.73m

(w) Backslope = 0°

Downslope = 30°

HARRISON GRIERSON

Job Name	Wainui Rds, Ohope		Page No.
Client	Steven Thornton		
Job No.	1510 011 050 01	Prepared By	KAP
Date	June 07	Checked By	AJT

Work Sheet:

Check seismic load case, find out K_{AE}

$C(T) = C_0 R Z$ $\quad \phi = 30°$

$C(T) = 0.4 \times 1 \times 0.8$

$C(T) = 0.32$

$\theta = \tan^{-1} C(0) = 17.75°$

$$K_{AE} = \frac{\cos^2(\phi - \beta - \theta)}{\cos\theta \cos^2\beta \cos(\delta + \beta + \theta)\left[1 + \sqrt{\frac{\sin(\phi+\delta)\sin(\phi-i-\theta)}{\cos(\delta+\beta+\theta)\cos(i-\beta)}}\right]^2}$$

($\cos^2\beta = 1$, $\cos(\delta+\beta+\theta) = 1$, $\cos(i-\beta) = 1$)

$$K_{AE} = \frac{\cos^2(12.25)}{\cos 30 \left[1 + \sqrt{\frac{\sin 30 \sin(30 - 0 - 17.75)}{1}}\right]^2}$$

$= 0.901$

$K_{AE}(0.901) > 1.6 K_0 \; (1.6 \times 0.5)$

Therefore earthquake case governing

Concrete Pile Retaining Wall

Input factor		
γ soil		kN/m³
Up slope (ω)		degree
Down slope		degree
ϕ soil		degree
Kae	0.90	
Retaining height		m
Actual retaining height (H)	3.7	m
Factor		
Surcharge		kN/m²
Pole spacing (s)		m

Calculation of M*		
Psoil	191.58 kN	
Psoil arm	1.24 m	= H/3
Psurcharge	0.00 kN	
Psurcharge arm	1.87 m	= H/2
M*	238.20 kN.m	= Psoil*arm*factor + Psurcharge*arm*factor

$P_{Soil} = K_A \gamma H^2 s /2$

$P_{Surcharge} = K_A$ *Sucharge *H * s

ϕ600 concrete pile with 12HD20 , R12 @ 150 c/c
5 tirrup

ok,

refer attached
analysis

Gen-Col
Analysis of Reinforced Concrete Columns

Job number (or name): Wainui Rd
Column number:

Dimensions of the column section:

Diameter = 600.0 mm
Clear Cover to ties = 75.0 mm

Reinforcement:

Bar no.	x, mm	y, mm	Bar dia, mm
1	202.0	0.0	20.0
2	174.9	101.0	20.0
3	101.0	174.9	20.0
4	0.0	202.0	20.0
5	-101.0	174.9	20.0
6	-174.9	101.0	20.0
7	-202.0	0.0	20.0
8	-174.9	-101.0	20.0
9	-101.0	-174.9	20.0
10	0.0	-202.0	20.0
11	101.0	-174.9	20.0
12	174.9	-101.0	20.0

With bars supported by ties, an allowance for deformations of db/10 is made in placing the bars

Ties:

Ties diameter = 12.0 mm

Column section area & reinforcement ratio:

Column section area = 282600 mm2
Reinforcement area = 3770 mm2
Reinforcement ratio = 0.01334

Gen-Col
Analysis of Reinforced Concrete Columns

Job number (or name): Wainui Rd
Column number:

User name : kap

Concrete properties:

Rectangular stress block as defined by NZS 3101:1995.
Concrete cylindrical compressive strength = 35.0 MPa
Concrete compression stress coefficient, a1 = 0.85
Compression zone depth coefficient, B1 = 0.81
Concrete maximum strain = 0.0030

Steel properties:

Steel modulus of elasticity = 200 000 MPa
Steel yield strength = 500.0 MPa

Dimensions of the column section:

Circular section.
Diameter = 600.0 mm
Clear cover to ties = 75.0 mm

Results:

Load combination number 1 :
Axial load = 1.1 kN, Mx = 333.3 kNm, My = 0.0 kNm
Strength reduction factor, Phi = 0.85
Required reinforcement ratio = 0.01333, Required reinforcement area = 3767.1 mm2
Initial reinforcement ratio = 0.01333, Initial reinforcement area = 3767.1 mm2
Initial reinforcement ratio scaled by = 1.0000
Moment ratio = 0.00000, Target moment ratio = N/A
Skew angle = 0.0 degrees, NA depth = 141.7 mm
Force (unfactored) carried by concrete = 1160.0 kN
Force (unfactored) carried by reinforcement = -1158.7 kN
Axial load eccentricity: ex = 0.0 mm, ey = 303000.0 mm

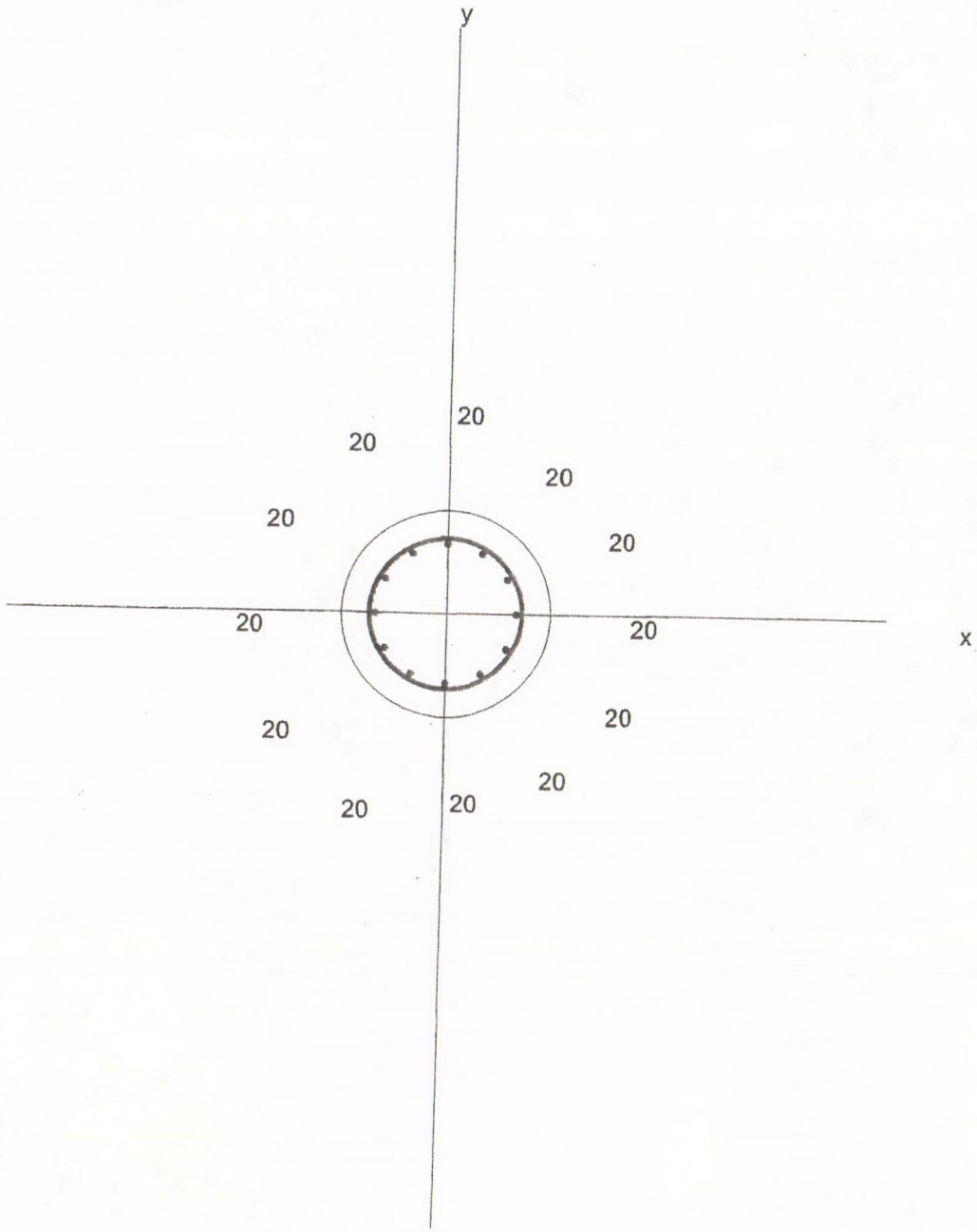
The analysis has been finished.

Gen-Col
Analysis of Reinforced Concrete Columns

Job number (or name): Wainui Rd
Column number:

Column area = 282600 mm2
Reinforcement area = 3770 mm2
Reinforcement ratio = 0.01334

Drawing scale : 1 / 20
Column section radius = 300.0 mm
Clear cover to ties = 75.0 mm



Gen-Col
Analysis of Reinforced Concrete Columns

Job number (or name): Wainui Rd
Column number:

The results are for the last load combination. (Phi =1)

Concrete (Phi=1) :
Element number = 1
Element x & y coordinates = (0, 277) mm
Element area = 10651 mm^2
Strain = 0.00251
Stress = 29.8 MPa
Force in the element = 316.9 kN
Moment x-axis = 87.7 kNm
Moment y-axis = 0.0 kNm

Element number = 2
Element x & y coordinates = (0, 231) mm
Element area = 17695 mm^2
Strain = 0.00153
Stress = 29.8 MPa
Force in the element = 526.4 kN
Moment x-axis = 121.5 kNm
Moment y-axis = 0.0 kNm

Element number = 3
Element x & y coordinates = (0, 196) mm
Element area = 10645 mm^2
Strain = 0.00081
Stress = 29.8 MPa
Force in the element = 316.7 kN
Moment x-axis = 62.2 kNm
Moment y-axis = 0.0 kNm

Reinforcement (Phi=1):
bar number = 1
Bar x & y coordinates = (202, 0) mm
Bar area = 314 mm^2
Strain = -0.00335
Stress = -500.0 MPa
Effective bar force = -157.1 kN
Moment x-axis = 0.0 kNm
Moment y-axis = -31.7 kNm

---

bar number = 2
Bar x & y coordinates = (175, 101) mm
Bar area = 314 mm^2
Strain = -0.00121
Stress = -242.3 MPa
Effective bar force = -76.1 kN
Moment x-axis = -7.7 kNm
Moment y-axis = -13.3 kNm

---

bar number = 3
Bar x & y coordinates = (101, 175) mm
Bar area = 314 mm^2
Strain = 0.00035
Stress = 70.5 MPa
Effective bar force = 22.1 kN
Moment x-axis = 3.9 kNm
Moment y-axis = 2.2 kNm

---

bar number = 4

41

Job number (or name): Wainui Rd
Column number:

Bar x & y coordinates = (0, 202) mm
Bar area = 314 mm^2
Strain = 0.00093
Stress = 155.4 MPa
Effective bar force = 48.8 kN
Moment x-axis = 9.9 kNm
Moment y-axis = 0.0 kNm
---
bar number = 5
Bar x & y coordinates = (-101, 175) mm
Bar area = 314 mm^2
Strain = 0.00035
Stress = 70.5 MPa
Effective bar force = 22.1 kN
Moment x-axis = 3.9 kNm
Moment y-axis = -2.2 kNm
---
bar number = 6
Bar x & y coordinates = (-175, 101) mm
Bar area = 314 mm^2
Strain = -0.00121
Stress = -242.3 MPa
Effective bar force = -76.1 kN
Moment x-axis = -7.7 kNm
Moment y-axis = 13.3 kNm
---
bar number = 7
Bar x & y coordinates = (-202, 0) mm
Bar area = 314 mm^2
Strain = -0.00335
Stress = -500.0 MPa
Effective bar force = -157.1 kN
Moment x-axis = 0.0 kNm
Moment y-axis = 31.7 kNm
---
bar number = 8
Bar x & y coordinates = (-175, -101) mm
Bar area = 314 mm^2
Strain = -0.00549
Stress = -500.0 MPa
Effective bar force = -157.1 kN
Moment x-axis = 15.9 kNm
Moment y-axis = 27.5 kNm
---
bar number = 9
Bar x & y coordinates = (-101, -175) mm
Bar area = 314 mm^2
Strain = -0.00705
Stress = -500.0 MPa
Effective bar force = -157.1 kN
Moment x-axis = 27.5 kNm
Moment y-axis = 15.9 kNm
---
bar number = 10
Bar x & y coordinates = (0, -202) mm
Bar area = 314 mm^2
Strain = -0.00762
Stress = -500.0 MPa
Effective bar force = -157.1 kN
Moment x-axis = 31.7 kNm

Gen-Col
Analysis of Reinforced Concrete Columns

Job number (or name): Wainui Rd
Column number:

Moment y-axis = 0.0 kNm

---

bar number = 11
Bar x & y coordinates = (101, -175) mm
Bar area = 314 mm^2
Strain = -0.00705
Stress = -500.0 MPa
Effective bar force = -157.1 kN
Moment x-axis = 27.5 kNm
Moment y-axis = -15.9 kNm

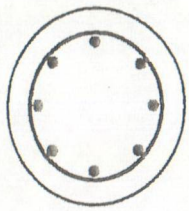
---

bar number = 12
Bar x & y coordinates = (175, -101) mm
Bar area = 314 mm^2
Strain = -0.00549
Stress = -500.0 MPa
Effective bar force = -157.1 kN
Moment x-axis = 15.9 kNm
Moment y-axis = -27.5 kNm

NA equation:
y = x * 0.000 + 158.25
Skew angle = 0.0 degrees
NA depth = 141.7 mm

The a line equation:
y = x * 0.000 + 185.18
Skew angle = 0.0 degrees
The a line depth = 114.8 mm

Pier Shear Strength



Circular Pier = 600mm Diameter
Longitudinal Reinforcing = 12 - HD 20

Circular Pier:

f'c = **35** MPa
d = diam = **600** mm
A_G = 0.28 m^2
d' = 450 mm
ϕ = **0.75**
N* = **0** kN

Longitudinal Reinforcing:

A_S = **12** - HD **20**
= 3,770 mm^2
cover = **75** mm

V* = **192** kN
V* < ϕV_N

check : $v_N = V^* / \phi\, b\, d'$

where : $b\, d'$ = 0.16 m^2

$\therefore v_N$ = 1.61 MPa

check : $v_N <$ 0.2 f'c = 7.0 MPa **OK**
$v_N <$ 1.1$\sqrt{f'c}$ = 6.5 MPa **OK**
$v_N <$ 9.0 MPa **OK**

$V_N = V_C + V_S$

$\therefore V_S = V^*/\phi - V_C$

where : $V_C = v_C\, b\, d'$

where : $v_C = (1 + 3\, N^*/A_G.\, f'c)\, v_B$

where: $v_B = (0.07 + 10\, p_W)\sqrt{f'c}$

$p_W = 0.3A_S/bd' = 0.0071$

$\therefore v_B$ = 0.83 MPa

check : $v_B <$ 0.2 $\sqrt{f'c}$ = 1.18 MPa **OK**
$v_B >$ 0.08$\sqrt{f'c}$ = 0.5 MPa **OK**

$\therefore v_C$ = 0.83 MPa

$\therefore V_C$ = 133 kN

$\therefore V_S = V^*/\phi - V_C$ = 123.2 kN

Try : D **12** @ **150** crs

$V_S = \pi/4.\, A_V\, .\, f_{YT}\, .\, d/s$ = 160 kN **OK**

where: f_{YT} = **300** MPa

Check : A_V (D12@150) = 226 mm^2

A_V (MIN) = 0.35 d's/f_{YT} = 79 mm^2 **OK**

and A_V (MIN) = $(v_N - v_C)d's/f_{YT}$ = 174 mm^2 **OK**

Use : D 12 @ 150 crs
as transverse reinforcement

HARRISON GRIERSON

Job Name	Wainui Rds, Ohope		Page No.
Client	Steven Thornton		
Job No.	1510 01105001	Prepared By	
Date	June 07	Checked By	AJT

Work Sheet:

Check rails

UDL = Kae γ H x 0.15 ← round ϕ150 rail

0.9 x 18 x 2 x 0.15 = 4.86 kN/m

$M^* = 4.86 \times 1.7^2 / 8 = 1.76$ kN.m

Adopt 150 round timber for rails

Calculation of ϕ Mu

Timber pole diameter		mm	
ϕ			
k1			
k4			
k5			
k8			
k20			
k21			
k22	1		
fb			
Z	331339.85	mm^3	
ϕMu	4.37	kN.m	OK

Check embedment

Horizontal force = 192 kN

$\phi Hu > 192$ kN

$$\phi Hu = \phi \frac{K_p D_s L^3 \gamma}{2(L+f)}$$

Lateral capacity for short free head pile in cohesionless soil

$$= \frac{0.5 \times 3 \times 0.6 \times 6.3^3 \times 18}{2(6.3+3.7)}$$

$= 203$ kN > 192 kN

Therefore pile is 6.3m deep below

Total pile length = 3.7m + 6.3m = 10 m

HARRISON GRIERSON

Job Name	Wainui Rd, Otaki	Page No.
Client	Steven Thornton	
Job No.	1510 011050	Prepared By KAP
Date	June 07	Checked By

Work Sheet:

check earthquake load case for car turning structure

Dead load of car turning structure

Deck + Slab = 24 x (0.25) x 1.5 x 1.5 = 13.5 kN

4 wheel = 36 kN

Total weight = 49.5 kN

C = 0.54 x 0.67 x 1.2 x 1 x 1 = 0.434

Feq = 49.5 x 0.434 = 21.5 kN

There are 4 piles, so each pile take 5.4 kN

say it's cantilever 1m (ignore top 1m soil)

$M^* = 5.4$ kN.m $\phi M = 13.5$ kN.m

Adopt ϕ 250mm with 6 D10 R6 @ 120 c/c

check embedment

F = 5.4 kN

$$\phi Hu = \frac{\phi K_p D s L^3 \gamma}{2(L+f)} = 0.5 \frac{3 \times 0.75 \times 2^3 \times 18}{2(2+1)} = 9 > 5.4 \text{ kN}$$

Gen-Col
Analysis of Reinforced Concrete Columns

Job number (or name): Wainui Rd
Column number:

Dimensions of the column section:

Diameter = 250.0 mm
Clear Cover to ties = 30.0 mm

Reinforcement:

Bar no.	x, mm	y, mm	Bar dia, mm
1	83.5	0.0	10.0
2	41.7	72.3	10.0
3	-41.8	72.3	10.0
4	-83.5	0.0	10.0
5	-41.7	-72.3	10.0
6	41.8	-72.3	10.0

With bars supported by ties, an allowance for deformations of db/10 is made in placing the bars

Ties:

Ties diameter = 6.0 mm

Column section area & reinforcement ratio:

Column section area = 49063 mm2
Reinforcement area = 471 mm2
Reinforcement ratio = 0.00960

Gen-Col
Analysis of Reinforced Concrete Columns

Job number (or name): Wainui Rd
Column number:

User name : kap

Concrete properties:

Rectangular stress block as defined by NZS 3101:1995.
Concrete cylindrical compressive strength = 30.0 MPa
Concrete compression stress coefficient, a1 = 0.85
Compression zone depth coefficient, B1 = 0.85
Concrete maximum strain = 0.0030

Steel properties:

Steel modulus of elasticity = 200 000 MPa
Steel yield strength = 300.0 MPa

Dimensions of the column section:

Circular section.
Diameter = 250.0 mm
Clear cover to ties = 30.0 mm

Results:

Load combination number 1 :
Axial load = 14.4 kN, Mx = 13.5 kNm, My = 0.0 kNm
Strength reduction factor, Phi = 0.85
Required reinforcement ratio = 0.00960, Required reinforcement area = 471.0 mm2
Initial reinforcement ratio = 0.00959, Initial reinforcement area = 470.5 mm2
Initial reinforcement ratio scaled by = 1.0000
Moment ratio = -0.00009, Target moment ratio = N/A
Skew angle = 0.0 degrees, NA depth = 43.6 mm
Force (unfactored) carried by concrete = 130.7 kN
Force (unfactored) carried by reinforcement = -113.8 kN
Axial load eccentricity: ex = 0.0 mm, ey = 937.5 mm

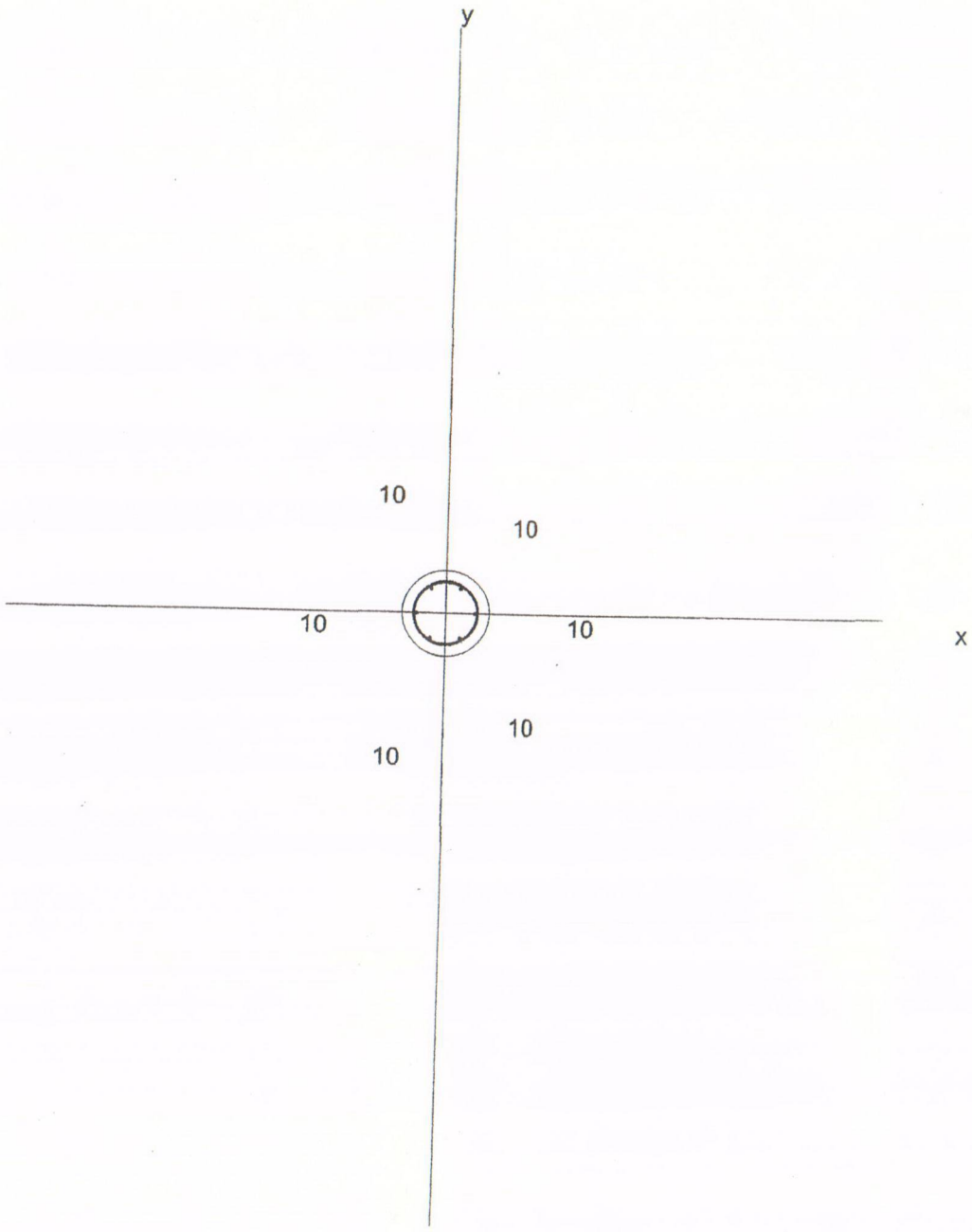
The analysis has been finished.

Gen-Col
Analysis of Reinforced Concrete Columns

Job number (or name): Wainui Rd
Column number:

Column area = 49063 mm2
Reinforcement area = 471 mm2
Reinforcement ratio = 0.00960

Drawing scale : 1 / 20
Column section radius = 125.0 mm
Clear cover to ties = 30.0 mm



Gen-Col
Analysis of Reinforced Concrete Columns

Job number (or name): Wainui Rd
Column number:

The results are for the last load combination. (Phi =1)

Concrete (Phi=1) :
Element number = 1
Element x & y coordinates = (0, 106) mm
Element area = 5127 mm^2
Strain = 0.00173
Stress = 25.5 MPa
Force in the element = 130.7 kN
Moment x-axis = 13.9 kNm
Moment y-axis = 0.0 kNm

Reinforcement (Phi=1):
bar number = 1
Bar x & y coordinates = (84, 0) mm
Bar area = 79 mm^2
Strain = -0.00559
Stress = -300.0 MPa
Effective bar force = -23.6 kN
Moment x-axis = 0.0 kNm
Moment y-axis = -2.0 kNm
---
bar number = 2
Bar x & y coordinates = (42, 72) mm
Bar area = 79 mm^2
Strain = -0.00062
Stress = -124.4 MPa
Effective bar force = -9.8 kN
Moment x-axis = -0.7 kNm
Moment y-axis = -0.4 kNm
---
bar number = 3
Bar x & y coordinates = (-42, 72) mm
Bar area = 79 mm^2
Strain = -0.00062
Stress = -124.4 MPa
Effective bar force = -9.8 kN
Moment x-axis = -0.7 kNm
Moment y-axis = 0.4 kNm
---
bar number = 4
Bar x & y coordinates = (-84, 0) mm
Bar area = 79 mm^2
Strain = -0.00559
Stress = -300.0 MPa
Effective bar force = -23.6 kN
Moment x-axis = 0.0 kNm
Moment y-axis = 2.0 kNm
---
bar number = 5
Bar x & y coordinates = (-42, -72) mm
Bar area = 79 mm^2
Strain = -0.01056
Stress = -300.0 MPa
Effective bar force = -23.6 kN
Moment x-axis = 1.7 kNm
Moment y-axis = 1.0 kNm
---
bar number = 6

Job number (or name): Wainui Rd
Column number:

Bar x & y coordinates = (42, -72) mm
Bar area = 79 mm^2
Strain = -0.01056
Stress = -300.0 MPa
Effective bar force = -23.6 kN
Moment x-axis = 1.7 kNm
Moment y-axis = -1.0 kNm

NA equation:

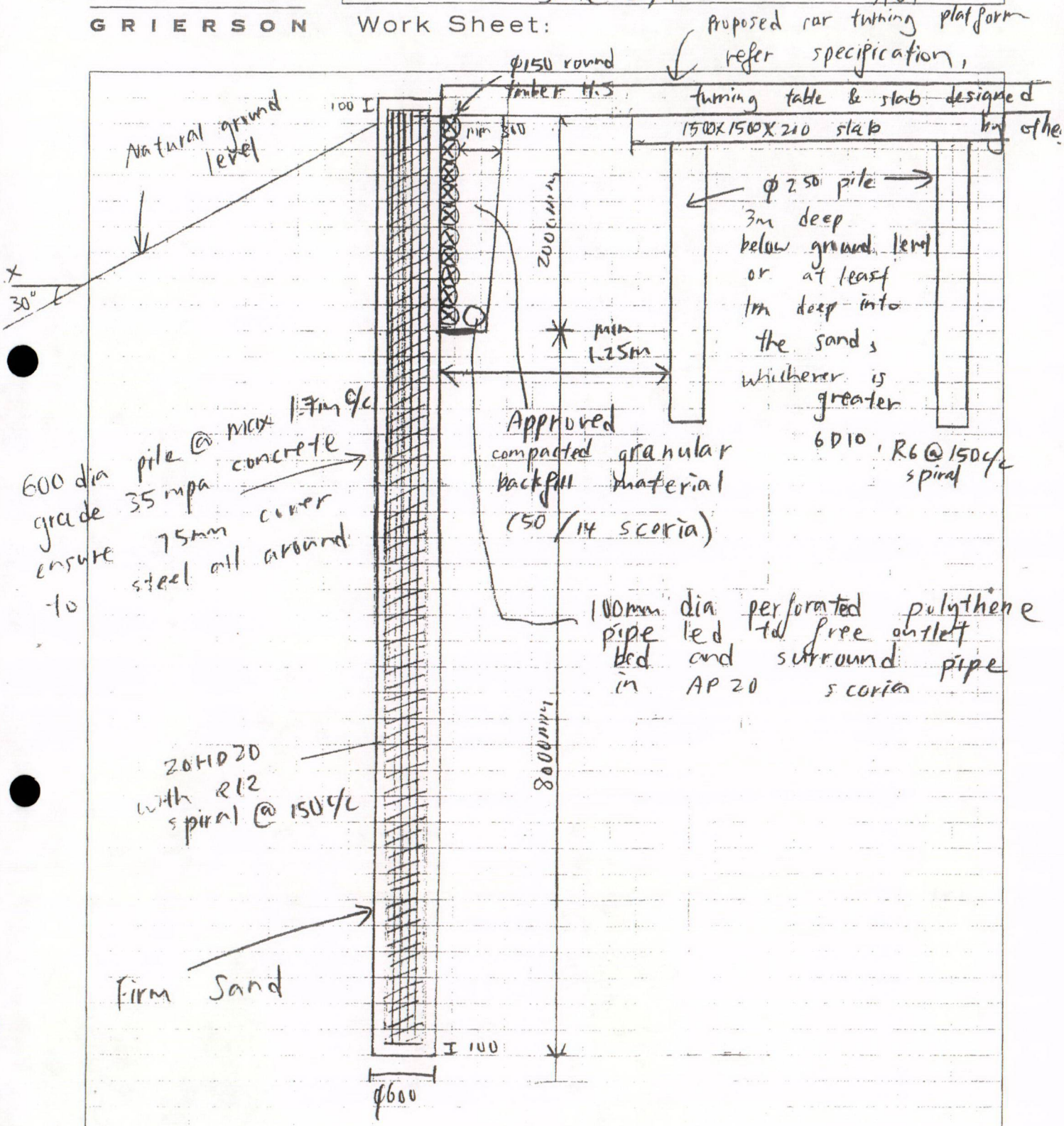
y = x * 0.000 + 81.35
Skew angle = 0.0 degrees
NA depth = 43.6 mm

The a line equation:
y = x * 0.000 + 87.90
Skew angle = 0.0 degrees
The a line depth = 37.1 mm

HARRISON GRIERSON

Job Name	Wainui Rd Otaki		Page No.
Client	Steven Thornton		
Job No.	1510 011030	Prepared By	ICAP
Date	June 07	Checked By	AJT

Work Sheet:



HARRISON GRIERSON

Job Name WAINUI ROAD, OHOPE		Page No.
Client STEVEN THORNTON		
Job No. 1510-011050	Prepared By Jm	
Date	Checked By 13-6-07.	

Work Sheet:

SUMMARY OF PRELIMINARY DESIGN CALCULATIONS

1. Carousel to be supported by 4 No. 250mm diameter bored concrete piles, refer to Fig on Page No 7 for layout;
2. Piles to extend a minimum of 3m from underside of pile cap or a minimum of 1m into the harder layer (very dense cemented sand), whichever is the deeper;
3. Pile cap dimensions have been taken as 1.5 x 1.5 x 0.2m thick (to be confirmed during the detailed design phase.
4. Axial capacity of piles significantly greater than the applied vertical loads when considered singly or as a group.
5. Analyses based on HGL's report 1510-011050-01 dated August 2005.

HARRISON GRIERSON

Job Name WAINUI ROAD, OHOPE		Page No. 1
Client STEVEN THORNTON		
Job No. 1510 011050.	Prepared By Jm	
Date 11-6-07	Checked By	

Work Sheet:

Refer to CARousel brochure (attached) for details of the turntable construction.

For details of ground investigation, refer to HGCL Report dated August 2005 (ref: 1510 011050 01). This report also gives details of the stability analyses undertaken.

The turntable and bearing assembly will be supported on a 1.5 x 1.5 x .2m thick pile cap by 4 No. piles.

According to the CAROUSEL brochure, the self weight of the assembly is approximately 1T (=10 kN)

Self weight of pile cap = 1.5 x 1.5 x 0.2 x 24

= 10.8 kN.

∴ Self WT = 10 + 10.8 = 20.8 kN. (= G)

Assume a uniformly distributed load of 2.5 kPa on turntable to represent the car, giving a line load of $\frac{\pi}{4}(4^2) \times 2.5 = 31.4$ kN. (= Q)

load at ULS = 1.2 (20.8) + 1.6 (31.4)

= 75.2 kN.

For a group of 4 piles, static load per pile

$= \frac{75.2}{4} = 18.8$ kN.

HARRISON GRIERSON

Job Name		Page No. 2
Client		
Job No.	Prepared By	
Date	Checked By	

Work Sheet:

Verification Method B1/VM14

Table 4 Strength reduction factors for deep foundation design.

$\phi_{f-c} = 0.4 - 0.55$

Take $\phi_{f-c} = 0.5$

Ultimate capacity required = $\frac{18.0}{0.5}$ = 37.6 kN. per pile.

Refer to Pile Analysis and Design by Poulos + Davis

Ultimate load capacity of a single pile in sand given by:

$$P_u = \int_0^L \pi D K_s \tan \phi'_d \, dz + A_b \sigma'_{vb} N_q - W.$$

where D = pile diameter

σ'_{vb} = effective stress at pile base

σ'_v = effective stress along shaft

N_q = bearing capacity factor (Berezantsev)

W = self weight of pile

ϕ'_d = design angle of friction

K_s = lateral earth pressure coefficient.

HARRISON GRIERSON

Job Name		Page No. 3.
Client		
Job No.	Prepared By	
Date	Checked By	

Work Sheet:

The following parameters were used in the stability analyses:

Upper Layer (0-2m) $\phi' = 30°$, $C' = 5\ kPa$, $\gamma_b = 18\ kN/m^3$

Lower Layer (> 2m) $\phi' = 40°$, $C' = 20\ kPa$, $\gamma_b = 18\ kN/m^3$.

Assume W.T at 2.0m depth.

Bored piles to be used that penetrate to the lower, more competent, layer. Ignore shaft friction component in the upper layer, and adopt a more conservative $\phi_d = 38°$, $C = 0$ for the lower layer.

Try 0.25m dia. piles.

Use method described in Section 3.2.3 of Poulos and Davis to limit the magnitude of effective stress (and hence end bearing and shaft friction components).

Ref fig 3.10(a).

$$\phi = \phi'_d - 3 = 38 - 3 = 35°.$$

$$\frac{z_c}{d} = 7 \quad \therefore z_c = 7 \times 0.25 = 1.75$$

Depth	σ_v	u	σ'_v	Depth	σ_v	u	σ'_v
0	0	0	0	5	90	30	60.
1.75	31.5	0	31.5				
2.0	36	0	36.0				
3.0	54	10	44.0				
4.0	72	20	52.0				

HARRISON GRIERSON

Job Name		Page No. 4
Client		
Job No.	Prepared By	
Date	Checked By	

Work Sheet:

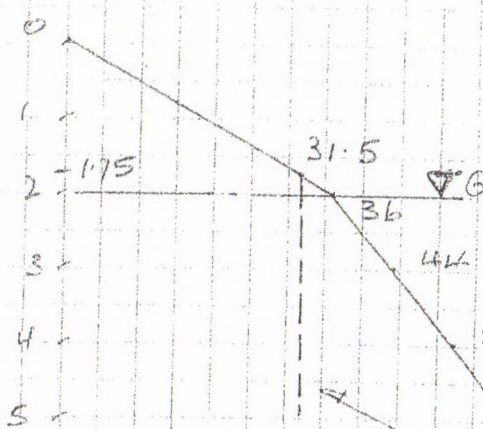


Fig 3.10(c) $K_s \tan \phi_d = 0.4$ (after Meyerhof)

Fig 3.11 $N_q = 70$ (after Berzantzev)

End bearing

$A_b N_q \sigma'_{vb}$

for piles of 3, 4 and 5m length.

$A_b N_q \sigma'_{vb} = \frac{\pi}{4}(0.25)^2 \cdot 70 \times 31.5$

$= 108.2$ kN.

Shaft friction

Pile length	$K_s \tan \delta$	$A_s = \pi D L$ *	σ'_v	$\pi D \sigma'_v K_s \tan \phi_d$ dz
3.0	0.4	0.785	31.5	9.9
4.0	0.4	1.571	31.5	19.8
5.0	0.4	2.356	31.5	29.7.

* A_s = area of shaft within lower layer (sand).
surface

HARRISON GRIERSON

Job Name		Page No. 5
Client		
Job No.	Prepared By	
Date 11/12-6-07.	Checked By	

Work Sheet:

Pile length	Ultimate capacity (kN) Base resistance	Shaft resistance	W	Pu
3.0	108.2	9.9	3.5	114.6
4.0	108.2	19.8	4.7	123.3
5.0	108.2	29.7	5.9	132.0

Target capacity per pile = 37.6 kN

Potential to reduce pile diameter but difficulties may be experienced in inserting the reinforcement. Also number of piles could be reduced but symmetry would be lost.

At this stage allow for 4 No. 250mm diameter piles.

Check on group effects

New Zealand Building Code, Verification Method B1/VM4.

Ultimate vertical strength of pile groups - Cl 4.4.1

Drained strength of a pile group considered as a single block (taking $c' = 0$)

$$V_B = (q' N_q + 0.6 B_g \gamma N_\gamma) B_g L_g + (\sigma'_v K_0 \tan \delta'_{av}) 2 (B_g + L_g)$$

HARRISON GRIERSON

Job Name		Page No. 6.
Client		
Job No.	Prepared By	
Date	Checked By	

Work Sheet:

Where

q' = vertical effective stress (σ_v') in ground adjacent to the foundation at depth D_f

σ_v' = vertical effective stress at a given depth in the soil profile

B_G = width (between pile extremities) of a pile group

L_G = length (Do) of a pile group

L = length of pile shaft

V_B = ultimate strength of the block of soil enclosed within the pile group.

Γ = bulk density or submerged density

δ' = drained angle of shearing resistance at the soil/block interface

K_0 = coefficient of earth pressure at rest.

N_γ, N_q = bearing strength factors

Consider only that portion of block in lower layer ($\geq 2m$)

For a concrete pile, $\delta' = 0.75\phi = 0.75 \times 38 = 28.5$

$K_s = 1.0$ for $R_D < 40\%$ } Table 2

from Fig 4 $\phi' = 38$, $N_q = 120$.

$N_\gamma = 2(N_q - 1)\tan\phi$

$= 2(120-1)\tan 38 = 186$.

For piles founded within the lower layer ($> 2m$) assume saturated conditions, therefore $\Gamma' = 18 - 10 = 8\ kN/m^3$.

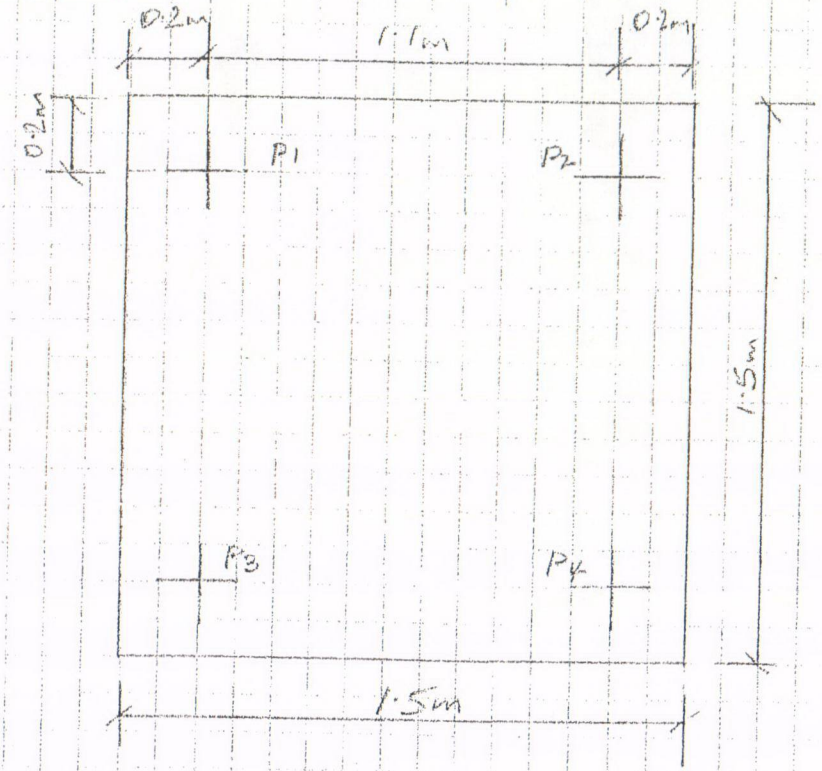
$K_0 = 1 - \sin\phi = 0.38$.

HARRISON GRIERSON

Job Name		Page No. 7
Client		
Job No.	Prepared By	
Date	Checked By	

Work Sheet:

PILE LAYOUT $P_1 = P_2 = P_3 = P_4$: 0.25m Φ concrete piles.



Consider group comprising piles P_1 & P_3

$B_G = 0.25$

$L_G = 1.1 + 0.25 = 1.35m$

Group P_1 P_2, P_3 & P_4 $B_G = L_G = 1.1 + 0.25 = 1.35m$.

Group P_1 & P_3.

$$V_B = (q' N_q + 0.6 B_G \gamma' N_\gamma) B_G L_G + 2(B_G + L_G) L (\sigma'_v K \tan\delta_{AV})$$

Pile length	σ'	u	σ'_v, q'	L
3.0	54	10	44	1.0
4.0	72	20	52	2.0
5.0	90	30	60	3.0

HARRISON GRIERSON

Job Name		Page No. 8
Client		
Job No.	Prepared By	
Date	Checked By	

Work Sheet:

For 3m pile length

$$V_B = ((44 \times 120) + (0.6 \times 0.25 \times 8 \times 186))0.25 \times 1.35 + 2(0.25 \times 1.35)1.0(44 \times 0.38 \times \tan 28.5)$$

$$= 1086 \text{ kN.}$$

The ultimate vertical strength of the group is given by:

$$\frac{1}{V_G^2} = \frac{1}{n^2 V_1^2} + \frac{1}{V_B^2}$$

where

V_G = ultimate strength of group

n = number of piles in group (2)

V_1 = ultimate strength of an individual pile in group (for 3m long 114.6 kN)

$$\frac{1}{V_G^2} = \frac{1}{2^2 \times 114.6^2} + \frac{1}{1086^2}$$

$$V_G = 227 \text{ kN.}$$

By observation, as pile length increases V_1 and V_B become larger and V_G increases accordingly. Apply a geotechnical reduction factor (ϕ_{pc}, Table 4) of 0.4

$\phi_{pc} V_G = 0.4 \times 227 = 90.8$ kN for 2 pile group

Capacity required $= \frac{75.2}{4} \times 2 = 37.6$ kN $\therefore$ OK.

HARRISON GRIERSON

Job Name		Page No. 9
Client		
Job No.	Prepared By	
Date	Checked By	

Work Sheet:

Group P_1, P_2, P_3 & P_4

$B_G \cdot L_G = 1.35 m.$

For 3m pile Long H.

$$V_B = ((44 \times 120) + (0.6 \times 1.35 \times 8 \times 186))\, 1.35^2 + 2(1.35 + 1.35)(1.0)(44 \times 0.38 \times \tan 28.5)$$

$$= 11868\ kN.$$

$$\frac{1}{V_G^2} = \frac{1}{4^2 \times 1114.6^2} + \frac{1}{11868^2}$$

$$V_G = 458\ kN.$$

$\phi_{pc} = 0.4$ $\quad \phi_{pc} V_G = 0.4 \times 458 = 183\ kN$

Requirement = 75.2 kN. $\therefore$ OK.

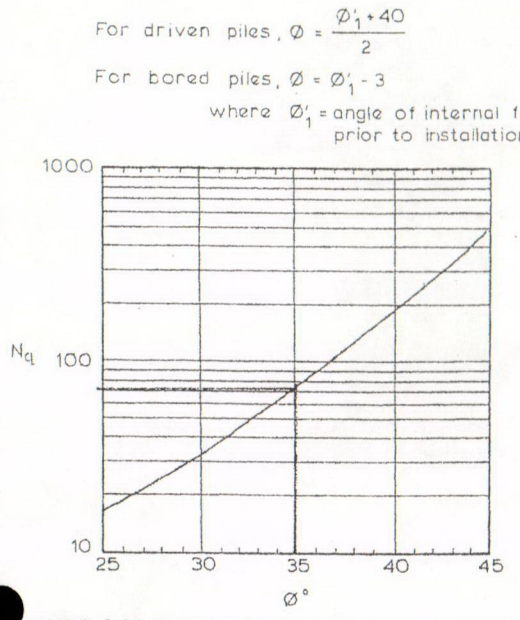


FIGURE 3.11 Relationship between N_q and ϕ (after Berezantzev et al., 1961).

of L/d; however, the curve of Fig. 3.11 also lies near the middle of Meyerhof's range.

Values of the taper correction factor F_ω are plotted against ϕ in Fig. 3.12 and have been derived from the results of the analysis developed by Nordlund (1963).

In applying the results in Fig. 3.10 to Fig. 3.12, it is suggested that the following values of ϕ be used to allow for the effects of pile installation.

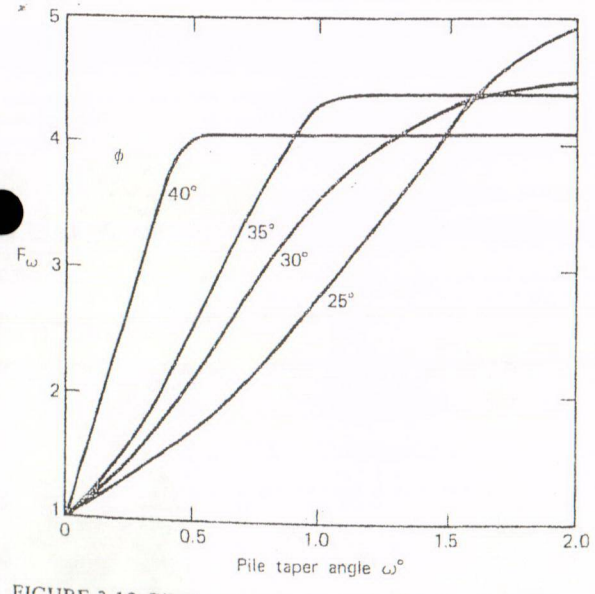


FIGURE 3.12 Pile taper factor F_ω (after Nordlund, 1963).

(a) Driven Piles

(a) For the determination of N_q, the values of ϕ beneath the pile top should be taken as the final value subsequent to driving, as given by Kishida (1967):

$$\phi = \frac{\phi'_1 + 40}{2} \tag{3.17}$$

where

ϕ'_1 = angle of internal friction prior to installation of the pile

(b) For the determination of $K_s \tan \phi'_a$ and z_c/d, the value of ϕ along the pile shaft should be taken as the mean of the values prior to, and subsequent to, driving; that is,

$$\phi = \frac{3}{4}\phi'_1 + 10 \tag{3.18}$$

(b) Bored Piles

(a) For the determination of N_q and z_c/d, it is suggested that the value of ϕ be taken as $\phi'_1 - 3$, to allow for the possible loosening effect of installation (see Section 2.4).
(b) For $K_s \tan \phi'_a$, Fig. 3.10*c* should be used, taking the value of ϕ'_1 directly.

The above suggestions may also require modification in the light of future investigations. Furthermore, if jetting is used in conjunction with driving, the shaft resistance may decrease dramatically and be even less than the value for a corresponding bored pile.

McClelland (1974) has reported tests in which the use of jetting with external return flow followed by driving reduced the ultimate shaft capacity by about 50%, while installation by jetting alone reduced the ultimate shaft capacity to only about 10% of the value for a pile installed by driving only.

Another case in which caution should be exercised is when piles are to be installed in calcareous sands. Such sands may show friction angles of 35° or more, but have been found to provide vastly inferior support for driven piles than normal silica sands. In such cases, McClelland (1974) suggests limiting the skin resistance to 0.2 tons/ft^2 (19 kN/m^2) and base resistance to 50 tons/ft^2 (4800 kN/m^2). In such circumstances, drilled and grouted piles may provide a more satisfactory solution than wholly driven piles.

In many practical cases, only standard penetration-test data may be available. The value of ϕ'_1 may be esti-

σ'_v = effective vertical stress along shaft
= effective overburden stress for $z \leqslant z_c$ or limiting value σ'_{vc} for $z \geqslant z_c$
σ'_{vb} = effective vertical stress at level of pile base
F_ω = correction factor for tapered pile (= 1 for uniform diameter pile)

On the basis of the test results of Vesic (1967), values of $K_s \tan \phi'_a$ and the dimensionless critical depth z_c/d have been evaluated. Vesic's results are presented in terms of the relative density D_r of the sand, but the results may also be expressed in terms of the angle of internal friction ϕ', by using a relationship such as that suggested by Meyerhof (1956):

$$\phi' = 28 + 15D_r \tag{3.16}$$

Relationships between $K_s \tan \phi'_a$ and ϕ', and z_c/d and ϕ', are shown in Fig. 3.10. In a layered-soil profile, the critical depth z_c refers to the position of the pile embedded in the sand. It should be emphasized that these relationships may be subject to amendment in the light of further test results. For example, at present, the dependence of $K_s \tan \phi'_a$ on the pile material is not defined. Vesic's tests were carried out on steel tube piles, but the values of $K_s \tan \phi'_a$ derived from these tests appear to be applicable to other pile materials. However, in the light of future test results, it may be possible to derive different relationships for different pile materials.

For bored or jacked piles, the values of $K_s \tan \phi'_a$ in Fig. 3.10*b* are considered to be far too large, and it is suggested that values derived from the data of Meyerhof (1976) are more appropriate for design. These values are shown in Fig. 3.10*c*, and have been obtained by assuming $\phi'_a = 0.75\phi'$. The values for bored piles are reasonably consistent with, although more conservative than, those recommended by Reese, Touma, and O'Neill (1976). Also shown are values of $K_s \tan \phi'_a$ for driven piles, derived from Meyerhof's data; these latter values are considerably smaller (typically about one half) of the values given in Fig. 3.10*b*. Some of this difference may lie in the method of interpretation of the data of Vesic and others by Meyerhof, which leads to smaller values of $K_s \tan \phi'_a$ associated with larger values of z_c/d.

The bearing capacity factor N_q is plotted against ϕ in Fig. 3.11, these values being based on those derived by Berezantzev et al. (1961). Vesic (1967) has pointed out that there is a great variation in theoretical values of N_q derived by different investigators, but the values of Berezantzev et al. appear to fit the available test data best.

The solutions given by Berezantzev et al. indicate only a small effect of relative embedment depth L/d, and the curve in Fig. 3.11 represents an average of this small range. The curves given by Meyerhof (1976) show a larger effect

For driven piles $\phi = \frac{3}{4}\phi'_1 + 10$ (Fig. 3.10a, Fig. 3.10b)
For bored piles, $\phi = \phi'_1 - 3$ (Fig. 3.10a); $\phi = \phi'_1$ (Fig. 3.10c)
where ϕ'_1 = angle of internal friction prior to installation of pile

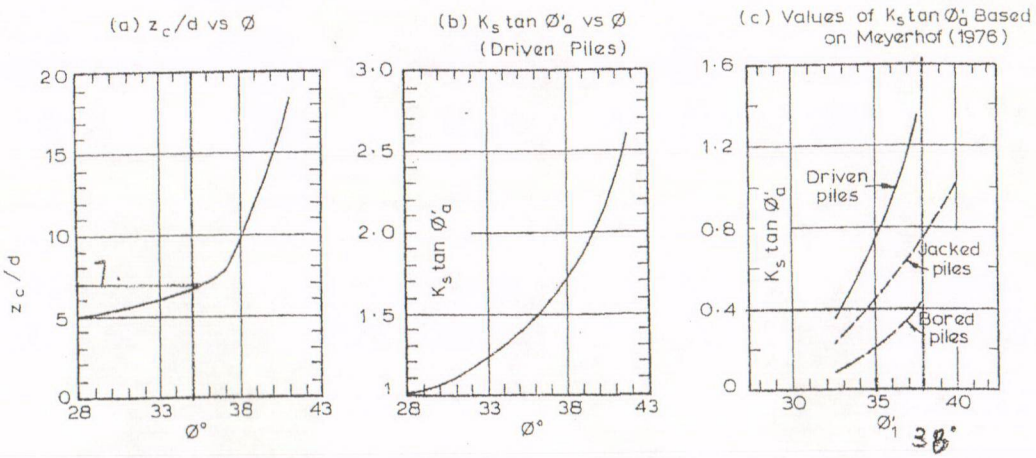
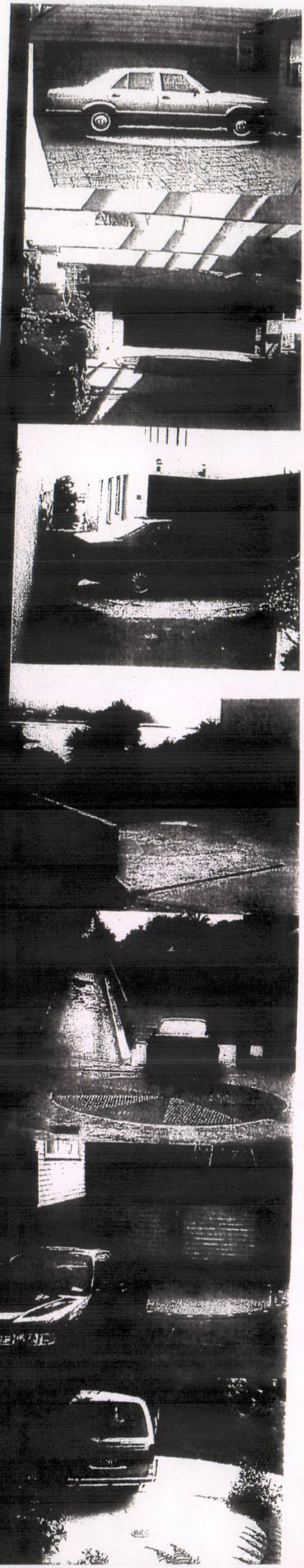


FIGURE 3.10 Values of z_c/d and $K_s \tan \phi'_a$ for piles in sand.

CARousel
Turntables ltd.



Space-saving
Vehicle Turntables

When you have nowhere else to turn

Message from **Ian Webb**



THINKING OF USING A TURNTABLE?
HERE ARE SOME POINTS TO CONSIDER.

You must decide how long you wish it to last. 2 years? 5 years? No! When you install a turntable, you will use it every-time you use your car. So you must buy one which has been thoroughly tested, and **will last a lifetime.** It has to out-last many cars you will buy. It will be an integral part of your property.

It would be a simple task to manufacture a flimsy turntable for the short term. Many people do.

We have often been asked to make repairs on such models for distressed owners. As a consequence, we reject any impulse to cut down on quality and durability in order to reduce the initial cost. This would be false economy.

Beware of turntables which **don't have Design Certificates** issued by Qualified Registered Structural Engineers and are backed up by extensive Guarantees from the manufacturer.

Make sure your turntable is protected by reserve strength in construction. Most cars weigh up to 1.5 tonnes but other vehicles such as 4x4 utilities, small but loaded delivery vans, or even large cars can weigh well over 2 tonnes. This is where a DESIGN CERTIFICATE is invaluable.

COST - A good well-made durable turntable protected by Hot Dip Galvanizing and installed in a well-considered position on your property is not a cost! **It is an INVESTMENT!** No other feature of your home will give such prestige and service.

Carefully check the ground stability in the chosen site area. The slightest sinking in any part of it can cause a turntable to jam, and became an embarrassment to own. Because of it's cantilevered design, the Standard Model CARousel can in fact, handle some ground movement without being adversely affected.

CHOOSE CAREFULLY.
BUY AN ASSET
- NOT A LIABILITY.

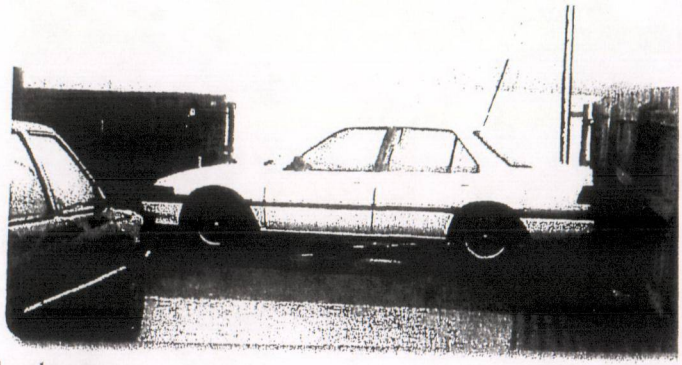
With best regards

Ian Webb, Managing Director/Designer

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Turntable Pit Details / Sloping Sites	1
High Density Parking Solutions	2
'Custom Built' to your requirements	4
New Model	5
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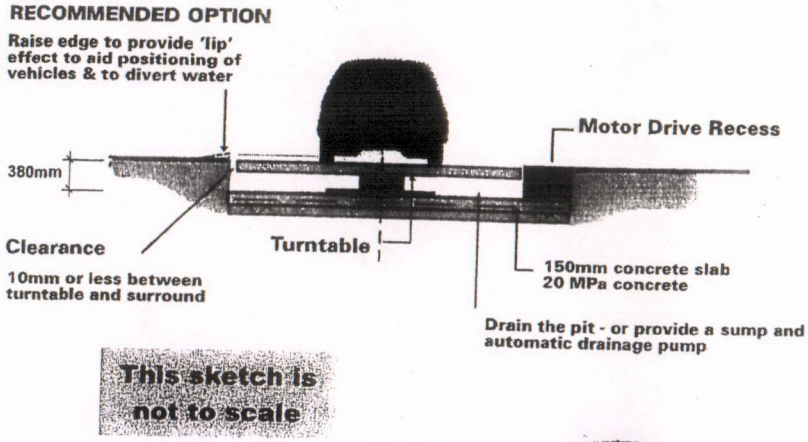
CARousel Vehicle Turntables are cost-effective solutions for properties with difficult access.



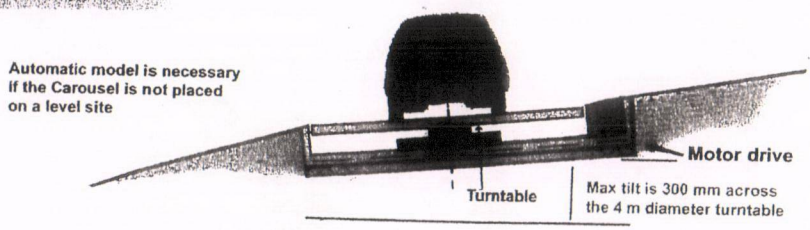
They prove less costly than the alternative of retaining walls or turning aprons either by crib walling or timber decks. They allow development of steep sections through improved access and allow in-fill housing where access would otherwise hinder development.

By removing the need for a turning apron, a CARousel allows more amenity space for outdoor living and increases attractiveness of your landscaping layout.

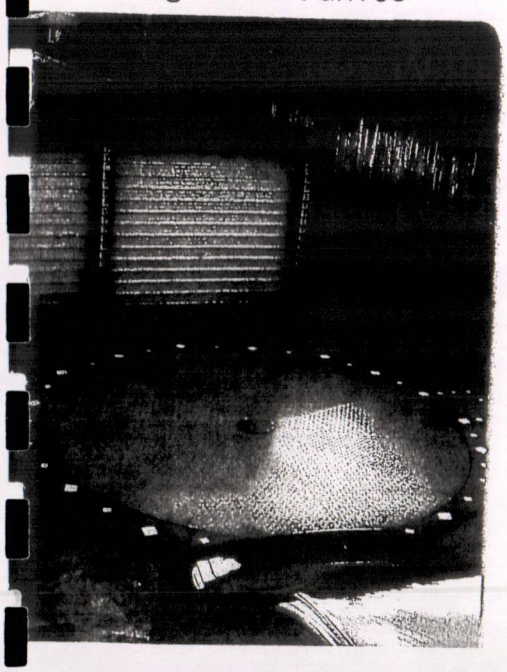
CARousel Turntable Pit Details



This sketch is not to scale



Eliminates reversing down long difficult drives

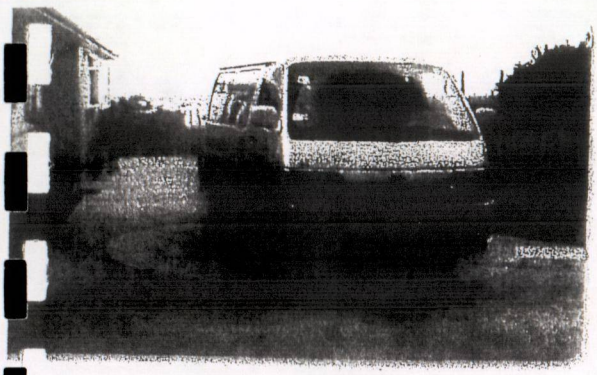


Sloping sites are easily catered for, with the CARousel:

- Mounted upon a single pole or centre support;
- Built into a deck structure;
- Fastened down on a 150mm concrete slab.

Steeper sites: CARousel turntables can be installed on angle to suit steeper sites. The automatic model is recommended in this situation.

Today's solution for properties with tight vehicle access. Doubles parking space.



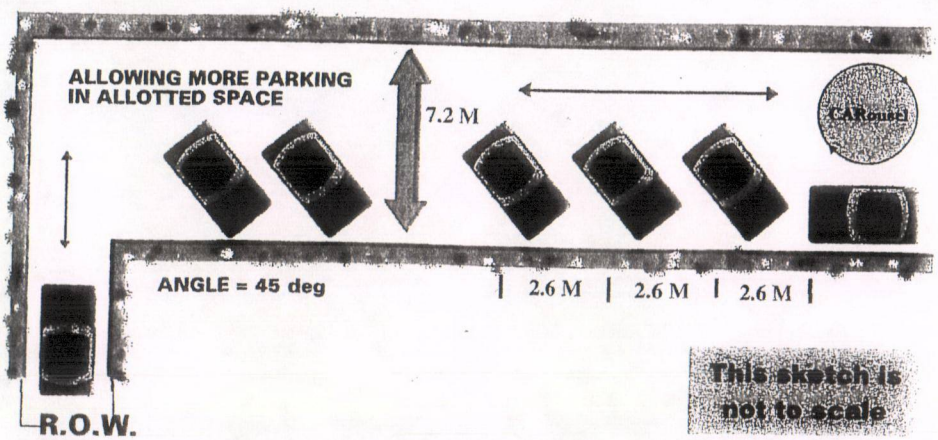
In drives that are NARROWER THAN THE LENGTH OF THE CAR there is usually a portion where a CARousel can be set that allows cars to overhang lawns and low gardens etc. as they turn.

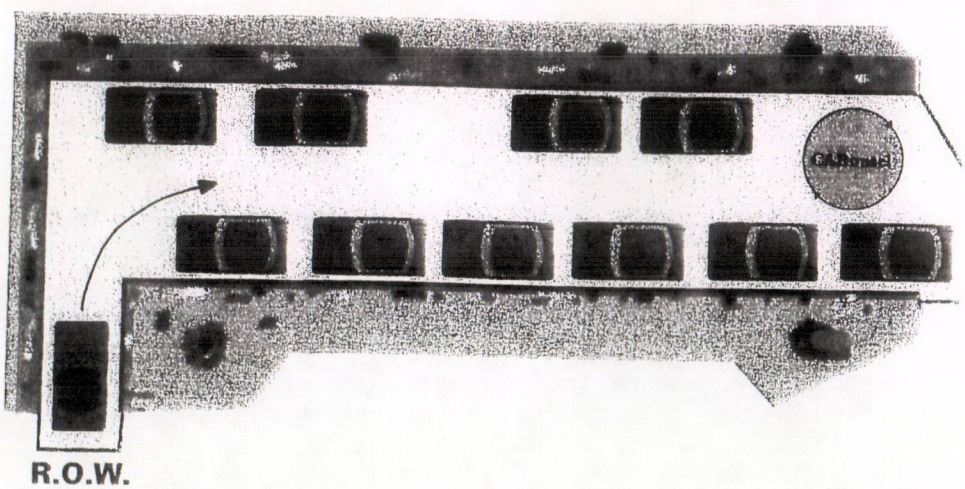
CARousel is the **ideal solution** for APARTMENTS & TOWN HOUSE COMPLEXES, for example, a turntable in Auckland is servicing ten vehicles which allowed the Architect to compact the design.



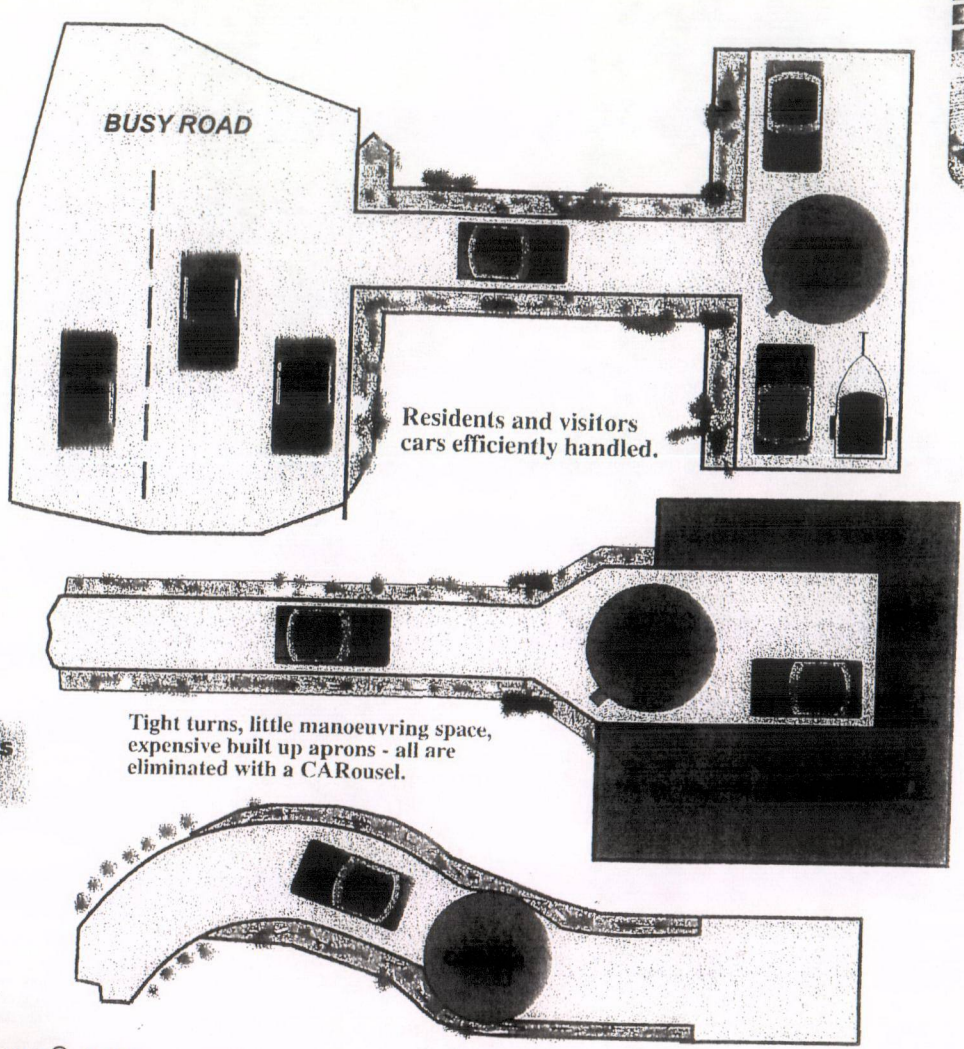
IN COMMERCIAL BUILDINGS, CARousel will increase car parking space and allow safer manoeuvring. Room needed for turning can be decreased markedly, allowing this **saved space to be more profitably used.**

CARousel Solution - High Density Parking





CARousel Solution
- No backing out on to the road.

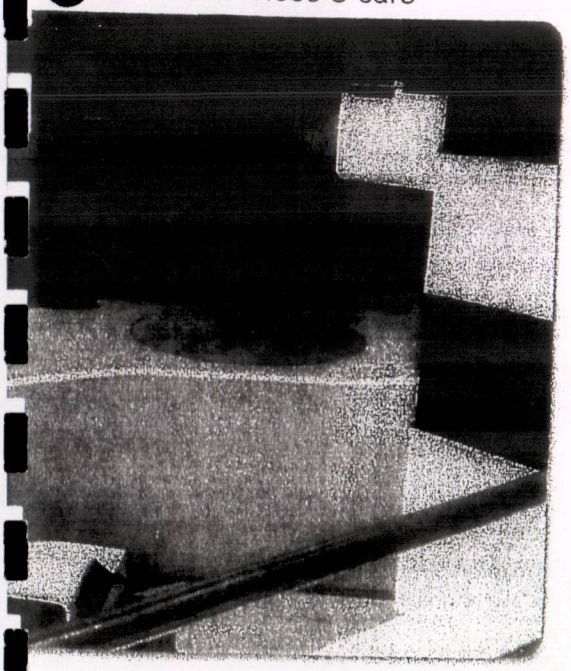


This sketch is not to scale



Manual and In-car remote control models available

This unit services 8 cars



CARousel Benefits:

- Allows vehicles to safely drive onto busy streets *(some Councils have by-laws preventing vehicles backing into dense traffic).*
- Removes the need for large unsightly and expensive manoeuvring areas.
- Permits more space on the section for attractive planting and increases areas for outdoor recreation.
- Greatly improves prestige and property value.

No more reversing down steep or awkward drives, or on to dangerous busy roads.

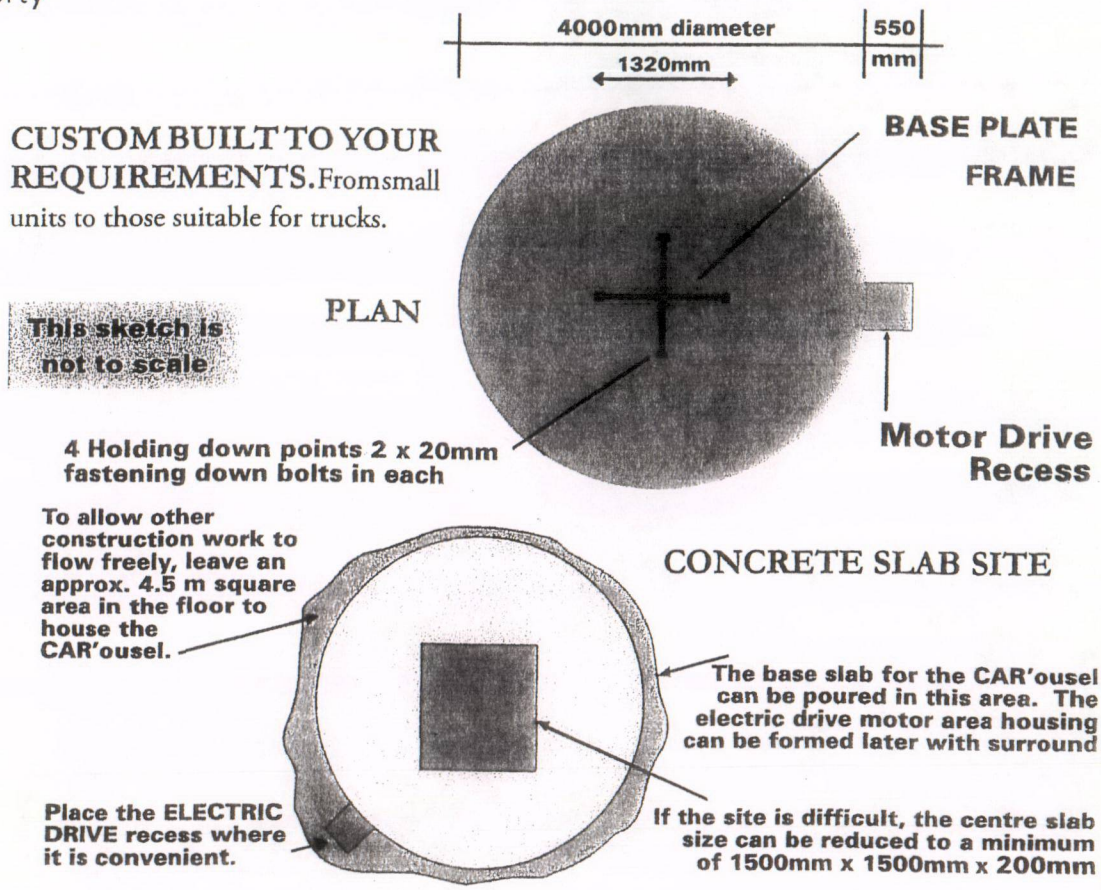


Adds value and prestige to your property

Strong and rugged - meets all NZ Standards.

STRENGTH: CARousel turntables are strongly made and designed to carry a distributed load of 4 tonnes and carry a PERIMETER LOAD OF 9 kNs PER WHEEL. CARousel revolves on a well engineered low maintenance bearing and has no troublesome wheels or castors on its perimeter. **Manual and In-car Remote control models available; the manual can easily be upgraded to automatic at any time.**

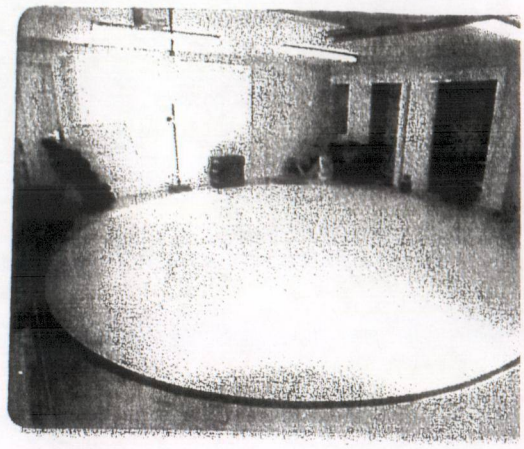
CUSTOM BUILT TO YOUR REQUIREMENTS. From small units to those suitable for trucks.



Dimensions inside box are 550mm x 550mm. Manual models can be made automatic by simply adding the motor assembly at a later time.

The DRIVE UNIT consists of a maximum 0.37kw three phase or single phase worm gear drive. This has a friction wheel which drives against the outer ring of the CARousel.

FREE SITE INSPECTION SERVICE



New Model

5.4 metre diameter/ 6 tonne max load capacity

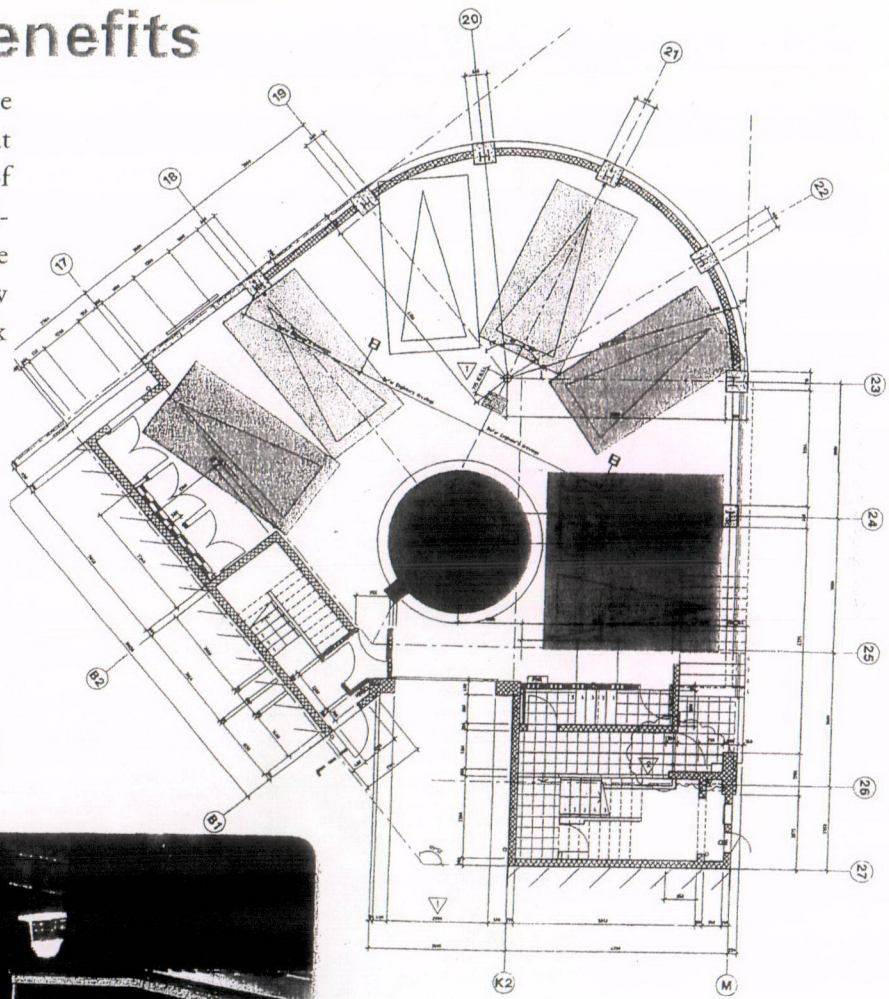
In response to enquiries we have developed and tested a larger CARousel turntable to meet the requirements of the market.

This new model will be capable of turning two medium to large standard cars at once, or, one larger vehicle such as the Chevrolet Suburban Wagon.

The diameter is 5.4metres and the load capacity is 6 tonne max. This unit will also be forwarded in kitset form, by container and site assembly time is two to three days . On site labour would be required to assist. Prices and specifications are available on request.

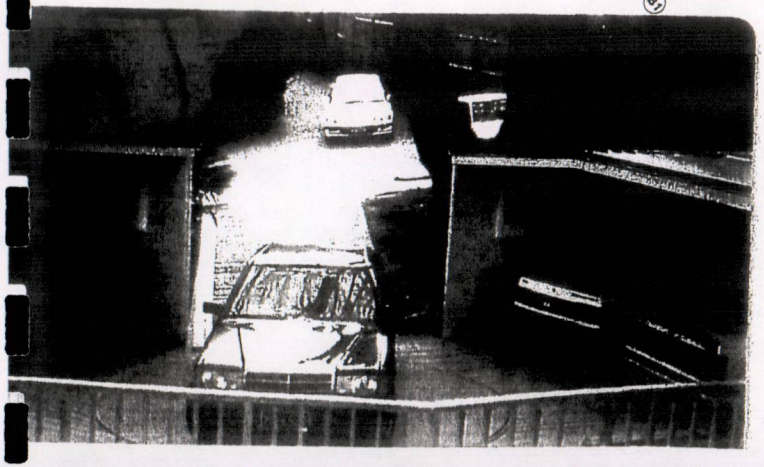
See the benefits

Here we see how effective the CARousel can be at maximising the amount of parking space. In this real-life situation, thanks to the CARousel, there is now enough space to safely park 7 vehicles.



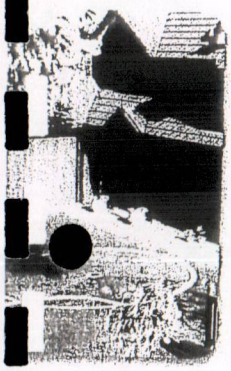
Servicing 4 cars

This unit is supported by a pole platform



Frequently Asked Questions (FAQ's)

Q. Do I need to position my car in the centre of the turntable?
A. No! Park anywhere as long as your wheels are on the turntable.



Q. How much will site preparation and surround work cost me?
A. If this work is being done in conjunction with a new driveway, then there is very minor extra cost. If the existing drive has to be removed etc, then this excavation work and new finishing work around the turntable is a cost but not an excessive one.



Removes the cost of creating large unproductive expensive turning aprons

Q. What maintenance is required?
A. Practically none. Grease one grease point 6-monthly.

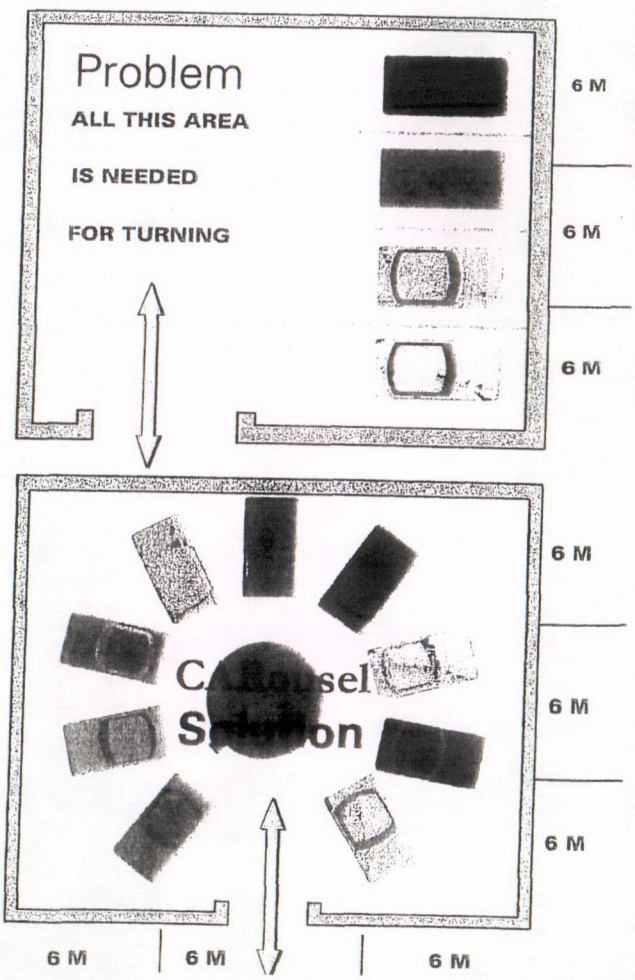
Q. Where should it be positioned?
A. Preferably where it can be accessed by all vehicles. Those in the garage and any casuals such as visitors. Just outside the garage is best.

Q. Can children get hurt playing on the turntable?
A. No more likely than any other situation such as doors jamming fingers, etc.

Q. How much room do I need to place a turntable?
A. The length of the cars likely to be using it. 6 metres in diameter is a desirable size. Remember though that the CARousel diameter is 4 metres.

Q. Do we have to have drainage from the pit?
A. Yes, a water outlet is necessary.

Q. What would happen if a heavy vehicle tried to drive upon it?
A. Our turntable can handle 2 tonnes on the edge, but any vehicle heavier should not use it. (2 tonnes will allow say a delivery van or similar, but care must be taken not to exceed this loading!).



This result can be achieved on an area of 18 metres square.

Specifications - Standard Model

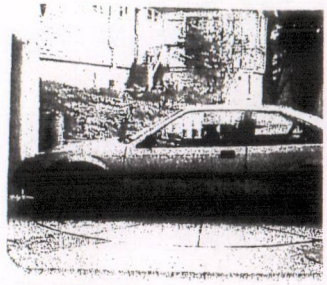
DESIGN CERTIFICATE: ..... Manufactured to NZS 3404, 4203 & AS 1250

TECHNICAL SPECIFICATIONS

LOADING:
- At any point 9kn
- Overall load capacity 4tonne
- Load capacity at edge..... 9kn per wheel

CONSTRUCTION:
- Base Plate size ..... 1200mm x 1200mm welded from 127mm x 64mm RHS steel
- Finish ..... Hot dipped galv.
- Bearing capacity..... 10tonne [11 tonne] (minimum)
- Decking..... 6mm Aluminium Tread Plate

DIMENSIONS:
- Diameter 4000mm
- Depth..... 380mm variable (see installation detail)



saved space can be more profitably used

UNIQUE FEATURE: The CARousel can be angled on slopes. Support can be given by either:
1. A single tanalised pole 250mm S.E.D.
2. Multi-pole platform or a deck structure
3. 150mm reinforced concrete slab

GENERAL:
- Site preparation: ..... Responsibility of the purchaser. **Full advice given.**
- Non-standard Models..... A quotation will be given.
- Location ..... Suitable for interior and exterior use.
- Packaging and freighting — To ensure easy transportation, the CARousel is supplied completely prefabricated and fits on one pallet. Gross weight: one tonne approx. The kit can be unloaded at site by hand.
- Assembly time ..... One man 2 day's work.

GENERAL SPECIFICATION FOR INSTALLATION ON CONCRETE BASE

DELIVERY. As the CARousel is a full kitset, it arrives palletised and can be moved on-site between floors on multi-storey buildings etc., with ease.

The diameter of the standard unit is 4000mm. The depth overall is 380mm but when site planning it is recommended that the finished height of the CARousel be 25mm to 100mm above the surrounding ground.

This allows:

(a) Turning away casual water.

(b) Reducing excavation (or other) depth allowance

(c) Allowing the vehicle driver to feel exactly when car is on the turntable.

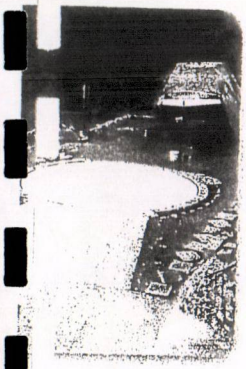
The ramp effect is easily formed when surround concrete is being formed.

The most inexpensive procedure on-site is to:-

1 - Pour a 150mm reinforced concrete slab (using F.82 weldmesh or D10 at 300mm centres) to finish at the desired height, after considering the recommendation in the paragraph above on depth.

2 - Install the CARousel - allow 2 days' work time.

3 - Provide concrete form work around the perimeter of the turntable using the deck to support the form-work at the top and some ramset blocks of timber below. After concreting and removal of the formwork, you should have a minimum of 10mm clearance around the CARousel turntable.



Electric Drive Details

If an electric drive unit is to be used, you will need to provide a recess in the surrounding concrete to house the motor drive equipment.

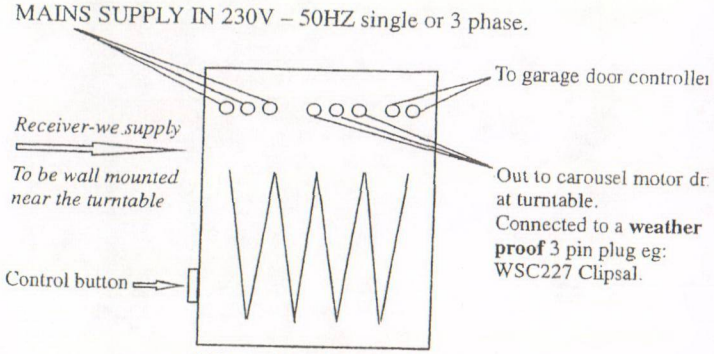
Supply power ducting and a power point to the recess.

ELECTRICAL SITE REQUIREMENTS

All site electrical preparations and connection work to be attended to by clients on site electrician at clients cost.

WE NEED: Power supply to the receiver and then from the receiver to the turntable drive unit.

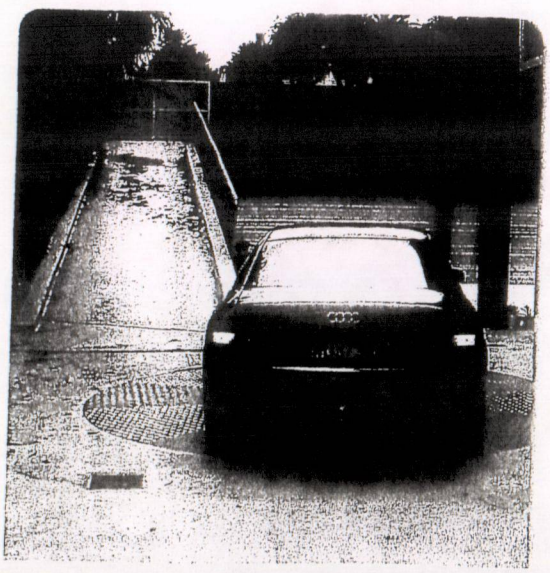
MAINS SUPPLY IN 230V – 50HZ single or 3 phase.



We supply the receiver and 2 remote transmitters. We provide an extra control button on the side of the receiver for casual users.

Design Certificate

Beware of turntables which don't have Design Certificates issued by Qualified Registered Structural Engineers and backed up by extensive Guarantees from the manufacturer.



DESIGN CERTIFICATE

MEMBER OF
THE ASSOCIATION OF CONSULTING ENGINEERS
NEW ZEALAND
A Division of the New Zealand Institution of Engineers

To Whom it may concern

I, Ernest Bertram Lapish
being registered under the provisions of the Engineers Registration Act 1924 and currently holding an Annual Practising Certificate, hereby certify that I have supervised the design of, and the computations for Carousel turntable
shown on the accompanying plan(s) prepared by Keith Motion numbered C - T/1
titled Carousel turntable
dated May 1987 and described in the accompanying specifications for a car turntable [TYPE OF STRUCTURE]
proposed to be erected for Anybody
on lot Where ever Section Deposited Plan No.
Located at Where ever
I further certify that the works defined above have been designed in accordance with sound and widely accepted engineering principles; that they have designed to support the loads specified in N.Z.S. 4203
and further that I have ascertained to the best of my ability that the stresses and combinations of stresses in the various materials of construction under the above loads will not exceed the maxima to ensure the safety and stability of the structure if erected in accordance with these plans and specifications.
Various aspects of the design are in accord with the following relevant authorities
N.Z.S. 3404 A.S. 1250

Signature: Association Member Date 29.5.87
Professional Qualifications M.I.C.E. M.I.P.E.N.Z.
For and on behalf of C.C Consulting Group
Address P.O. Box 51547, Pakuranga Auckland

Client Testimonials



The turntable has performed perfectly

TO WHOM IT MAY CONCERN

My wife and I had a new house built at this address in 1989. The house is on a steep hill with a curved drive leading from the street to the carport. Since there was no space to turn a car at the top of the drive we decided to have a turntable built - We had lived in Wellington and seen them on the short narrow street that runs to the west from Lambton Quay and on a ferry that ran to the Sounds.

At the time we were in our late fifties and I was looking ahead to the time when we might find it difficult to back down the drive.

The builder knew of Ian Webb's turntables and Ian built the one we have. From the time that we moved in we have used the turntable virtually every day. After going off the drive a number of times we never reversed down the hill again.

The turntable has performed perfectly, with no faults or problems. It requires virtually no maintenance and can take the weight of service trucks that are over a ton in weight. While rain can beat into the carport at times the painted surface has protected the surface very well.

I have maintained contact with Ian over the past decade for I believe he has developed an excellent and useful product. He is a very honest and dedicated craftsman, justifiably proud of his turntables, and I can thoroughly recommend him to anyone considering installing one.

Ashley Wilson

- Ashley Wilson, Auckland, NZ 11/99

To whom it may concern,

If anyone is hesitating about purchasing one of Ian Webb's Carousel turntables, I can assure them that I have never recreated the day I decided to have one installed on a very steep section in Opua.

In order to get my car off the road, and to turn it, I had obtained a design for a sort of turning platform hanging out over the steep bank and road, but it would also have involved excavating under my house. I was not happy about it, and hunted around for a turntable. I discovered Ian Webb and his design for the Carousel, and my problems were solved.

So 11 years ago Ian installed the turntable and I obtained peace of mind over the ease of turning my car, its security and the fact that I did not have to reverse down a steep drive onto the road. Even without my remote control the Carousel is beautifully balanced and easy to turn.

An added bonus is that the Carousel has considerably increased the value of my property

I can thoroughly recommend Ian Webb's design of Carousel and am pleased to show it to anyone interested.

June Crowden.

Yours sincerely,
Mrs J Crowden, Bay of Islands, NZ 12/99

Dear Ian

The first anniversary of successfully relocating the, turntable on to the new parking platform is coming up and I thought I would let you know how well it is performing.

As you are aware in the previous situation where there was absolutely no alternative to backing out into the traffic, under the new set-up we now have ample room to back and fill so we could come out of the drive front wards. However, there is no way we would be without the turntable both on the grounds of better space utilisation and physical comfort. We old guys are not so agile in neck turning for backing as we used to be.

Although a property may allow the physical capability of turning at the end of a driveway, the installation of one of your turntables is not really just a luxury, it adds value to a property and considerably enhances the owner's enjoyment of life.

Feel free to use our installation as a demonstration, model for prospective customers if you wish. It says much for the workmanship that it has now been operating without a problem for over 10 years in the very harsh environment of the coast.

Kind regards.

Barrie

Barrie Hopkins, Auckland, NZ 11/99



HEAR FROM
Satisfied Customers

"The installation of the CAROUSEL has transformed the parking situation. We can now park three or four guest cars in addition to our own and the operation is such that once they have experienced the turntable our friends do the operation themselves."

- A.L. Roberts, *Auckland, NZ 11/99*

"If anyone is hesitating about purchasing one of Ian Webb's CAROUSEL turntables, I can assure them I have never regretted the day I decided to have one installed on a very steep section in Opua."

- Mrs J Crowden, *Bay of Islands, NZ 12/99*

"We have now been using our turntable for almost 18 months. Right from the first day after it was installed we've been delighted with it's performance."

- M. Daniell, *Auckland, NZ 11/99*

CARousel *Turntables ltd.*

ENQUIRIES TO:

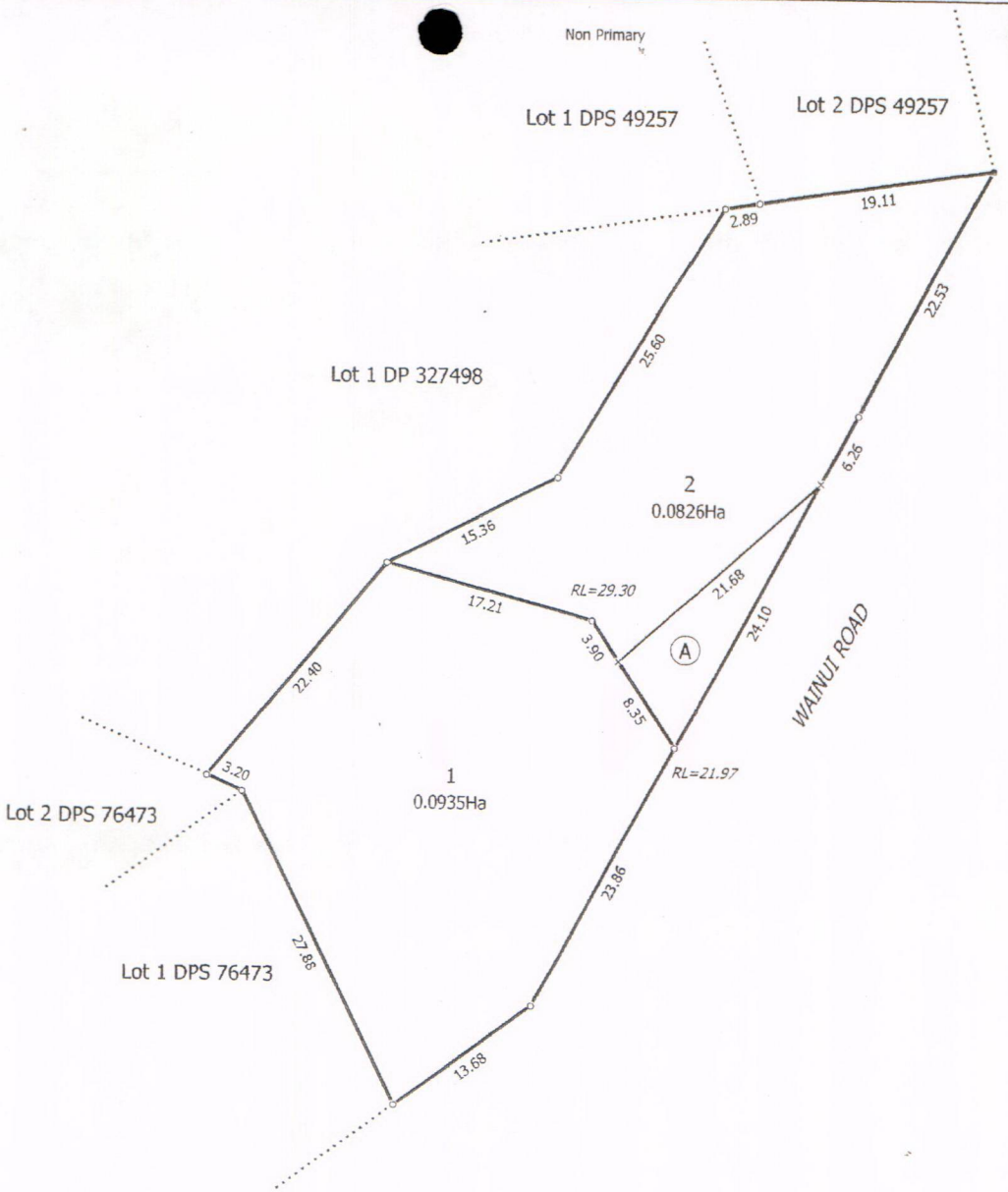
Ian Webb

CARousel Vehicle Turntables Ltd.

P. O. Box 27-281
Mt. Roskill, Auckland, New Zealand.
Phone/Fax: +64 9 827 4583 (24 Hours)
Mobile: 0274 93 11 84 (NZ only)
Freephone: 0800 227 687 (NZ only)

Website: www.carousel-turn.com
Email: carousel_1@xtra.co.nz

DRAWINGS



Land District: South Auckland Digitally Generated Plan Generated on: 18/04/2007 3:18pm Page 3 of 3	Lots 1 & 2 being a subdivision of Lot 2 DP 327498 & Lot 25 DPS 9167	Surveyor: Michael Peter Dewhirst Firm: Harrison Grierson Consultants Ltd (Te	Digital Title Plan LT 387121 DRAFT

T 1/1

ASSOCIATION OF CONSULTING ENGINEERS NEW ZEALAND
ACENZ
ISO 9001 QUALITY ASSURED
THIS DRAWING AND DESIGN REMAINS THE PROPERTY OF, AND MAY NOT BE REPRODUCED OR ALTERED, WITHOUT THE WRITTEN PERMISSION OF HARRISON GRIERSON CONSULTANTS LIMITED. NO LIABILITY SHALL BE ACCEPTED FOR UNAUTHORISED USE OF THIS DRAWING.

N

Corner of nearest part of neighbouring house. Refer aerial photograph

1
DP 327498

2
DPS 49257

1
DPS 49257

27/5/2004
P1, P2
BH2

Pohutukawa Trees

Lot 2

P3
27/5/2004

Top of shallow slip site.
Note - this slip occurred prior to our 2004 investigation

HA3
P3

HA5
P5

HA4
P4

20/5/2004
HA1
P1

27/5/2004
P4

Pohutukawa Tree

As-built Driveway position

Edge of Seal

Portion of Existing Driveway (to be abandoned)

WAINUI ROAD
Leagal Road - Sealed (over 20.12m wide)

Driveway

Existing Watermain

Approx position of Water Meter (plotted from Council GIS)

Exotic Trees

Early 2007 Slip Site

25.6
15.3
1.6m
22.4
17
12
23
45

59 60 59 58 57 56 55 54 53 52 50

HARRISON GRIERSON
CONSULTING ENGINEERS SURVEYORS PLANNERS
141 Cameron Road Tauranga Ph 07 578 0023 Fax 07 577 9557

REF	AMENDMENT	BY	DATE
A	SHEET NUMBERS CHANGED, SHEETS ADDED	DAA	27/6/2007

PROJECT:

S & K THORNTON
2B KOWHAI STREET, OHOPE
POLE HOUSE

TITLE:

PRELIMINARY DESIGN
SITE INFORMATION

DESIGNED: GDM	DATE: 6/2007	SIGNATURE:	PLOT DATE: 16/7/2007
DRAWN: DAA	DATE: 7/6/2007	SIGNATURE:	CAD REF: 1510-011050-2-200
CHECKED: GDM	DATE: 6/2007	SIGNATURE:	CAD XREF:
APPROVED:	DATE:	SIGNATURE:	SURVEY BY:
			SURVEY DATE:
			SDR REF:

PRELIMINARY DESIGN

PROJECT No: 1510-011050-01	SCALES: 1:100 (A1) 1:200 (A3)	A1
DRAWING No: 011050-2-200		REV A

ASSOCIATION OF CONSULTING ENGINEERS NEW ZEALAND
ACENZ
ISO 9001 QUALITY ASSURED
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2
DPS 49257

1
DPS 49257

Pohutukawa Trees

Lot 2

2m high retaining wall

Walkway/Cut-off Drain to act as overland flow path - refer Detail

Pole house outline

3 - 3.5m high retaining wall

3m high retaining wall

Formed steps to direct overland flow to driveway

Pohutukawa Tree

Corner of nearest part of neighbouring house. Refer aerial photograph

1
DP 327498

2m high debris wall Refer Dwg. 011050-2-204

A

2.5m

Vehicle turn-table RL = 54m

As-built Driveway position

All piles @ 1.5 Crs both ways below vehicle deck

1.0m to 1.5m high retaining wall

Subsoil drain in addition to retaining wall drains

Reinforced / concrete piles

Refer Turntable Support Detail. Dwg. 011050-2-201

1.6m

1.5m 1.5m 1.5m 1.8m 1.7m 1.5m 1.5m

2.0m 2.0m

Vehicle parking deck

Edge of Seal

50mmØ horizontally drilled slotted uPVC Subsoil Drains @ 3m Crs maximum. Drain to be encased in Geotextile Sock. Drain outlets to be piped to base of slope below driveway

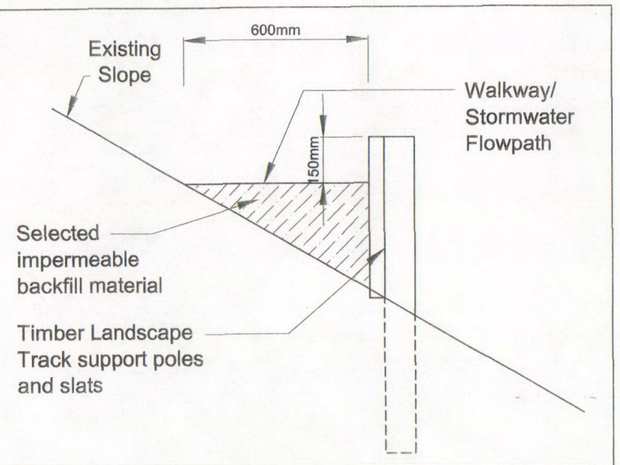
Portion of Existing Driveway (to be abandoned)

WAINUI ROAD
Leagal Road - Sealed (over 20.12m wide)

Driveway

Approx position of Water Meter (plotted from Council GIS)

Existing Watermain



WALKWAY/CUT-OFF DRAIN DETAIL
NTS

MEMBER SUMMARY

Bearers & Joists

* Bearers for house 250 x 50 span = 2.4m
* Joists for house 200 x 50 @ 450Crs span = 3.1m
* Joists for house 150 x 50 @ 450Crs span = 1.8m
* Bearers for vehicle deck 2/300 x 50 span = 1.5m
* Joists for vehicle deck 2/300 x 50 span = 1.5m
* Decking for vehicle deck 100 x 100 span between joists.

Piles

* Typical timber 325mmØ, encased in 650mmØ concrete embedded 5m below existing surface.
* Piles beneath bracing lines. Timber 400mmØ encased in 750mmØ concrete embedded 5m below existing surface.

NOTES

1. This drawing shows a preliminary design for a pole house on this site and demonstrates typical member sizes.
2. This drawing is not intended for use in a Building Consent Application, nor is it intended as a construction drawing.

KEY

Retaining Wall

House Piles

Vehicle Deck Piles

HARRISON GRIERSON
CONSULTING ENGINEERS SURVEYORS PLANNERS
141 Cameron Road Tauranga Ph 07 578 0023 Fax 07 577 9557

REF	AMENDMENT	BY	DATE
B	Plan number change, drains added	DAA	27/6/2007

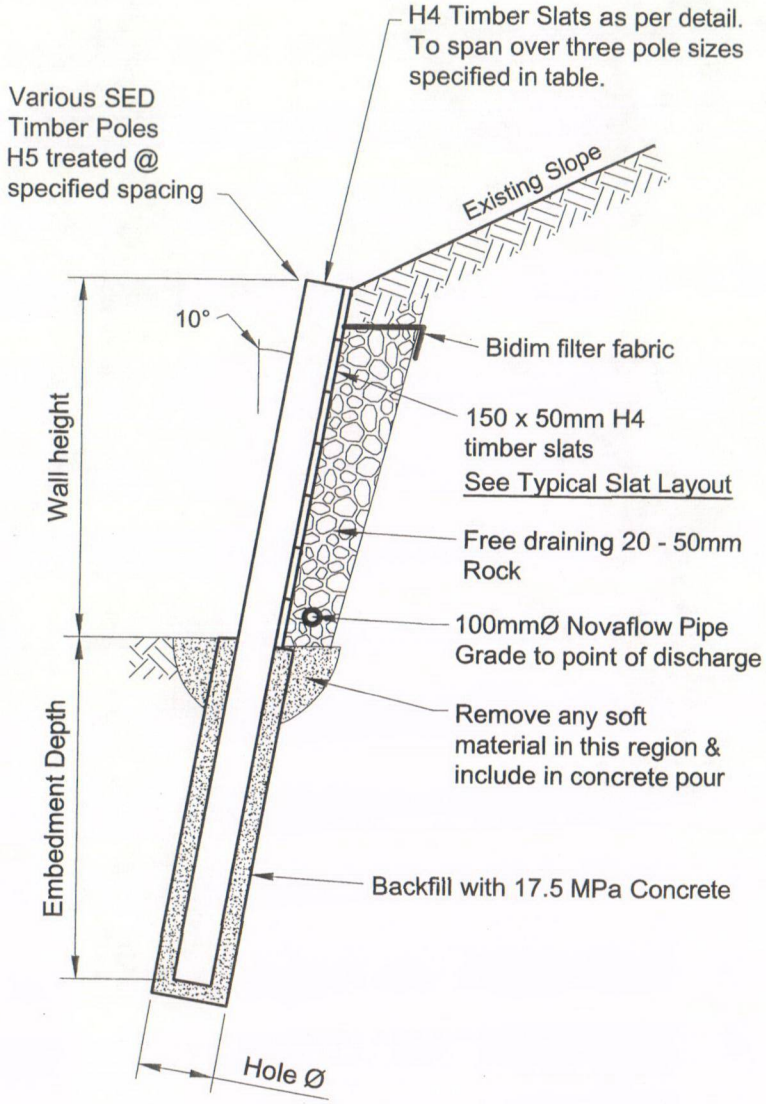
PROJECT:
S & K THORNTON
2B KOWHAI STREET, OHOPE
POLE HOUSE

TITLE:
PRELIMINARY DESIGN
SITE INFORMATION

DESIGNED: GDM	DATE: 6/2007	SIGNATURE:	PLOT DATE: 16/7/2007
DRAWN: DAA	DATE: 7/6/2007	SIGNATURE:	CAD REF: 1510-011050-2-201
CHECKED: GDM	DATE: 6/2007	SIGNATURE:	CAD XREF:
APPROVED:	DATE:	SIGNATURE:	SURVEY BY:
			SURVEY DATE:
			SDR REF:

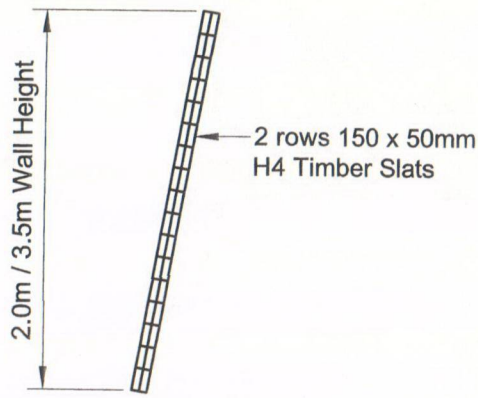
PRELIMINARY DESIGN

PROJECT No: 1510-011050-01
SCALES: 1:100 (A1) 1:200 (A3)
A1
DRAWING No: 011050-2-201
REV B



RETAINING WALL TYPICAL DETAIL

N.T.S



TYPICAL SLAT LAYOUT

N.T.S

SUMMARY OF RETAINING WALL SIZES		
Wall Height (m)	2.0	3.0
SED Pole Ø (mm)	250	375
Pole Spacing (m)	0.9	0.9
Embedment Depth (m)	3.4	5.0
Hole Ø (mm)	450	650
Wailing Size (mm)	refer detail	refer detail

DESIGNED: GDM	DATE: 6/2007	PLOT DATE: 16/7/2007	
DRAWN: DAA	DATE: 8/6/207	CAD REF: 1510-011050-2-203	
CHECKED: GDM	DATE: 6/2007	CAD XREF:	
APPROVED:	DATE:	SURVEY BY:	
		SURVEY DATE:	
		SDR REF:	

HARRISON GRIERSON
CONSULTING ENGINEERS SURVEYORS PLANNERS
141 Cameron Road Tauranga Ph 07 578 0023 Fax 07 577 9557

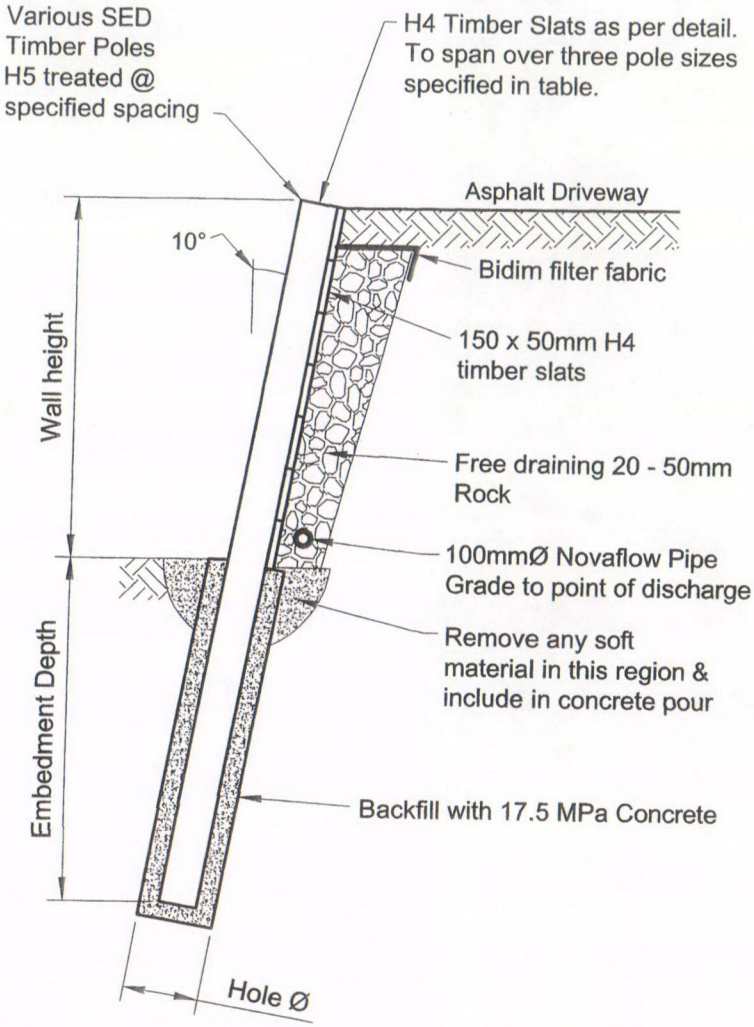
PROJECT: S & K THORNTON, 2B KOWHAI STREET, OHOPE

TITLE: PRELIMINARY DESIGN, RETAINING WALL DETAIL

PLOT STATUS: PRELIMINARY DESIGN

PROJECT No: 1510-011050-01 | SCALES: NTS | A4

DRAWING No: 011050-2-203 | REV A



RETAINING WALL TYPICAL DETAIL

N.T.S

SUMMARY OF RETAINING WALL SIZES		
Wall Height (m)	1.0	1.5
SED Pole Ø (mm)	125	200
Pole Spacing (m)	0.9	0.9
Embedment Depth (m)	1.7	2.4
Hole Ø (mm)	450	450
Wailing Size (mm)	150 x 50	150 x 50

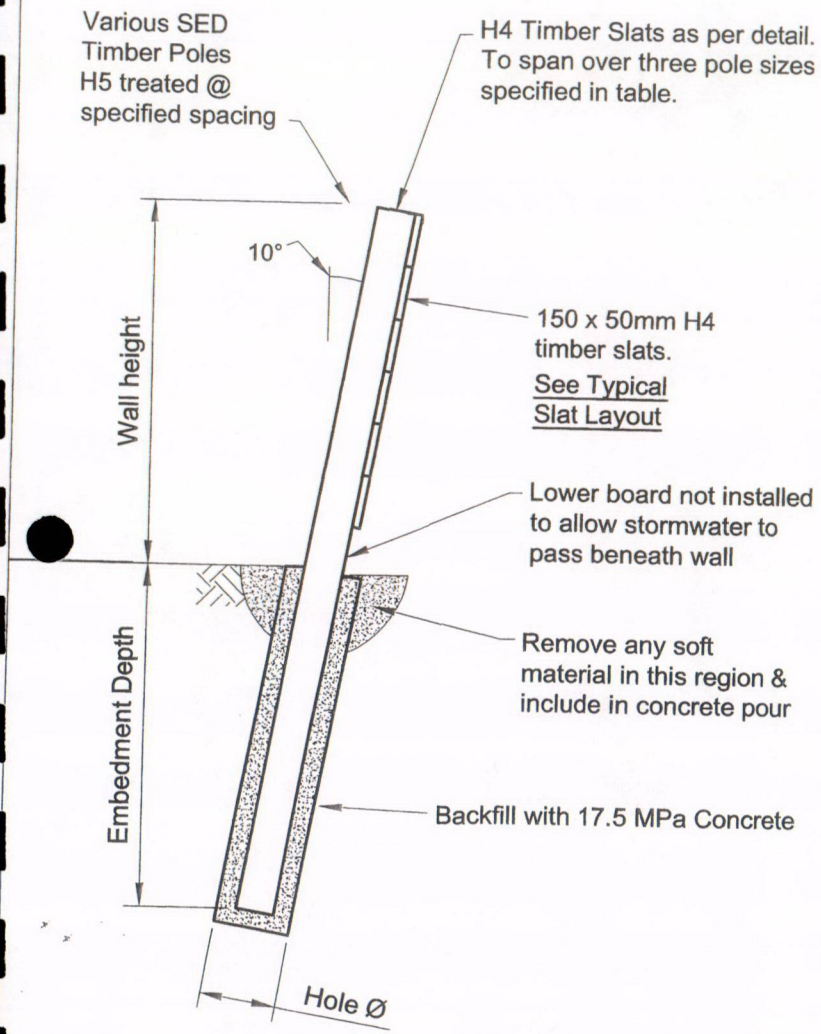
SIGNED: DATE: 6/2007 | DATE: 8/6/207 | DATE: 6/2007 | PROVED: DATE:
PLOT DATE: 28/6/2007 | CAD REF: 1510-011050-2-204 | CAD XREF: | SURVEY BY: | SURVEY DATE: | SDR REF:

HARRISON GRIERSON
CONSULTING ENGINEERS SURVEYORS PLANNERS
141 Cameron Road Tauranga Ph 07 578 0023 Fax 07 577 9557

PROJECT: S & K THORNTON, 2B KOWHAI STREET, OHOPE

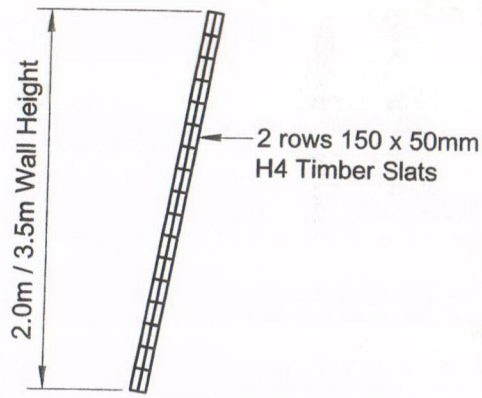
TITLE: RETAINING WALL DETAIL BELOW DRIVEWAY

PLOT STATUS: PRELIMINARY DESIGN
PROJECT No: 1510-011050-01 | SCALES: NTS | A4
DRAWING No: 011050-2-204 | REV A



DEBRIS WALL TYPICAL DETAIL

N.T.S



TYPICAL SLAT LAYOUT

N.T.S

SUMMARY OF DEBRIS WALL SIZES	
Wall Height (m)	2.0
SED Pole Ø (mm)	225
Pole Spacing (m)	1.2
Embedment Depth (m)	2.7
Hole Ø (mm)	500
Wailing Size (mm)	refer detail

DATE: 6/2007 | PLOT DATE: 27/6/2007
DATE: 13/6/207 | CAD REF: 1510-011050-2-205
DATE: 6/2007 | CAD XREF:
DATE: | SURVEY BY:
SURVEY DATE:
SDR REF:

HARRISON GRIERSON
CONSULTING ENGINEERS SURVEYORS PLANNERS
141 Cameron Road Tauranga Ph 07 578 0023 Fax 07 577 9557

PROJECT: S & K THORNTON
2B KOWHAI STREET
OHOPE

TITLE: PRELIMINARY DESIGN
DEBRIS WALL
DETAIL

PLOT STATUS: DESIGN
PROJECT No: 1510-011050-01 | SCALES: NTS | A4
DRAWING No: 011050-2-205 | REV A

* Position of all services shown are approximate, actual positions are to be verified on site.

KOWHAI ST

ROAD

Whakatane District Council

Kowhai Street - Ohope

Cadastral Information derived from the Department of Survey and Land Information's Digital Cadastral Database (DCDB). CROWN COPYRIGHT RESERVED. Approved for internal reproduction by the Whakatane District Council, Digital Licence No.HN/033525.

Parcel boundaries are to be taken as appoximate only. Not to be substituted for site specific survey.

PLAN No. A3 Layout

MapInfo/AsbuiltsAerial.WOR

Scale = 1:1,000

Date of issue 16/01/2007 DMVN

Land Registration District

South Auckland

Plan Number

DP 387121

Territorial Authority (the Council)

Whakatane District Council

Certifications under the Resource Management Act 1991

Pursuant to the Resource Management Act 1991 I hereby certify that:

- ☐ pursuant to Section 224(c) some of the conditions of the subdivision consent have been complied with to the satisfaction of the Council and that a consent notice has been issued in respect of those conditions that have not been complied with.

Dated this 3th day of August 2007

Authorised Officer

CONSENT NOTICE

(Pursuant to Section 221 of the Resource Management Act 1991)

GIVEN by: S A and C A Thornton

IN FAVOUR of: THE WHAKATANE DISTRICT COUNCIL

DATED: day of 2007

PROPERTY: Lots 1 and 2 on Deposited Plan 387121

SUBJECT: Consent Conditions

COUNCIL REFERENCE: 24.3.04.92

HAMERTONS
Lawyers
(B N Carter)
Telephone NO. 07 307 0680
Fax NO. 07 307 0225
PO Box 601
DX JA31519
WHAKATANE
(drt consent notice - thornton)

IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of a subdivision of land in the South Auckland Land Registration District

CONSENT NOTICE

(Pursuant to Section 221 of the Act)

THE WHAKATANE DISTRICT COUNCIL ("the Council") being the territorial authority for the district within which the Land described in the First Schedule of this Notice is situated has, pursuant to Part X of the Act, granted its consent to the subdivision shown on Land Transfer Plan 387121 subject to certain conditions, including the requirement in respect of the Land that the Owner (as defined in the Act) complies on a continuing basis with the conditions set out in the Second Schedule of this Notice.

FIRST SCHEDULE

('the Land")

FIRST 0.0935 hectares more or less being Lot 1 on Land Transfer Plan 387121 and being part of the land comprised in Certificate of Title 111896 (South Auckland Registry) .

SECOND 0.0826 hectares more or less being Lot 2 on Land Transfer Plan 387121 and being part of the land comprised in Certificate of Title 111896 (South Auckland Registry) .

SECOND SCHEDULE

("the Conditions")

The Owner(s) of Lot 2 referred to in the First Schedule shall, on a continuing basis:

1.0 Be aware that:

- There are geotechnical constraints affecting the design of a house on Lot 2.

- As part of the subdivision consent process that created this allotment, the consent holder is to provide a preliminary design for one particular building solution prior to the approval of the Section 224 Certificate to the satisfaction of Council (as required by condition (p) of the subdivision consent). This shall be considered as the "default option".

- For any building option selected (including the default option referred to above) specific design will be required, with expert geotechnical input, prior to the issue of a building consent.

- Where the building option selected involves the creation of a building platform prior to subsequent dwelling construction, a building consent shall be obtained for the associated debris and retaining walls required prior to any works being undertaken.

- It may not be practical to provide turning circles on the site to meet the Council's dimension requirements, in which case alternative solutions such as a carousel (turntable) may be required.

2.0 Ensure that prior to any works commencing on site to form any retaining and debris wall structures associated with any building the proposed building platform on Lot 2, horizontal drains shall be installed as prescribed in the additional information supplied by Harrison Grierson Consultants Limited dated 26th April 2006 and to the satisfaction of Manager Development and Compliance.

2.1 That the horizontal drains referenced in consent notice condition 2.0 above shall be constructed in a manner that provides for regular and ongoing maintenance to be undertaken.

2.2 The geotechnical engineer undertaking the design of the horizontal drains shall submit a formal programme for ongoing periodic inspections and maintenance beyond the end of construction to Whakatane District Council, prior to the drains being installed. The programme shall include the frequencies for inspections and monitoring, maintenance schedules, alert and alarm levels, and contingency measures to be initiated if alarm levels are exceeded.

2.3 No works to construct the Building Platform on site shall be undertaken until such time as the Whakatane District Council is satisfied the Debris and Retaining Wall structures and the horizontal drains have been installed in accordance with the approved plans.

2.4 Prior to any dwelling being constructed on the identified building platform. A Geotechnical Completion Report shall be undertaken. This report shall:

- Confirm that the works undertaken on site including horizontal drain installation, debris and retaining wall installation, formation of new access and building platform and reinstatement of bulldozed track, have resulted in the site being geotechnically stable and suitable for construction and occupation of a dwelling on the building platform.

- Identify recommendations for foundation design methodology, disposal of stormwater from impervious areas and roofing, the best practical options for connection to reticulated services located at the property boundary and any other matters considered relevant following the completion of physical works on site.

- Identify post construction inspection/maintenance requirements and programmes for structures located on site including, but not limited to horizontal drains, retaining walls and retaining wall anchors.

This Geotechnical Completion Report may be peer reviewed at the discretion of Whakatane District Council and at the expense of the consent holder.

3.0 Any building to be constructed on site shall be subject to specific design and constructed in accordance with the Geotechnical Completion Report contained under clause 2.4 of this consent notice.

4.0 Any horizontal drains required by this consent notice shall be maintained in accordance with the Geotechnical engineer's requirements stipulated under consent notice condition 2.2 to ensure they continue to function. Confirmation of inspection by a Chartered Professional Engineer shall be provided to Whakatane District Council at the inspection frequency identified in the Geotechnical Completion Report.

5.0 Council's officer or contractors shall be permitted entry upon the land at reasonable times so as to ascertain compliance with these conditions.

6.0 Following the completion of construction of a dwelling on Lot 2 the common driveway which serves Lots 1 and 2 shall be formed and constructed in accordance with Standard Drawings R 01A and R13 contained within the Whakatane District Council's Engineering Code of Practice. In particular this will require that the surface of the common driveway is upgraded to meet surfacing option A, B or C prescribed in Table 2 of Standard Drawing R13 within three months of the occupation of the dwelling.

7.0 The common driveway which serves Lots 1 and 2 inclusive of associated retaining and stormwater structures, shall be maintained at all times to the satisfaction of Whakatane District Council.

NOTE Requirements (i) to (vii) above shall apply only where the building option selected involves the creation of a building platform prior to subsequent house construction, with corresponding debris and retaining wall requirements.

8.0 Council's officer or contractors shall be permitted entry upon the land at reasonable times so as to ascertain compliance with these conditions.

9.0 Pay the Council's legal costs and disbursements directly or indirectly attributable to the preparation execution registration and enforcement of this Notice and the Council's conditions set out in this Notice and any variation or cancellation of such conditions.

The Owner(s) of Lot 1 referred to in the First Schedule shall, on a continuing basis:

10.0 Be aware any new or additional buildings to be constructed on site shall be subject to specific designs which include geotechnical considerations.

11.0 Council's officers or contractors shall be permitted entry upon the land at reasonable times so as to ascertain compliance with these conditions.

12.0 The common driveway which serves Lots 1 and 2 inclusive of associated retaining and stormwater structures, shall be maintained at all times to the satisfaction of Whakatane District Council.

13.0 Pay the Council's legal costs and disbursements directly or indirectly attributable to the preparation execution registration and enforcement of this Notice and the Council's conditions set out in this Notice and any variation or cancellation of such conditions.

DATED at Whakatane this 6th day of August 2007.

AUTHENTICATED by the)
Council by the Principal)
Administration Officer of)
the Council pursuant to)
Section 252 of the Local)
Government Act 1974)

(Authorised Officer)

CONSENT NOTICE

(Pursuant to Section 221 of the
Resource Management Act 1991)

GIVEN by: S A and C A Thornton

IN FAVOUR of: THE
WHAKATANE DISTRICT COUNCIL

DATED: day of 2007.

PROPERTY: Lots 1 and 2 on Deposited Plan 387121

SUBJECT: Consent Conditions

COUNCIL REFERENCE: 24.03.04.92

HAMERTONS
Lawyers
(B N Carter)
Telephone NO. 07 307 0680
Fax NO. 07 307 0225
PO Box 601
DX JA31519
WHAKATANE

RC ID: 24.3.04.92

~~BOND RELEASE FORM~~

288070.11

Project Engineer Development	✓
Senior Inspector	
Parks Officer	
Planner	

Applicant SA/CA Thornton

Please confirm whether the conditions of the bond have been met. Please confirm by MAPP [date].

2B Kowhai St Otaipe

Condition	Approved	Not approved	Comments
d	✓ ✓		Monk. check. (refer to att report)
e	✓		Pat inspect
f	✓		"
g	✓		Checked by Ellen.
h	✓		meets standard/Bond required for hump.
i	✓		OK
j	✓		see report.
L			see report.
n	✓		Subject to reinstatement of pumice (see report)
o	✓		Pat

Signed: EES Date: 2/8/07.

Purpose	Time	Initial
Pat - Check. @ $80	0.5.	EES.
Ellen. Paperwork etc.	2.0	EES.
Monk.		

?

~~Bond Release Approved:~~

Signed: _____ Date: _____

District Planner/Senior Planner

Comments on Access conditions relating to 2B Kowhai Street, Ohope

WDC Consent #

Condition (d)

RO1A — The common driveway complies with the required minimum carriageway width of 3m as stated in drawing RO1A. Owing to the sloped nature of the site berms are not at the same level as the driveway but, sufficient room is available above and below the driveway level to allow any required services to be run.

R13 — The accessway has not been constructed in full compliance of drawing R13 but, the alternative kerbing system is deemed acceptable (using retaining wall structures). A chip seal surface has also been applied and this is acceptable.

(h) The existing driveway servicing 2 Kowhai Street meets the required formation standard. However, the transition from the existing driveway to the new common driveway is currently unacceptable. In turning into the new common driveway you must travel over a 'hump'. This impairs visibility and the driver is unaware if anything is approaching from the other direction.

It is understood that modifications to this aspect are planned but, will not be undertaken until some retaining walls on 2 Kowhai Street and a neighbouring property are repaired/upgraded. If Section 223/224 sign off is required before the retaining walls are repaired/ugraded and the driveway improved then a bond may have to be provided.

(i) The culvert and existing access to Lot 1 have been removed satisfactorily.

(j) The reinstatement of road reserve drainage where the culvert and driveway have been removed is unsatisfactory. The water table profile needs to be formed.

(l) The issue of any required maintenance, in the future, at the common accessway and the retaining walls, needs to be agreed. These are located on road reserve but Council in no way should be responsible for their upkeep. Responsibility for maintenance of these items should be determined and if necessary take the form of a written agreement.

(n) Pumice washed away at southern end of retaining wall over common accessway needs to be re-instated and area grassed.

RC ID: 24.3.04 -92

~~BOND RELEASE FORM~~

Project Engineer Development	
Senior Inspector	
Parks Officer	
Planner	✓

Applicant SA/CA Thornton

Please confirm whether the conditions of the bond have been met. Please confirm by ASAP *[date]*.

Condition	Approved	Not approved	Comments
a	✓		As per letter.
b	✓		As per letter.
c	✓		As per letter.
k	✓		As per letter.
m	✓		As per letter.
p	✓		Jeff to advise / Tony Cawthorne approved plans.
q	✓		Rod Fraser ✓ 15/2/07
r			
R			R #
S			financial contrib $2405.25 (invoice)
t	✓		As per surveyor's letter.
u	✓		Preparing consent notice
v	✓		Preparing consent notice.
w	✓		
x	✓		Jeff?

Signed: _____ Date: _____

Purpose	Time	Initial

~~Bond Release Approved:~~

Signed: _____ Date: _____

District Planner/Senior Planner

Laura Swan

From: John Tailby [John.Tailby@opus.co.nz]
Sent: Thursday, 7 June 2007 12:07 p.m.
To: Laura Swan
Subject: RE: Thornton Job - Wainui road

Yes all done

John Tailby
Senior Roading Engineer
P O Box 800
Whakatane
Office 07 308 0061
Mobile 027 480 6912
Fax 07 308 4757

From: Laura Swan [mailto:lauras@whakatane.govt.nz]
Sent: Thursday, 7 June 2007 10:35 a.m.
To: John Tailby
Subject: Thornton Job - Wainui road

Hi

When you guys looked at the new driveway did you check that the existing one had been closed off appropraitely and that the culvert had been removed? (Condition (i)

Thanks

Laura

Laura Swan
Senior Planner

WHAKATANE DISTRICT COUNCIL
14 Commerce Street
Whakatane

phone 07 306 0557
fax 07 307 0718
email laura.swan@whakatane.govt.nz
web http://www.whakatane.govt.nz

****

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24/07/2007



stormwater

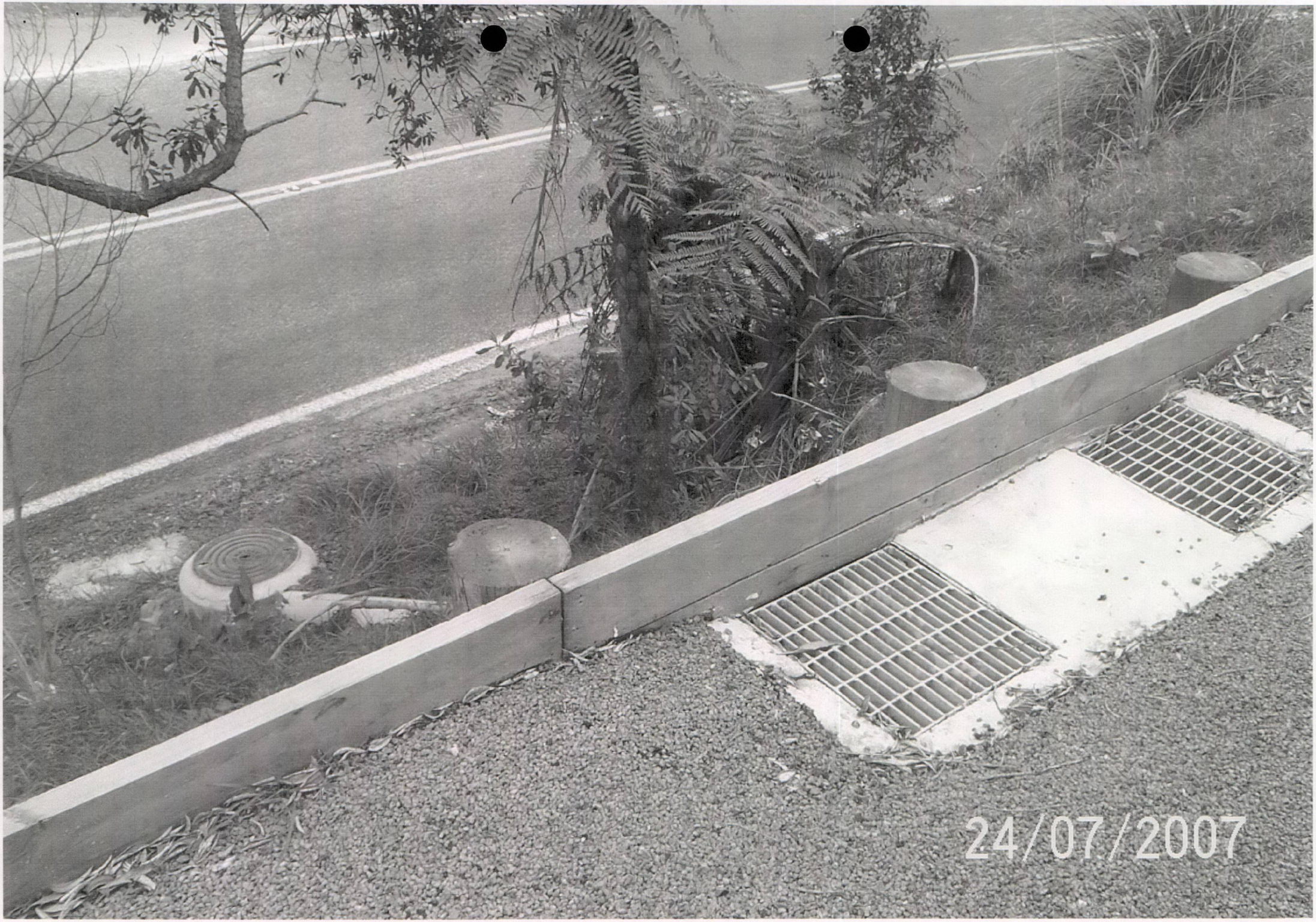

24/07/2007


24/07/2007


24/07/2007



gap in retaining wall


24/07/2007


24/07/2007


24/07/2007

Recd 27/6/07

Laura

HARRISON
GRIERSON

21 June 2007

The General Manager
Whakatane District Council
Private Bag 1002
WHAKATANE

Your Reference: 24.3.04.92

Attention: Mr J Farrell, Manager Development & Compliance

Dear Jeff

Subdivision Of 2A Kowhai St: Thornton: Services As Built

With our letter dated 18 April 2007 we provided a Services As Built Plan- H G drwg no. 11050-AB02(A3) dated 16.04.07. We have since updated this plan to now include the new water connections to the two lots. The new plan shows the new 50 mm rider main that the Council's Operations Business Unit arranged to be thrust under Wainui Road and under the new accessway. A new water meter was then installed for lot 2 and the existing water meter to serve lot 1 was relocated to a position 1.0 m from the lot 1 meter (i.e. shifted approximately 17.8 metres northwards). Both meters are now fed from the new 50 mm rider main in Wainui Road.

Accordingly we enclose two copies of our updated plan drwg. No. 11050-AB02(A3) dated 20.06.07.

Furthermore, we enclose a marked up copy of an aerial photograph which shows a water service line that fed the existing lot (i.e. the Thornton house) from the rider main in the lane way above the site up until the 15 June 2007 when the meter was shifted as described above. This service line is on the mains side of the meter and is therefore a WDC asset. We requested that this service line be disconnected (at the position where it was joined to the rider main) at the end of the lane way as it is now redundant. The Council's records should be amended by deleting the service line when the OBU confirm the work is completed.

Yours sincerely
Harrison Grierson Consultants Limited

Jim Finlay
Senior Associate /Office Manager
Chartered Engineer

N:\1510\11050\Admin\wdc-letasblts.doc

Harrison Grierson Consultants Limited
Ground Floor Concordia House
17 Pyne Street, Whakatane
PO Box 336, Whakatane, New Zealand
Ph 07 308 5478 Fax 07 308 4907
Email whakatane@harrisongrierson.com
www.harrisongrierson.com
ISO9001 Quality Assured

WHAKATANE DISTRICT COUNCIL
FILE:
REG. No.: GH1673
17 APR 2007
ACTIONED DATE
1 Jeff F
2 Helen G
3
4

HARRISON GRIERSON

16 April 2007

The General Manager
Whakatane District Council
Private Bag 1002
WHAKATANE

Your Reference: 24.3.04.92

Attention: Mr J Farrell, Manager Development & Compliance

Dear Jeff

Thornton Subdivision: Services As Built

In accordance with Condition (g) of consent issued 17/11/2006 we enclose an As Built of services for your records.

Yours sincerely
Harrison Grierson Consultants Limited

Diana Cory
Office Administrator/Draughtsperson

N:\1510\11050\Admin\wdc-let.2.doc

Harrison Grierson Consultants Limited
Ground Floor Concordia House
17 Pyne Street, Whakatane
PO Box 336, Whakatane, New Zealand
Ph 07 308 5478 Fax 07 308 4907
Email whakatane@harrisongrierson.com
www.harrisongrierson.com
ISO9001 Quality Assured

NOTES:

Levels are in terms of Moturiki Datum

Measurements and levels on this plan are certified as correct.

Jim Finlay
Chartered Engineer
4 / 04 / 2007

N

SWMH 1
LL 20.71
IL 22.51

200mmø uPVC

9.1
1.6
1.6
3.0
4.9

CP 1
LL 23.00

CP 2
LL 22.98
IL 22.51

Open Roadside Drain

200mmø uPVC

SWMH 2
LL 18.91
IL 18.31

WAINUI ROAD

200mmø uPVC

CP 3
LL 21.76
IL 21.27

19.2
19.9
6.1
12.6

SWMH 3
LL 18.26
IL 17.64

12.8
0.1
Sewer Inlet

edge of seal

edge of seal

CP 4
LL 20.82
IL 20.09

6.5
0.8
1.9
2.8
3.0
1.0

Water Meter
To Serve Lot 1
(Existing House)

46.0

Ex. SSMH

2

1
DPS 49257

1
DP 327498

1

REF	AMENDMENT	BY	DATE

DESIGNED:	DATE:	SIGNATURE:	PLOT DATE: 16.4.07
DRAWN: DJC	DATE:	SIGNATURE:	CAD REF:
CHECKED: 16.4.07	DATE:	SIGNATURE:	CAD XREF:
APPROVED:	DATE:	SIGNATURE:	SURVEY BY:
			SURVEY DATE:
			SDR REF:

ASSOCIATION OF CONSULTING ENGINEERS NEW ZEALAND — ISO 9001 QUALITY ASSURED

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HARRISON GRIERSON
CONSULTING ENGINEERS SURVEYORS PLANNERS
17 Pyne Street Whakatane Ph 07 308 5478 Fax 07 308 4907

PROJECT: S THORNTON WAINUI ROAD OHOPE

TITLE: AS BUILT SERVICES

PLOT STATUS:

PROJECT No: 1510-011050 | SCALES: 1:250 | A3

DRAWING No: 11050-AB02 | REV



Whakatane District Council

Cadastral information derived from the Department of Survey and Land Information's Digital Cadastral Database (DCDB). CROWN COPYRIGHT RESERVED. Approved for internal reproduction by the Whakatane District Council, Digital Licence No.HH033625.

Parcel boundaries are to be taken as approximate only. Not to be substituted for site specific survey.

Kowhai Street - Ohope :—

PLAN No. A3 Layout

MapInfo/AsbuiltsAerial.WOR

Scale = 1:1,000

Date of Issue 16/01/2007 DMVN

Drawn: JDF Harrison Grierson

Date: 21.06.07

Showing Redundant Length of Water Service line as of 15 June 2007

NOTES:

Levels are in terms of Moturiki Datum

Measurements and levels on this plan are certified as correct.

Jim Finlay
21/ 06/ 2007

WAINUI ROAD

Existing WDC Watermain (50mmø)

N

SWMH 1
LL 20.71
IL 22.51

9.1
1.6
1.6
3.0
4.9
0.5
1.8

200mmø uPVC

CP 1
LL 23.00

CP 2
LL 22.98
IL 22.51

Open Roadside Drain

150mmø uPVC
Stormwater Connection
to serve Lot 1
DP 327498 (no pipe
laid to date in
easement)

2
DPS 49257

200mmø uPVC

New 50mmø uPVC

50mm Valve
in meter box

SWMH 2
LL 18.91
IL 18.31

CP 3
LL 21.76
IL 21.27

0.9
13.2
18.2
19.2
19.9
0.1

200mmø uPVC

SWMH 3
LL 18.26
IL 17.64

CP 4
LL 20.82
IL 20.09

edge of seal

edge of seal

12.6
6.1
2.7
2.8

Water Meter
To Serve Lot 2

Water Meter
To Serve Lot 1
(Existing House)

2

12.8
6.5
2.8
0.8
1.9

Sewer
Inlet

16.4
17.4

46.0

1
DPS 49257

1
DP 327498

1

Ex. SSMH

REF	AMENDMENT	BY	DATE
	ADDED NEW WATER METERS	DC	21.06.07

DESIGNED: DATE: SIGNATURE:
DRAWN: DJC DATE: 16.4.07 SIGNATURE:
CHECKED: DATE: SIGNATURE:
APPROVED: DATE: SIGNATURE:
PLOT DATE: 19.4.07
CAD REF:
CAD XREF:
SURVEY BY:
SURVEY DATE:
SDR REF:

ASSOCIATION OF CONSULTING ENGINEERS NEW ZEALAND

ISO 9001 QUALITY ASSURED

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HARRISON GRIERSON
CONSULTING ENGINEERS SURVEYORS PLANNERS
17 Pyne Street Whakatane Ph 07 308 5478 Fax 07 308 4907

PROJECT: S THORNTON
WAINUI ROAD
OHOPE

TITLE: AS BUILT SERVICES

PLOT STATUS:
PROJECT No: 1510-011050
SCALES: 1:250
A3
DRAWING No: 11050-AB02
REV

NOTES:

Levels are in terms of Moturiki Datum

Measurements and levels on this plan are certified as correct.

Jim Finlay

22 / 06 / 2007

WAINUI ROAD

Existing WDC Watermain (50mmø)

Open Roadside Drain

SWMH 1
LL 20.71
IL 22.51

9.1

200mmø uPVC

1.6

1.6

CP 1
LL 23.00

CP 2
LL 22.98
IL 22.51

3.0

4.9

0.5

1.8

150mmø uPVC
Stormwater Connection
to serve Lot 1
DP 327498 (no pipe
laid to date in
easement)

2
DPS 49257

200mmø uPVC

New 50mmø uPVC

50mm Valve
in meter box

SWMH 2
LL 18.91
IL 18.31

CP 3
LL 21.76
IL 21.27

0.9

13.2

18.2

19.2

200mmø uPVC

SWMH 3
LL 18.26
IL 17.64

0.1

edge of seal

12.6

6.1

2.7

2.8

19.9

CP 4
LL 20.82
IL 20.09

0.8

Water Meter
To Serve Lot 2

2

Water Meter
To Serve Lot 1
(Existing House)

12.8

6.5

2.8

1.9

Sewer
Inlet

16.4

17.4

46.0

1
DPS 49257

1
DP 327498

1

Ex. SSMH

			DESIGNED:	DATE:	SIGNATURE:	PLOT DATE: 19.4.07	ASSOCIATION OF CONSULTING ENGINEERS NEW ZEALAND	ISO 9001 QUALITY ASSURED	HARRISON GRIERSON	PROJECT: S THORNTON WAINUI ROAD OHOPE	TITLE: AS BUILT SERVICES
			DRAWN: DJC	DATE: 16.4.07	SIGNATURE:	CAD REF:			CONSULTING ENGINEERS SURVEYORS PLANNERS		PLOT STATUS:
	ADDED NEW WATER METERS	DC 21.06.07	CHECKED:	DATE:	SIGNATURE:	CAD XREF:			17 Pyne Street Whakatane Ph 07 308 5478 Fax 07 308 4907		PROJECT No: 1510-011050 SCALES: 1:250 A3
			APPROVED:	DATE:	SIGNATURE:	SURVEY BY:					DRAWING No: 11050-AB02 REV
REF	AMENDMENT	BY DATE				SURVEY DATE:					
						SCH REF:					

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WHAKATANE DISTRICT COUNCIL
FILE
REG. No. G 43551
-2 JUL 2007
ACTION DATE
1 Carol G
2 Jeff
3
4

HARRISON GRIERSON

28 June 2007

The Chief Executive
Whakatane District Council
Private Bag
Whakatane

Attention Manager Development and Compliance

Dear Jeff

Subdivision At 2B Kowhai St, Ohope: WDC Ref 24.3.04.92
Application For s224 Certificate

This letter is to advise that works on this subdivision are now completed and on behalf of the consent holders, Mr and Mrs Thornton we request Council process the s224 Certificate.

We enclose copies of the following documents:

- The digital title plan document set
- Harrison Grierson cheque to the sum of $112.50 being the requested deposit
- The As Built Plan of Services (Note: this has previously been submitted to Council)
- The s224 Certificate
- Attachment 1: H G letter 15 December 2006:works start notice
- Attachment 2: Building consent for driveway inclusive of retaining walls
- Attachment 3: H G letter 25 May 2007: proposed changes to conditions *(p)* and *(u)*

We submitted the survey and easement details along with a copy of the title plan when we applied for the s223 certificate with our letter dated 19 April 2007.

We provide the following comments in regard to the conditions of subdivision consent as described in the Council's letter dated 17 November 2006:

1. (a) We advise that the development has been carried out in general accordance with the documents as listed. As a result of soil slippage prior to and during construction some design changes were introduced to the accessway and sections of the retaining walls alongside the access. The details of these changes have been submitted to the Council, in particular for peer review and code of compliance requirements. The details will be recorded on Council's file for the Building Consent no. 16323.

Harrison Grierson Consultants Limited
Ground Floor Concordia House
17 Pyne Street, Whakatane
PO Box 336, Whakatane, New Zealand
Ph 07 308 5478 Fax 07 308 4907
Email whakatane@harrisongrierson.com
www.harrisongrierson.com
ISO9001 Quality Assured

1.(b) On behalf of the consent holders we wrote to Council on 15 December 2006 (refer attachment A.1) and advised works were to commence on 18 December 2006.

1.(c) We confirm that no archaeological remains, features or sites were found during the construction works or survey field work.

1.(d) The common driveway to serve lots 1 and 2 have been formed in accordance with drawings R 01A and R13 of the WDC Eng Code of P. and two coat chip seal has been applied. With the exception of the existing concrete entrance section (shared with 2 Kowhai Street) stormwater that would generate from the common accessway has been directed to cesspits, which then discharge via 3 piped outlets to the open drain alongside the Wainui Road carriageway. Preliminary approval of these systems was sought from Council (inspection carried out by Opus Consultants as Council's Professional Service Provider prior to the contractor arranging for the chip sealing).

1.(e) Sewer connections which independently serve lots 1 and 2 have been installed. The connection to lot 1 (the existing dwelling is on this lot) is recorded in Council GIS system and the enclosed as built plan shows the location of the new service connection for lot 2.

1.(f) Independent metered water connections were installed by Council's Operation Business Unit on the 15 June 2006. The positions of these are shown on the as built plan.

1.(g) The certified as build plan of new services is enclosed.

1.(h) The existing access and driveway currently serving 2 Kowhai Street (Lot 2 DPS 49257) is to be upgraded following construction work on lot 2 and 2A. The driveway is to be used to gain access to repair a retaining wall on lot 2A and build two new walls, one each on lots 2 and 2A below the repaired wall. These works will be substantially funded by the Earthquake Commission and allowance for the replacement of the driveway has been in the cost settlement. Harrison Grierson have sited the settlement document and discussed the proposed use of the access with the Thorntons, the owners of Lot 2 (St Georges) and 2A (Towerseys).

1.(i) The access from Wainui Road that served the existing dwelling (i.e. new lot 1) has been permanently closed and the culvert has been removed.

1.(j) The reinstatement of the road reserve and road reserve drainage has been carried out. The culvert was sufficiently clear of the seal edge to avoid damage hence no seal widening was necessary.

1.(k) Traffic management plans were prepared and approved by Opus Consultants prior to earthworks/access construction and sewer installation on the road reserve.

1.(l) The common driveway which serves lots 1 and 2 was designed by Gavin Moore and Mark Thomas, both Chartered Professional Engineers employed by Harrison Grierson. Plans were submitted and Council approved a building consent no. 16323 (refer Attachment 2) for the construction works on 14 December 2006.

1.(m) The building consent no. 16323 included consent for the retaining walls.

1.(n) The bulldozed track was not reinstated. During excavation works for the common driveway a slip occurred which undermined the greater part of the bulldozed track. Unsuitable (saturated, loose) slip debris was removed and the driveway was then constructed at a higher elevation on clean, imported fill. The area between the old bulldozed track and the driveway was then filled with clean fill and the suitable remnants of soil that overlaid the weaker slip debris. Harrison Grierson are satisfied that the reinstated slip site and the area of the bulldozed track is stable and does not overload the retaining walls constructed below this area. Additional information to explain the design changes has been submitted to the Council.

1.(o) The stormwater from existing intakes on lot 1 have been piped into the cesspit at the end of the common driveway and this has a piped outfall to the Wainui Road drain.

1.(p) Harrison Grierson have applied (letter 25 May 2007, Attachment 3 attached) for a change in this condition. Additional information supporting this proposed change has been submitted and is currently being peer reviewed by Council's consultant. We accept that Council's decision on the s223 and s224 approval is held pending the Council's decision on the proposed design changes as outlined in the additional information. (Note: these comments also apply to *1. (u)* as well).

1.(q) The landscape proposals were prepared by Mr and Mrs Thornton and agreed on site with Council's Service Delivery Officer, Rod Fraser.

1.(r) Mr and Mrs Thornton propose to pay the Council's monitoring fees when these are invoiced.

1.(s) Similarly the financial contribution will be paid when invoiced.

1.(t) No easements are necessary for service connections to lots 1 and 2. The water supply that served lot 1 via a service connection through lot 2 has been terminated. Both lots are now served from a new rider main laid by the Council in Wainui Road (refer as built plan).

1.(u) In conjunction with condition *1.(p)* above, Harrison Grierson have proposed a change to item *(i)* of this condition (refer same attached letter for details). We similarly understand a decision from the Council is necessary on this condition before the certificates can be processed. Items *(ii)* to *(xi)* of the existing condition are not proposed to be changed. We acknowledge that the items *(i)* to *(xi)* of the condition will have to be addressed in a consent notice registered against the title for lot 2 and this will be arranged by the Council.

1.(v) We also acknowledge that the items *(i)* to *(x)* of this condition will have to be addressed in a consent notice registered against the title for lot 1 and this will be arranged by the Council.

.....

We trust this information is sufficiently complete and in order for the Council to process the s223 and s224 approvals. Please contact me should further information be required.

Yours sincerely
Harrison Grierson Consultants Limited

Jim Finlay
Senior Associate/ Office Manager
Chartered Engineer

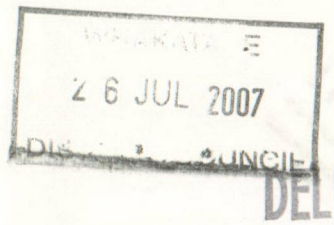
N:\1510\11050\s224Applcn.doc

Hamertons
LAWYERS

LEGAL SOLUTIONS

Our Ref: Mrs D Timmins: 954371/256

Your Ref: Planning Department – Trish Evans



25 July 2007

The Chief Executive
Whakatane District Council
Private Bag 1002
WHAKATANE

SUBDIVISION CONSENT NOTICE — SA AND CA THORNTON – 28 KOWHAI STREET, OHOPE - COUNCIL REFERENCE NO. 24.3.04.92

Further to your instructions we now enclose the prepared Consent Notice for the above subdivision.

A note of our costs has been sent direct to Judy Papuni for payment. We enclose a copy for your information.

Yours faithfully
HAMERTONS

per:

Dawn Timmins
Legal Executive

Brian Carter
Supervising Partner
DRT(lets)30ab537b

PARTNERS:
Bill Jones LLB
Brian Carter LLB
Jonathan Kay LLB
Steve Franklin LLB
B Soc-Sci.

CONSULTANT:
Robert Chappell LLM

Top Floor
Niederer Plaza
The Strand
PO Box 601
DX JA31519
Whakatane, 3158

T. 07 307 0680
F. 07 307 0225

E-mail:
hamertons
@xtra.co.nz

ALSO AT:
Jellicoe Court
PO Box 150
DX JA31001
Kawerau 3169

T. 07 323 8612
F. 07 323 6629

Hamertons
LAWYERS
LEGAL SOLUTIONS

Whakatane District Council

CONSENT NOTICE AUTHENTICATION
RESOURCE MANAGEMENT ACT 1991

File Ref: 24.3. 64. 92

Applicant: Thornton SA/CA

Location: 28 Kowhai street.

I confirm that the attached consent notice has been prepared in accordance with the resource consent granted by the Whakatane District Council on _____.*(Date)*

Planning Officer _____ **Date:** _____

Authorised Officer _____ **Date:** 3/8/07

Please sign and date both copies of the consent notice including the date on both the front and back covers.





24.3.04.92

23 July 2007

Messrs Hamertons
P O Box 601
WHAKATANE

Attention: Dawn Timmins

Dear Madam

THORNTON 2B KOWHAI STREET – 24.3.04.92

The Council requires a consent notice to be issued for this resource consent. Can you please prepare the consent notice on our behalf?

I have forwarded the request and the Council decision letter by email and attached is a copy of the following information:

1. The Land Transfer Plan
2. The Pre-allocated Plan Number
3. Any accompanying plans or supporting documentation

If you require any additional information, please contact me at this office. If there is any delay in the preparation of the consent notice, please contact Laura Swan (Senior Planner) or myself.

If there are easements in gross to be created, please prepare the necessary documents on our behalf.

Please send the invoice directly to Judy Papuni (Creditors Clerk), with a copy to me for processing purposes.

Thank you.

Yours faithfully

Trish Evans
TEAM LEADER CUSTOMER SERVICES

Address all correspondence to: The Chief Executive Officer **Whakatane District Council** Private Bag 1002 Whakatane 3158 New Zealand
Telephone +64 7 306 0500 Facsimile +64 7 307 0718 Email information@whakatane.govt.nz Website www.whakatane.govt.nz

Whakatane District Council

SURVEY PLAN APPROVAL - SECTION 223
RESOURCE MANAGEMENT ACT 1991

File Ref: 24.3. 04-92

Applicant: SA/CA Thornton

Location: 2B Kowhai St, Onepe

I confirm that:

- The submitted survey plan (copy attached) is in accordance with the resource consent granted by the Whakatane District Council on 16-11-06 .*(Date)*
- The consent has not lapsed.
- All roads, private roads, reserves, land vested in the Council in lieu of reserves, and private ways shown on the survey plan have been authorised and accepted under the Resource Management Act 1991 and the Local Government Act 1974.

Planning Officer _____ **Date:** 1.5.07

Authorised Officer CJ Campbell **Date:** 13/7/07

Survey Plan Received: _____

Survey Plan Signed: _____

Survey Plan Returned: _____

Land Registration District	Plan Number
SOUTH AUCKLAND	DP 387121

Territorial Authority (the Council)

Whakatane District Council

Certifications under the Resource Management Act 1991 ***(options that do not apply must be deleted)***

Pursuant to the Resource Management Act 1991 I hereby certify that:

☐ the above plan was approved by the Council pursuant to section 223 of the Resource Management Act 1991 on the 13th day of July 2007

Dated this 13th day of July 2007

CJ Campbell

Authorised Officer

Schedule of Easements/ Interests to Remain with Land (Pursuant to s239(2) of the Resource Management Act 1991)			
Purpose / Interest	**Shown**	**Servient Tenement**	**Dominant Tenement**
Buildings, Other Structures and Vegetation Height Restriction - Level Plane of RL 28.80m Moturiki Datum	A	Lot 2 hereon	Lot 1 hereon

Digital Title Plan - LT 387121

Survey Number	LT 387121
Surveyor Reference	1510-011050-01
Surveyor	Michael Peter Dewhirst
Survey Firm	Harrison Grierson Consultants Ltd (Tauranga)
Surveyor Declaration	

Survey Details

Dataset Description	Lots 1 & 2 being a subdivision of Lot 2 DP 327498 & Lot 25 DPS 9167		
Status	Initiated		
Land District	South Auckland	**Survey Class**	Class I Cadastral Survey
Submitted Date		**Survey Approval Date**	
		Deposit Date	

Territorial Authorities

Whakatane District

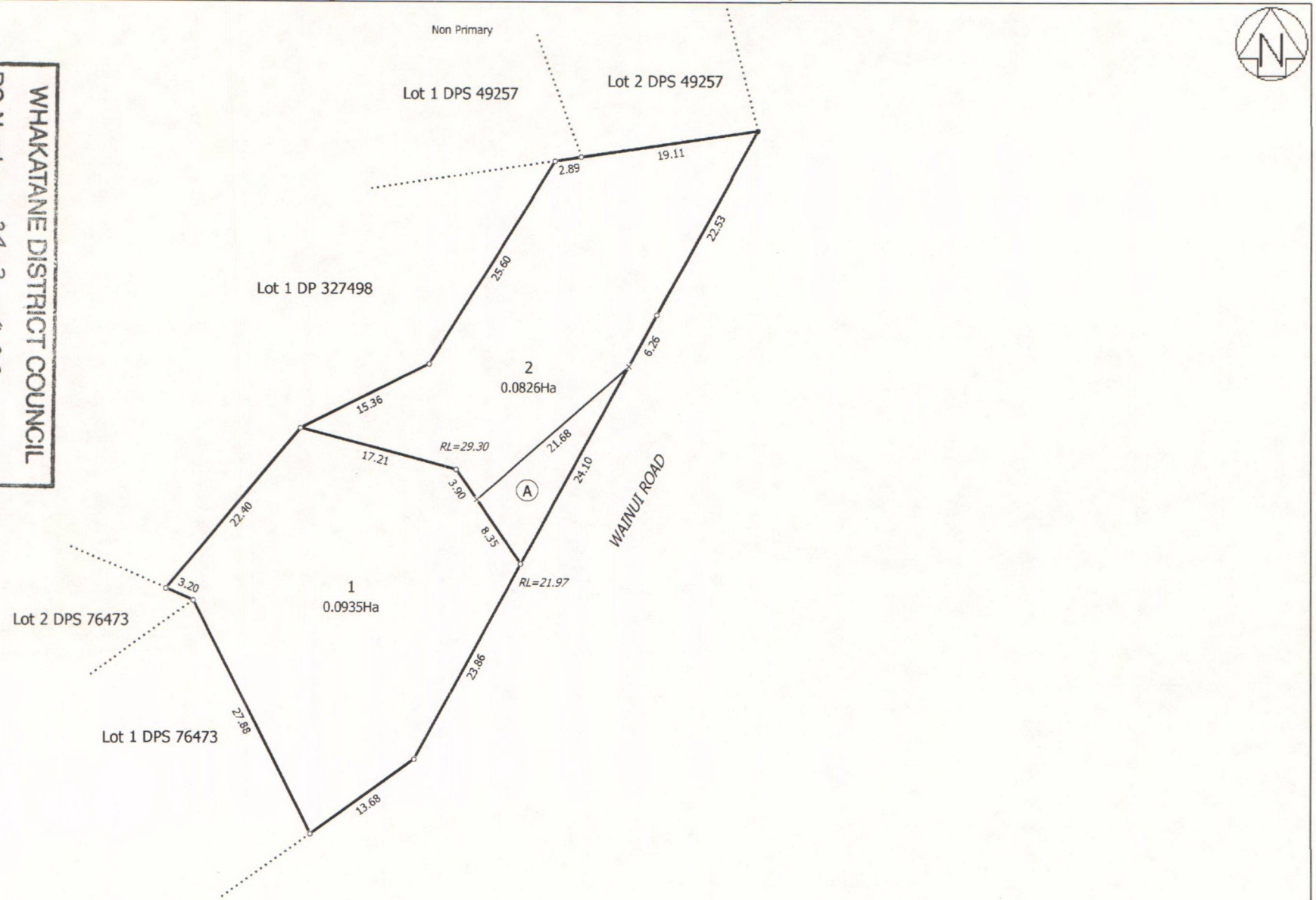
Comprised In

CT 111896

Created Parcels

Parcels	Parcel Intent	Area	CT Reference
Lot 1 Deposited Plan 387121	Fee Simple Title	0.0935 ha	348787
Lot 2 Deposited Plan 387121	Fee Simple Title	0.0826 ha	348788
Marked A Deposited Plan 387121	Land Covenant		
Total Area		0.1761 ha	

WHAKATANE DISTRICT COUNCIL
RC Number 24.3.04.92
Date 13/2/07
Signed GJ Campbell
APPROVED LT TITLE PLAN



T 1/1

Land District: South Auckland Digitally Generated Plan Generated on: 18/04/2007 3:18pm Page 3 of 3	Lots 1 & 2 being a subdivision of Lot 2 DP 327498 & Lot 25 DPS 9167	Surveyor: Michael Peter Dewhirst Firm: Harrison Grierson Consultants Ltd (Te	Digital Title Plan LT 387121 DRAFT

Digital Title Plan - LT 387121

Survey Number	LT 387121
Surveyor Reference	1510-011050-01
Surveyor	Michael Peter Dewhirst
Survey Firm	Harrison Grierson Consultants Ltd (Tauranga)
Surveyor Declaration	

Survey Details

Dataset Description	Lots 1 & 2 being a subdivision of Lot 2 DP 327498 & Lot 25 DPS 9167		
Status	Initiated		
Land District	South Auckland	**Survey Class**	Class I Cadastral Survey
Submitted Date		**Survey Approval Date**	
		Deposit Date	

Territorial Authorities

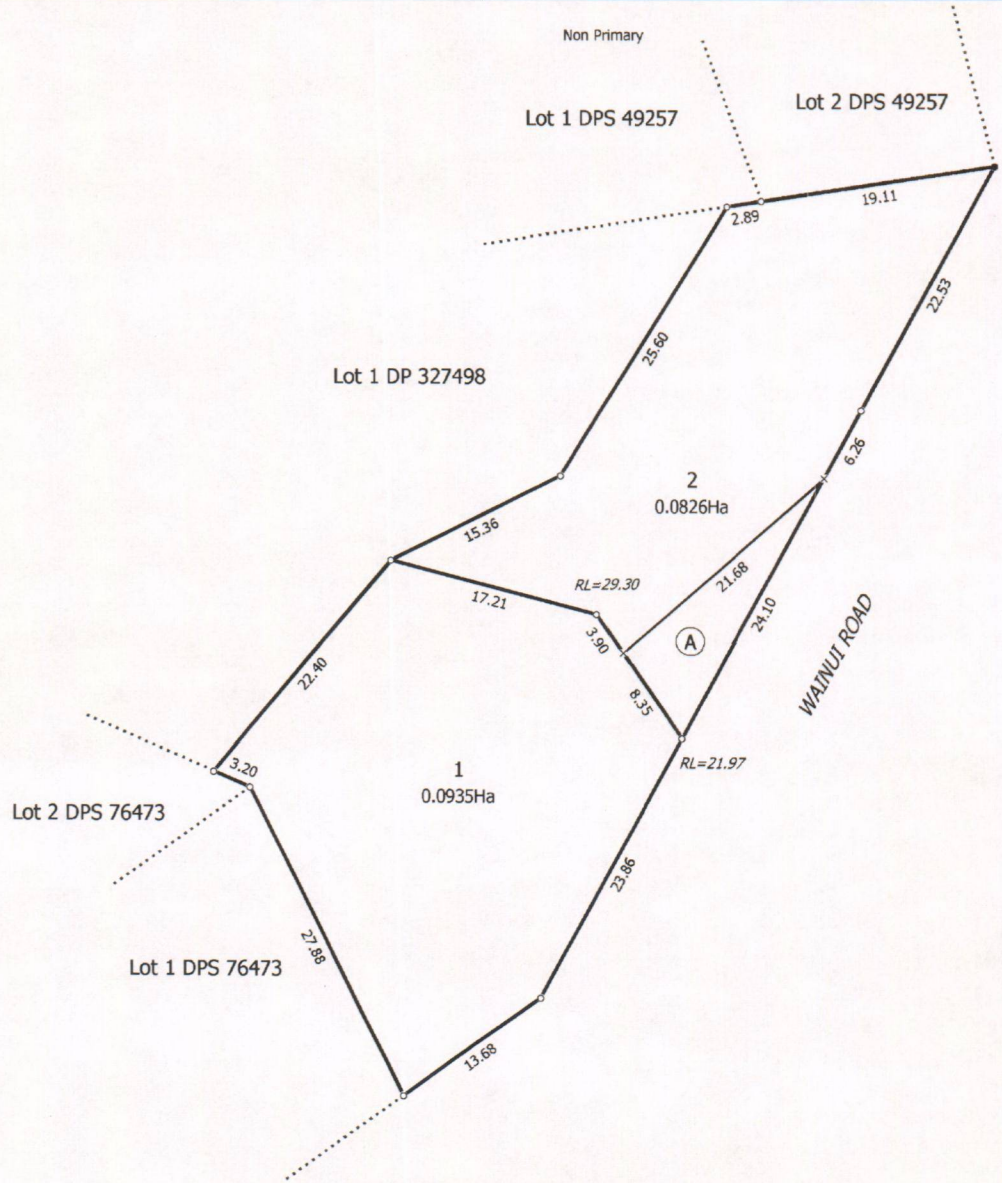
Whakatane District

Comprised In

CT 111896

Created Parcels

Parcels	Parcel Intent	Area	CT Reference
Lot 1 Deposited Plan 387121	Fee Simple Title	0.0935 ha	348787
Lot 2 Deposited Plan 387121	Fee Simple Title	0.0826 ha	348788
Marked A Deposited Plan 387121	Land Covenant		
Total Area		0.1761 ha	



WHAKATANE DISTRICT COUNCIL
RC Number 24.3.04.92
Date 7/5/07
Signed
APPROVED LT TITLE PLAN

Another copy of the same plan has been signed by Carolyn

T 1/1

Land District: South Auckland Digitally Generated Plan Generated on: 18/04/2007 3:18pm Page 3 of 3	Lots 1 & 2 being a subdivision of Lot 2 DP 327498 & Lot 25 DPS 9167	Surveyor: Michael Peter Dewhirst Firm: Harrison Grierson Consultants Ltd (Te	Digital Title Plan LT 387121 DRAFT

Schedule of Easements/ Interests to Remain with Land (Pursuant to s239(2) of the Resource Management Act 1991)			
Purpose / Interest	**Shown**	**Servient Tenement**	**Dominant Tenement**
Buildings, Other Structures and Vegetation Height Restriction - Level Plane of RL 28.80m Moturiki Datum	A	Lot 2 hereon	Lot 1 hereon

$250 deposit paid

Carolyn Campbell

From: Laura Swan
Sent: Monday, 23 July 2007 8:07 a.m.
To: Carolyn Campbell
Subject: FW: Thornton s223 survey plan approval and s224 - consent notices

Hi
Are you ok to follow this up with Trish and Hamertons or do you want me to do it?

From: Andrew Collins [mailto:a.collins@harrisongrierson.com]
Sent: Friday, 20 July 2007 5:13 p.m.
To: Carolyn Campbell; Laura Swan
Cc: Barrie Pettigrew; Jim Finlay
Subject: Thornton s223 survey plan approval and s224 - consent notices

Carolyn

Thanks for issuing the s127 decision last week.

Jeff Farrell advised that the s223 certificate was also being signed off the same day. I don't believe we have received this yet. Could you please advise if it has been sent or is ready to pick up.

Re. the s224, Revised condition (u) and condition (v) require consent notices to be registered under s221 RMA. Our s224 application dated 28 June 2007 noted that the consent documentation would be prepared by Council's lawyers, as is normal practice. Can you please confirm that Hamertons have been instructed to prepare this documentation for signing.

On the assumption that the final geotech report (and Tony Cowbourne's peer review confirmation) is submitted by next Tuesday (24th July), thereby satisfying revised Condition (p), what would be the chances of the consent notices being ready and the s224 being signed off by the end of next week do you think? Tight I know but I am always hopeful !!!

Thank you.

Andrew Collins
Director
Harrison Grierson Consultants Limited
Level 1 141 Cameron Road Tauranga
P O Box 1199 Tauranga New Zealand
Ph: +64 7 578 0023 Fax: +64 7 577 9557 Mob 021 972631
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Harrison Grierson, WINNER of the 2007 INGENIUM EXCELLENCE AWARD
(category: large infrastructure projects, click here for more details)

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HARRISON
GRIERSON

19 April 2007

Your ref: 24.3.04.92

Whakatane District Council
Private Bag 1002
WHAKATANE

WHAKATANE
31 APR 2007
DISTRICT COUNCIL

Attention: Helen Grigg

Dear Helen

Subdivision: S & C Thornton - 2B Kowhai Street, Ohope.

We wish to apply for Councils' endorsement under Section 223 of the RMA 1991. Please find attached:

- HGCL cheque (Signing fee $112.50)
- Section 223 Certificate with Schedule of Proposed Easement (2 x A4 sheets)
- Copy of the Land Transfer Plan (DP 387121) - 2 x A4 sheets

1(a) The subdivision has been carried out in terms of the Revised Resource Consent plan and additional information supplied and the application as approved.

(d) The common driveway has been constructed with single coat chip seal surface.

(i) Existing access to Lot 1 has been permanently closed.

(p) Review of the wall design has been done.

(t) There are no service easements required.

Please do not hesitate to contact the writer if any items above require further action or if further information is required.

Yours faithfully
Harrison Grierson Consultants Limited

Barrie Pettigrew
Surveyor

N:\1510\011050\Admin\let-wdc-3.doc

Harrison Grierson Consultants Limited
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Ph 07 308 5478 Fax 07 308 4907
Email whakatane@harrisongrierson.com
www.harrisongrierson.com
ISO9001 Quality Assured

This is the composite decision

24.3.04.92
2080/0002/B00

23 July 2007

S A and C A Thornton
C/- Harrison Grierson Consultants Limited
P O Box 1199
TAURANGA

Attention: Mark Thomas

Dear Mark

RESOURCE CONSENT (SUBDIVISION) – S A AND C A THORNTON, 2B KOWHAI STREET, OHOPE.

On 16 November 2006, the Manager Development and Compliance, under delegated authority, resolved as follows:

"1. ***THAT*** *pursuant to Sections 34A, 104, 104B, 106, 108, 220 and 221 of the Resource Management Act 1991, the Whakatane District Council grants consent to subdivide the property situated at 2B Kowhai Street, Ohope and legally described as Lot 25 DPS 9167 and Lot 2 DP 327498, subject to the following conditions:*

General

(a) The proposed activity shall be carried out in general accordance with:

- *The application prepared by Harrison Grierson Consultants Ltd dated 28th June 2004.*
- *Additional information supplied by Harrison Grierson Consultants Ltd dated 31st August 2005.*
- *Additional information supplied by Harrison Grierson Consultants Ltd dated 6th October 2005.*
- *Additional information supplied by Harrison Grierson Consultants Ltd dated 24th February 2006.*
- *Additional information supplied by Harrison Grierson Consultants Ltd dated 26th April 2006.*
- *Additional information supplied by Harrison Grierson Consultants Ltd dated 20th June 2006.*
- *Additional information supplied by Harrison Grierson Consultants Ltd dated 25th July 2006.*
- *Plan number 011050-SC02 Revision A supplied By Harrison Grierson Consultants Ltd amendment date 13th October 2006.*

Except where modified by any other condition of this consent.

(b) *That prior to any works commencing on site, the consent holder shall notify the Whakatane District Council in writing of their intention to do so and the date of works commencing.*

(c) *In the event that any archaeological remains, features, or sites are uncovered during operations on site, all works on site shall cease immediately and the relevant Iwi groups shall be contacted along with the New Zealand Historic Places Trust. Works shall not commence again on site until such time as appropriate authorisation is given to the consent holder.*

(d) *The proposed common driveway to serve proposed Lots 1 and 2 shall be formed and constructed in accordance with Standard Drawings R 01A and R13 contained within the Whakatane District Council's Engineering Code of Practice except that a single coat chip seal surface will be accepted by Council for the purposes of acquiring Section 223 and Section 224 approval for the subdivision. All stormwater generated by the common driveway shall be collected and disposed of via a piped system onto Wainui Road to the satisfaction of the Director Works and Services.*

(e) *That proposed Lots 1 and 2 shall be provided with independent Council reticulated sewer connections to their respective boundaries in accordance with Standard Drawing SS 01 of the Whakatane District Council's Engineering Code of Practice.*

(f) *Proposed Lots 1 and 2 shall be provided with independent metered water connections in accordance with the Engineering Code of Practice.*

(g) *"As built plans" of all new and extended services associated with the development of proposed Lots 1 and 2 shall be submitted to the Whakatane District Council for approval and record keeping purposes. These plans shall be certified by a Registered Professional Surveyor as an accurate record of the location of services as constructed on site.*

(h) *The existing access and driveway currently serving 2 Kowhai Street (Lot 2 DPS 49257) shall if necessary, be upgraded to meet the requirements prescribed in Standard Drawings R 01A and R 13 contained within the Whakatane District Council's Engineering Code of Practice.*

(i) *The existing access onto Wainui Road and serving proposed Lot 1 shall be permanently closed and the culvert removed to the satisfaction of the Director of Works and Services prior to Section 223 and Section 224 approval being issued for the subdivision.*

(j) *That reinstatement of the road reserve and road reserve drainage inclusive of seal widening works shall be undertaken across the former access to proposed Lot 1 to the satisfaction of the Director Works and Services.*

(k) *The consent holder shall prepare a traffic management plan and submit this plan to Whakatane District Council for approval prior to any works on either the Wainui Road formation or Wainui road Reserve commencing.*

(l) *The common driveway to serve proposed Lots 1 and 2 shall be designed by a Chartered Professional Engineer who is familiar with the geotechnical constraints and geotechnical reports relating to this subdivision consent. Plans for the driveway shall be submitted to the Director of Environment and Policy for approval and shall consider the collection and disposal of stormwater and groundwater in relation to the structures and the rest of the site and the construction methodology required to facilitate the driveway formation. Engineering plans associated with the proposed common driveway and associated structures will be peer reviewed at the expense of the consent holder and no work shall commence on site until such time as the plans have been approved by the Director of Environment and Policy.*

(m) *Building Consent for retaining walls associated with the access formation to serve proposed Lots 1 and 2 shall be obtained prior to any works commencing on site.*

(n) *As part of the formation of the new access to the site, the existing bulldozed track shall be reinstated as per the further information supplied by Harrison Grierson Consultants Limited dated 26th April 2006 and to a standard that does not decrease the stability of the slope above or below the existing bulldozed track. Materials to be used for backfilling shall be of a suitable moisture content and not of an organic nature and shall be layered uniformly and compacted concurrently. The stability of the reinstated track area shall be designed and constructed to meet building code stability requirements.*

(o) *All stormwater generated by the existing dwelling, garage and concrete manoeuvring area located on proposed Lot 1 shall be collected and disposed of via a piped system onto Wainui Road to the satisfaction of Director of Works and Services.*

(p) *A preliminary design (which may incorporate a retaining wall, or propped wall or pole house solutions) shall be submitted to the Council, along with supporting calculations, to demonstrate to the satisfaction of the Council that a dwelling can be constructed on Lot 2. In the event that the preliminary design relates to a pole house solution, the focus shall be on the design of the pole foundations up to floor level and it shall be*

demonstrated how structural loads will be taken, including pole layouts and key pole loading calculations.

This design shall take into account the requirements for inspection and maintenance of these structures inclusive of anchoring systems, where required by the design. A peer review of the design of these structures shall be undertaken to the satisfaction of Manager Development and Compliance prior to Section 224 Certificate approval being issued for the subdivision and at the expense of the consent holder.

(q) *The consent holder shall prepare a landscape plan for the subject site that identifies any representative vegetation that may be affected by the proposal and measures employed to retain or replace this vegetation. This plan shall be submitted to the Manager of Community Facilities for approval prior to implementation and any works commencing on site.*

(r) *That a monitoring fee of $200.00 (inclusive of GST) shall be paid to the Council as a single charge for the administration, monitoring and supervision of this resource consent. Notwithstanding the above, where there is good and reasonable cause for unprogrammed monitoring and additional site inspections, then the costs of that will be a charge on the consent holder. Such costs are recovered on an actual and reasonable basis as defined in the General Conditions and Notes of the Fees and Charges Schedule as approved by the Council in terms of Section 36 of the Resource Management Act 1991.*

(s) *That a financial contribution of $2405.25 (inclusive of GST) shall be paid to the Council for reserves purposes.*

(t) *That any Easements required to provide for service connections to proposed Lots 1 and 2 shall be duly reserved and granted.*

(u) *In accordance with Section 221 of the Resource Management Act 1991 a Consent Notice shall be registered against the Title of Lot 2 requiring that:*

(i) *The owners of Lot 2 shall be aware that:*

- *There are geotechnical constraints affecting the design of a house on Lot 2.*
- *As part of the subdivision consent process that created this allotment, the consent holder is to provide a preliminary design for one particular building solution prior to the approval of the Section 224 Certificate to the satisfaction of Council (as required by condition (p) of the subdivision consent). This shall be considered as the "default option".*

- *For any building option selected (including the default option referred to above) specific design will be required, with expert geotechnical input, prior to the issue of a building consent.*
- *Where the building option selected involves the creation of a building platform prior to subsequent dwelling construction, a building consent shall be obtained for the associated debris and retaining walls required prior to any works being undertaken.*
- *It may not be practical to provide turning circles on the site which meet the Council's dimension requirements, in which case alternative solutions such as a carousel (turntable) may be required.*

(ii) *Prior to any works commencing on site to form any retaining and debris wall structures associated with any building the proposed building platform on Lot 2, horizontal drains shall be installed as prescribed in the additional information supplied by Harrison Grierson Consultants Limited dated 26th April 2006 and to the satisfaction of Manager Development and Compliance.*

(iii) *That the horizontal drains referenced in consent notice condition (ii) above shall be constructed in a manner that provides for regular and ongoing maintenance to be undertaken.*

(iv) *The Geotechnical engineer undertaking the design of the horizontal drains shall submit a formal programme for ongoing periodic inspections and maintenance beyond the end of construction to Whakatane District Council, prior to the drains being installed. The programme shall include the frequencies for inspections and monitoring, maintenance schedules, alert and alarm levels, and contingency measures to be initiated if alarm levels are exceeded.*

(v) *No works to construct the Building Platform on site shall be undertaken until such time as the Whakatane District Council is satisfied the Debris and Retaining Wall structures and the horizontal drains have been installed in accordance with the approved plans.*

(vi) *Prior to any dwelling being constructed on the identified building platform, a Geotechnical Completion Report shall be undertaken. This report shall:*

- *Confirm that the works undertaken on site including horizontal drain installation, debris and retaining wall installation, formation of new access and building platform and reinstatement of bulldozed track, have resulted in the site being geotechnically stable and suitable for the construction and occupation of a dwelling on the building platform.*

- *Identify recommendations for foundation design methodology, disposal of stormwater from impervious areas and roofing, the best practicable options for connection to reticulated services located at the property boundary and any other matters considered relevant following the completion of physical works on site.*

- *Identify post construction inspection/maintenance requirements and programmes for structures located on site including, but not limited to horizontal drains, retaining walls and retaining wall anchors.*

This Geotechnical Completion Report may be peer reviewed at the discretion of Whakatane District Council and at the expense of the consent holder.

(vii) Any building to be constructed on site shall be subject to specific design and constructed in accordance with the Geotechnical Completion Report contained under clause (vi) of this consent notice.

(viii) Any horizontal drains required by this consent notice shall be maintained in accordance with the Geotechnical engineer's requirements stipulated under consent notice condition (iv) to ensure they continue to function. Confirmation of inspection by a Chartered Professional Engineer shall be provided to Whakatane District Council at the inspection frequency identified in the Geotechnical Completion Report.

(ix) Council's officers or contractors shall be permitted entry upon the land at reasonable times so as to ascertain compliance with these conditions.

(x) The Council's legal costs and disbursements directly or indirectly attributable to the enforcement of the consent notice and the Council's conditions set out in the notice shall be paid by the consent holder.

(xi) Following the completion of construction of a dwelling on Lot 2 the common driveway which serves Lots 1 and 2 shall be formed and constructed in accordance with Standard Drawings R 01A and R13 contained within the Whakatane District Council's Engineering Code of Practice. In particular this will require that the surface of the common driveway is upgraded to meet surfacing option A, B or C prescribed in Table 2 of Standard Drawing R13 within three months of the occupation of the dwelling.

(xii) The common driveway which serves Lots 1 and 2 inclusive of associated retaining and stormwater structures, shall be maintained at all times to the satisfaction of Whakatane District Council.

NOTE:
Requirements (ii) to (viii) above shall apply only where the building option selected involves the creation of a building platform prior to subsequent house construction, with corresponding debris and retaining wall requirements.

(v) In accordance with Section 221 of the Resource Management Act 1991 a Consent Notice shall be registered against the title of Proposed Lot 1 requiring that:

(i) Any new or additional buildings to be constructed on site shall be subject to specific designs which include geotechnical considerations.

(ii) Council's officers or contractors shall be permitted entry upon the land at reasonable times so as to ascertain compliance with these conditions.

(iii) The Council's legal costs and disbursements directly or indirectly attributable to the enforcement of the consent notice and the Council's conditions set out in the notice shall be paid by the consent holder.

(iv) The common driveway which serves Lots 1 and 2 inclusive of associated retaining and stormwater structures, shall be maintained at all times to the satisfaction of Whakatane District Council.

(w) That the consent holder shall pay the Council's legal costs and disbursements directly or indirectly attributable to the preparation, execution and registration of the consent notice(s).

(x) Whakatane District Council may, following receipt of advice from its Geotechnical Peer Reviewer involved throughout engineering design and approval for the access and for structures to be located on Lots 1 and 2, serve notice on the consent holder of it's intention to review the conditions of this Resource Consent under Section 128 of the Resource Management Act 1991, at any time prior to the release of Section 224 certification. The purpose of this review is to address any particular matters that may arise from the engineering design and approval process and/or deal with any adverse effects on the environment that may result from exercising this consent and may need to be dealt with at a later stage to ensure the conditions of subdivision consent remain relevant.

Advice Notes

1. *Whakatane District Council will require that the geotechnical aspects of this subdivision are subject to specific design and certification by a Chartered Professional Engineer with competence and experience in geotechnical engineering.*

2. *Detailed design of the subdivision should include, but not be limited to the following matters:*

    - *Ground retention or any other measure(s) needed to protect the building platform against slope stability;*
    - *Interaction between adjacent retaining walls;*
    - *Slope stability analysis considering both global and local stability and including accurate modelling of the ground anchors;*
    - *Site specific seismic hazards;*
    - *Foundation design;*
    - *Setback distances;*
    - *Earthworks, particularly the disposal of spoil generated by formation of the accessway and new building platform;*
    - *Temporary stability of cut slopes;*
    - *Stormwater control;*
    - *Requirements for post-construction inspections, testing and maintenance.*

3. *Detailed design of the proposed subdivision should include specific assessment of the following aspects of the ground anchor design (where applicable) :*

    - *The lengths required to achieve the required anchor capabilities;*
    - *The length of the anchors and whether they will extend over the property boundary;*
    - *Anchor durability. Given the importance to the overall stability and the coastal environment, triple protection may be required;*
    - *Requirements for construction;*
    - *Load testing.*

4. *The practicalities of the proposed subsoil drainage system should be demonstrated at the time of detailed design, including (1) how any perched seepage zones remote from the level of the drains will be managed, and (2) how the drains will be maintained in the long term.*

5. *It is recommended that the consent holder considers design of the overall development in a timely fashion. Engineering approval of the design of the debris and retaining wall structures associated with the building platform on proposed Lot 2 is critical in acquiring Section 223 and*

Section 224 approval for the subdivision, and may be relevant for the design/construction of the access.

6. *Where applicable, Retaining and Debris Wall Structure anchors will require strength testing. A condition of Building Consent for these structures shall require that this testing is undertaken.*

7. *The consent holder is advised that the reinstatement of the existing Bulldozed track on Proposed Lot 1 and 2 has been provided for as part of this granted consent for Subdivision. Should the Subdivision process be delayed and/or no development occurs on site within 6 months of the date of this consent being granted, Whakatane District Council will require that the track is reinstated to Council's satisfaction.*

8. *Archaeological sites are historic places as defined by the Historic Places Act 1993, and all archaeological sites are protected under the provisions of that Act. Any activity, which impacts on an archaeological site, requires the prior permission of the Historic Places Trust. If any archaeological site is uncovered during operations on site, then work must stop until the site can be assessed by a qualified archaeologist and an authority to modify, damage or destroy the site is applied for under Section 11 or 12 of the Act.*

9. *Full compliance with the conditions of this consent is necessary at all times. Failure to meet the conditions of the consent may result in Whakatane District Council taking enforcement actions against the consent holder.*

10. *A development contribution will be payable when the new dwelling is constructed on Lot 2 and will be charged as part of the building consent for the dwelling. Credit will be given for the portion of the contribution paid as a reserves contribution under this subdivision consent.*

11. *Additional details of the works recommended to comply with condition (j) are contained within Whakatane District Council Subdivision file 24.3.04.92.*

Reasons for the decision

1. *The proposed activity is a discretionary activity in the Residential 1 Zone of the Proposed Whakatane District Plan.*

2. *The site is a difficult site geotechnically and will require particular care in its development. The Council is only satisfied that the proposal is consistent with the relevant objectives and policies contained within the Proposed Whakatane District Plan subject to the stringent mitigation measures contained within the consent conditions. This subdivision can only be considered an appropriate use of the subject land parcel if the conditions are met. Residential use of the*

resulting land parcels will prevail which provides consistency with the surrounding land use.

3. *The Council is satisfied that any adverse environmental effects that may actually, or potentially, result from the subdivision can be avoided, remedied or mitigated by the conditions of this resource consent. All services will be provided to residential Lots prior to the issue of s224 certification.*

4. *The proposal has been extensively considered by Tonkin and Taylor and Terrane Consultants specialist Geotechnical Engineers through a peer review process. Following receipt of this advice, Council is satisfied that this subdivision meets the requirements of S106 of the Resource Management Act 1991.*

5. *The proposal will result in minimal effect to the vegetation on site which comprises second generation exotic and also indigenous species including Pohutukawa, Puriri, Kanuka and Ponga. The proposed building platform is located within an area that has been cleared of plant pest species and therefore contains no significant vegetation and the proposed access is to pass through an area of established Pohutukawa without affecting these trees. Furthermore this consent requires that any trees affected by the proposal and identified as representative by Council, are to be either relocated on site or replacement plantings are undertaken to the satisfaction of Council.*

6. *The subject site is surrounded by residential development and Wainui Road. There are 4 dwellings (exclusive of the one owned by the applicant) which are located within close proximity to the proposed subdivision and elevated in relation to the relative level of the subject site.*

   The potential effects are restricted to one of these dwellings which is located on Lot 1 DP 327498 at 8B Kowhai Street. Any potential effects to Lot 1 DP 327498 are associated with land instability and were confirmed in the owner's submission in opposition to the original application. Geotechnical advice has determined that these effects are able to be avoided, remedied or mitigated by the conditions of this consent and based upon this advice the submitter has withdrawn their right to be heard in support of their lodged submission.

7. *The changes to the conditions in the Section 127 enable greater flexibility in the final design and construction of a dwelling on the new lot. There are three options considered viable for building on this site as outlined in the s127 application. The original option submitted as part of the subdivision application is the most costly and involves substantial earthworks. A pole house option is the simplest as this involves the least amount of earthworks and engineering design. The applicant has submitted a preliminary pole house design to demonstrate that this a feasible option and can be achieved on the site. This design has been reviewed by Terrane Consultants on behalf of the Council. This pole house design will effectively be the default position if other designs are not considered appropriate or cost effective when the specific design work is done for a dwelling. The Council is therefore satisfied that there is a suitable building site available on*

the lot subject to specific design. Future owners will be made aware the constraints and requirements for building by the registration of a consent notice on the title of the new lot. The Council is satisfied that any effects can be mitigated by the new conditions.

8. *The Council is satisfied that the affected parties to the activity have been consulted with through a limited notification process and that submissions received in opposition to the original application have been considered and subsequently addressed by the applicant through amendments to their application or by conditions of this consent. Furthermore, there were no special circumstances in terms of Section 94(C) of the Resource Management Act 1991 which warranted the public notification of this proposal.*

9. *The financial contribution for reserves purposes charged under condition (s) was based on the amount of the contribution required for reserves under the Council's current Development Contribution Policy. The subdivision application was received prior to the Development Contribution Policy coming into effect however due to an assessed land value for proposed Lot 1 of $100, 000 (inclusive of GST) a reserves contribution based on the development contribution policy is considered a fairer assessment given the new calculations for units of demand. The financial contribution for reserves if assessed under the Local Government Act would have required a contribution of $4500 (4.5% of $100, 000).*

10. *The Council is satisfied that conditional consent to this proposal is in accordance with Part II matters of the Resource Management Act 1991. The Council considers that this subdivision is an efficient use of land subject to the very stringent mitigation measures, and the amenity values and environmental quality of this area will not be adversely affected."*

In accordance with Section 357A of the Resource Management Act 1991, you have the right to submit to Council an objection to any of the above conditions of approval. An objection must be lodged with the Whakatane District Council within 15 working days of receipt of the Council's decision. If you are in any way not satisfied with the decision of Council on your objection, you have the right to appeal to the Environment Court. Any appeal is required to be lodged with the Environment Court within 15 working days of receiving the decision on your objection.

Please note that this consent will expire if not given effect to within five years from the date of this letter. Under some circumstances this five year period may be extended if an application for an extension is made before the consent lapses and in accordance with Section 125 of the Resource Management Act 1991.

If you have any further enquiries, please contact Laura Swan (Senior Planner), at this office.

Yours faithfully

Jeff Farrell
MANAGER
DEVELOPMENT AND COMPLIANCE

Terrane
geotechnical solutions

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www.terrane.co.nz

Our Ref. 3055
3 June 2009

Whakatane District Council
Private Bag 1002
Whakatane

Attention: Jeff Farrell

Dear Jeff,

PEER REVIEW INPUTS FOR THORNTON SUBDIVISION, WAINUI ROAD

Further to our meeting we have compiled a summary of the timeline for the Thornton peer review based on the information within our project files. A copy is attached for your information. We note the following:

- We believe we gave a clear response to WDC in late 2006 that the design documentation included within the building consent application remained insufficient. From there onwards we concentrated on the subdivision consent. The building consent issue was - to Terrane at least - a dead issue;
- We were in detailed contact with Paul Howells during the review process (rather than yourself) on how H&G were progressing the extra documentation for the application. We were often waiting for considerable periods while H&G undertook further calculations, analyses, design, etc;
- In mid-2007 there were two residual technical issues for which we made several attempts to get H&G to clarify. When we eventually did get a response it was to the effect that, having suffered so much grief on the project, they had absolutely no interest in having anything to do with it. We acknowledge that, in hindsight, we should have alerted WDC earlier to the difficulties in getting anything out of H&G.

On the question of costs, we note that Terrane has absorbed a significant amount of costs not passed on to WDC (over 50% of the time booked to the job). This is shown by the attached status report. We note that the cost report does not include all of the inputs listed in the summary timeline.

We trust this clarifies the situation. Please contact the undersigned on ph 07 -579 9708 if you would like to discuss the above.

Yours faithfully
TERRANE CONSULTANTS LTD

Tony Cowbourne
CPEng MIPENZ BE(Hons) MSc(Hons) BSc
DIRECTOR

Attach.

3055.090110.WDC.let

4/6/09 Met Tony in office. Terrane to contribute 50% of the council costs.

Cost info

Dispute

Terrane

Thornton Subdivision and Driveway Retaining Walls
Wainui - Kowhai Roads, Ohope
Timeline for Geotechnical Peer Review

Abbreviations:

WDC	Whakatane District Council
H&G	Harrison Grierson Consultants Ltd
MTEC	MTEC Consultants
Terrane	Terrane Consultants
T&T	Tonkin & Taylor

MT	Mark Thomas (HGC)
GM	Gavin Moore (HGC)
JF	Jim Finlay (H&G)
TC	Tony Cowbourne (Terrane)

Date	Query / Action	Comments
14-Jun-04	H&G letter report for driveway and retaining walls	
1-Aug-05	H&G issue their report: "Site Suitability Report for Subdivision of Wainui Road Property"	
27-Sep-05	T&T fax, querying stability under extreme groundwater conditions	subdivision stage
6-Oct-05	H&G provide additional geotechnical data	
21-Oct-05	T&T geotechnical peer review report for proposed subdivision	
24-Feb-06	H&G letter giving suggestions for conditions of consent	
13-Mar-06	MTEC take over subdivision consent processing	
16-Mar-06	Pre-hearing meeting	
16-May-06	T&T fax, raising 13 issues	
20-Jun-06	H&G fax, providing additional information	
24-Jul-06	T&T fax, identifying three outstanding issues	
25-Jul-06	H&G fax	Responding to T&T fax of 24th July 2006
27-Jul-06	T&T fax to WDC	Stated that the wall design was considered sufficient for subdivision purposes.
17-Oct-06	MTEC request to Terrane to provide supplementary advice on geotechnical issues affecting the proposed subdivision,	Particularly asked for comments on the integration of geotechnical aspects into the overall design
18-Oct-06	Terrane site inspection	
25-Oct-06	Terrane issue first review report.	Identified significant issues with the design. Included was a note that there were inconsistencies in the layout of the lower level of the proposed dwelling.
17-Nov-06	Resource Consent (Subdivision) issued by WDC, with conditions	
20-Nov-06	Copy of H&G design documents for driveway design received by Terrane.	Documents were dated 2004.
30-Nov-06	Query via email from TC to MT	Asked why the 2004 design had been submitted considering all of the issues that had been raised/considered since then.
30-Nov-06	Query discussed in follow-up phone call MT/TC	MT acknowledged the design was "probably not consistent" with the recent peer review of the subdivision documents. TC advised there were a number of significant issues that were still to be resolved.
2-Dec-06	Draft peer review statement issued by Terrane to WDC and H&G.	
7 Dec 06 (am)	Meeting to discuss driveway design (MT / TC). Also discussed some aspects of the proposed house.	TC pointed out that the plans for the proposed house were not consistent with the current/revised driveway layout. MT advised that H&G were not involved in the design of the house, but that he would alert the architect.
7 Dec 06 (pm)	Revised driveway design provided by H&G.	However, was a mixture of 2004 and 2006 documents, and therefore internally inconsistent.
8-Dec-06	Email TC to MT	Asked for H&G to sort out the inconsistencies
8-Dec-06	Email MT to TC	Giving response, but partial only
11-Dec-06	H&G issued amended design statement	
12-Dec-06	Terrane issued second peer review report	
20-Dec-06	(approx date) Building consent application lodged for retaining walls	
6-Jan-07	Terrane inspection of driveway construction	By TC
8-Jan-07	Email from TC to WDC and H&G	Confirmed that there were problems with construction, including the slip event.
9-Jan-07	Telecon JF / TC	JF explained the construction problems and the management problems that had arisen.
10-Jan-07	Terrane issued inspection report	
18-Jan-07	Terrane inspection of driveway construction	by Sally Hargraves
19-Jan-07	Email from TC to MT, JF and WDC	Identified problems seen on site
19-Jan-07	Fax issued by H&G, responding to Terrane report of 11th Jan.	Supporting calcs issued 20 Jan
21-Jan-07	Email from MT to TC	MT gave initial response
22-Jan-07	Email from TC to MT	TC: acknowledgement, with one item of clarification
19-Feb-07	Response from H&G (MT)	
20-Feb-07	Response from H&G (MT)	Calculation provided. Not all issues resolved
4-Mar-07	Terrane inspection of site	Inspection by TC
7-Mar-07	Terrane draft peer review report issued via email	
20-Mar-07	Meeting to discuss outstanding retaining wall construction issues (GM / TC)	
14-Apr-07	Terrane progress/update report #3	Only ever a draft - s/s by report #4
16-Apr-07	Telecon GM + Andrew Collins (H&G) / TC :	Clarified what information is outstanding for wall peer review. H&G waiting for statement on durability issue from contractor. TC repeated previous comment about the driveway not matching the proposed house. H&G stated "not our responsibility".
16-Apr-07	Telecon TC + JF	To clarify the driveway peer review issues raised
23-Apr-07	Terrane issue draft review report on house platform design to PH	
24-Apr-07	Terrane issue peer review report on house platform design	Total of 27 queries raised. Concluded that design was not substantiated
14-Jun-07	Terrane inspection of site	Still shortcomings in the construction
5-Jul-07	H&G provide additional information	
9-Jul-07	Terrane issue report #4 for driveway construction	Final sign-off, with recommendations
7-Aug-07	Terrane draft final report on subdivision issued	Still loose ends
	Messages TC to GM	
28-Oct-08	Terrane issue final report on subdivision design	

3055 WDC Peer Reviews 05-06:07 Wainui

SUMMARY ONLY

Company: Whakatane District Council

Client:

Contact:

Site Location: 24 Wainui Road

Area: Ohope

Description: Peer review

QB Job Status: ACTIVE

JMS Job Status: Active

Invoiced Costs vs Actual Costs

	Consulting Fees	In House Expenses	Disbursements	TOTAL
Budgeted:				
Actual:	7,131.25	191.47		7,322.72
Invoiced:	3,080.00	85.00	35.00	3,200.00
Profit / Loss:	-4,051.25	-106.47	35.00	-4,122.72

Time Tracking Summary

	Total	Billed	Not Billed
Amount:	7,131.25	7,131.25	0.00
% of Total Time Tracking:	100.0%	100.0%	0.0%

Jeff Farrell

From: Sally Hargraves [sallyh@terrane.co.nz]
Sent: Monday, 15 December 2008 7:49 a.m.
To: Jeff Farrell
Subject: RE: Thornton Resource Consent Application - 2 Kowhai Street, Ohope

Sorry for being unavailable on Friday. I have been working a four day week for some time now in an attempt to spend a bit more time with the kids; my phone had also run out of battery which I didn't notice until Sunday!!

I will have a look back through the job file and through the accounts, as well as talking through the problem with Tony. I certainly appreciate your situation and will try and work something out to help move this forward. I'll be back in touch either later today or tomorrow.

Regards
Sally

From: Jeff Farrell [mailto:jefff@whakatane.govt.nz]
Sent: Friday, 12 December 2008 2:36 p.m.
To: Sally Hargraves
Cc: Laura Swan; Paul Howells
Subject: Thornton Resource Consent Application - 2 Kowhai Street, Ohope

Hi Sally

Rang the office and found you were not in till Monday. Also unsuccessful with your cell phone.

I would appreciate it if you would give me a call after you have read and considered the following.

Having received Tony's finalised report at the end of October, we have finalised the documentation to complete both the subdivision and the building consent for the retaining walls. The fees associated with each application amount to:

Resource consent: $2091.61
Building consent: $1724.75 ($1311.75 of which was an earlier invoice [3055.06-02] which we paid around 1st of May 2007.
Total: $3816.36

We approved the s224 over a year ago based on Tony's verbal assurance. The building consent application has also been cancelled due to Tony's report not being provided earlier. During the period we were waiting for Tony's report which we requested on several occasions, the applicant complained vigorously to the Council's Director of Environment and Policy, the Chief Executive, the Mayor and a number of councillors, and threatened to go to the ombudsman's office. I am not understating the situation when I say that Tony caused us a great deal of embarrassment on several occasions as a consequence of saying he would deliver the report then consistently failing to do so. We consider that that under these circumstances, we are unable to go back to the applicant to recover the above costs at this late stage in the proceedings.

The purpose for my writing is to enquire if Terrance Consultants would be prepared to make a contribution toward the above costs in recognition of Tony's poor performance in this instance.

I look forward to receiving your call.

Sincerest regards
Jeff

Jeff Farrell
Manager Development and Compliance

WHAKATANE DISTRICT COUNCIL
Private Bag 1002

17/12/08 - Met with Tony Cowbourne C WDC. Tony to formulate a considered response & email it back to me. Jeff

Whakatane 3158

phone 07 306 0500
ext 7532
ddi 07 306 0532
mobile 027 453 6248
fax 07 307 0718
email jefff@whakatane.govt.nz
web http://www.whakatane.govt.nz



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_____ Information from ESET NOD32 Antivirus, version of virus signature database 3690 (20081214) _____

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http://www.eset.com

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Jeff Farrell
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WHAKATANE DISTRICT COUNCIL
Private Bag 1002
Whakatane 3158

phone 07 306 0500
ext 7532
ddi 07 306 0532
mobile 027 453 6248
fax 07 307 0718
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web http://www.whakatane.govt.nz

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Laura instructed to waive these costs excl the Hamertons invoice – too long & not worth the drama with the applicant. Nadia 19/5/10

RC ID: 24.3.04.92
Invoice Date:
Send Invoice To:
Applicants Name: SA & CA Thornton
Agents Name: Harrison Grierson Consultants Ltd
Agents Address: PO Box 336, Whakatane
Property Address: 2B Kowhai Street, Ohope
Postal Address: C/- PO Box 336, Whakatane

Position	Charge Code	Other Time (min)	Amount ($)
Planning Assistant	251010-1250	160	$237.04
Planner	251010-1250	450	$800.03
Senior Planner	251010-1250		
District Planner			
Director S and D			
Senior Inspector	201220-1250		
Parks Officer	251010-1250		
Development Engineer	251010-1250		
Manager D and C	251010-1250	60	$133.33

Disbursements		Details	
QVNZ	251010-1400		
Advertising	251010-1400		
Consultant	251010-1400	Opus	$811.20
	251010-1400	Hamertons	~~$432.23~~
	251010-1400		
	251010-1400		
Monitoring Fee	251010-1250		
Total			**$2,413.83**
Deposit Fee 1	251010-1250		$322.22
Deposit Fee 2	251010-1250		
Balance to pay (GST excl)			**$2,091.61**

286.25 Invoiced 19/5/10 with consent notice fee.

Information for Invoice:
Additional admin charges for processing of Other
S127, s223 and s224

Jeff.

This is what we would have billed thorntons if we hadn't waited for Tony L.

Did you ever reply to these letters.

Resource Consent Time and Disbursements Record

Applicant: S127 Thornton
RC ID: .....

+ S223 + 224

Planning Department

Date	Staff	Comments	Hours
7/6/07	LS	Review app + S94 Report	80
12/7	CC	Meet Andrew Collin, discuss this	30
13/7	CC	S127, S223	4 hr
23/7	CC	Compile decision for CN	40
3/8	LS	Chase 224s + check	60
13/7/07	JF	Sign S127 Decision + various discussions	60

	Total Hrs
PA 3	80 min S223/224
Plnr)	80 min S127
Snr Plnr 3	450
~~DP~~ CC ~~2~~	
DSD JF	60
Mon	
Hrg	

Other Departments

Date	Staff	Comments	Total Hrs
	Parks Officer		
	Project Engineer		
	Senior Inspector		
	Property Officer		

Disbursements

Date	PO Num#	Details	$Amount
		Monitoring	
		QVNZ	
		Consultant 1 Consent Notice	432.23
		Consultant 2 OPUS.	811.20
		Advertising	
		Legal	
		Other	

- ☐ Additional admin charges for processing of subdivision consent .....
- ☐ Additional admin charges for processing landuse consent +100.00 223
- ☐ Additional admin charges for processing S224 for subdivision 100.00 224
- ☐ Other .....

Sub Total	
Deposit	722.22
To Pay	

Aug

WDC CONTRACT 06/11 PROVISION OF PROFESSIONAL SERVICES 2006 TO 2011
PROGRESS CLAIM NUMBER: 15 ~~JULY~~ 2007

ITEM 10.4.1 CONSENT APPLICATION PROCESSING - SUMMARY

OPUS REF.N(	WDC REF. NO.	CLIENT NAME	CLIENT ADDRESS	FEE ($)
2-88063.29	24.3.03.10	M Lyon	646 Manawahe Rd	25.50
2-88063.91	24.2.06.91	Agai Awa Social & Health Trust	17 James St	1517.00
2-88065.40	24.2.07.8/24.3.07.4	DJ & RA Cutler	225 Pohutukawa Ave, Ohope	116.50
2-88065.55	24.3.07.8	Super Centre Ltd	Mill Road, Whakatane	142.00
2-88065.84	24.3.06.86	Sisam & Sons Ltd	34A Pohut St, Whk	17.00
2-88065.94	24.2.07.44	GD Jelley	13 Claydon Pl, Ohope	39.95
2-88066.26	24.3.07.49	Askey Law	181/181A Putiki Rd	293.80
2-88066.35	24.3.07.52	Bunnings	23 Mill Rd, SH 30	658.00
2-88066.37	24.2.07.78	A Burt K Clark	1611/1611A Thornton Rd	220.00
2-88066.39	24.2.07.82	Pacific Toyota	81-83 Commerce St, Whakatane	93.50
2-88066.45	24.2.04.241	Sheaff & Jackson	31 Muriwai Rd, Whk	313.00
2-88066.64	24.3.07.68	Linea Investments Ltd	16 Stewart St, Whk	55.00
2-88066.66	24.3.07.69	CJ Hume	91 Eivers Rd, Whk	169.40
2-88066.75	24.3.07.75	IM Magee	97 Thornton Beach Rd	201.80
2-88066.76	24.3.07.76	MC & GF Zonneveld	36 Hinemoa St	175.90
2-88066.77	24.3.07.77	LN & JN Brownlee	849 SH30 Awakeri	158.50
2-88066.78	24.3.07.83	Kora Bell & Hodgson	263/265 Waimana Rd	201.90
2-88066.81	24.3.07.79	MK & LA Butler	116 Te Rahu Rd	158.50
2-88066.84	24.3.07.80	S Willis	259 Pikowai Rd, Matata	395.60
2-88065.85	24.2.07.114	P Traver & T Priebe	41 Kawerau West Road	201.60
2-88066.86	24.3.07.81	M & K Brown	49 West End, Ohope	159.00
2-88066.87	24.2.07.112	Telecom	13 Rewatu Road	105.00
2-88066.91	24.3.01.70	V M Gray	1353 Manawahe Rd	96.50
2-88066.93	24.3.07.90	K Jolly	78 Paheha St, Matata	201.00
2-88066.95	24.2.07.123	P Hadley	659A White Pine Bush Rd	182.30
~~2-88066.96~~	~~24.2.07.116~~	~~GBC DevelopmentS~~	~~47 & 53 White Horse Drive~~	~~175.50~~
2-88066.98	24.3.07.89	G & P Dennis	89 Te Rahu Rd	188.50
2-88090.01	24.2.07.120	HNZ	18 22 32 Garaway St	171.90

SUB TOTAL	***6,434.15***

CONSENT ANNUAL MONITORING

SUB TOTAL	***0.00***

ITEM 10.4.2 PRE APPLICATION ADVICE

288068.00	Monthly lump sum	412.13
	SUB TOTAL	***412.13***

ITEM 10.4.3 SECTION 223 CERTIFICATION - SUMMARY

OPUS REF.N(	WDC REF. NO.	CLIENT NAME	CLIENT ADDRESS	
2-88070.06	24.3.06.9	WJ & JM Searle	32 Bridge St, Whk	25.50
2-88070.08	24.3.06.141	Hall & Fox	17 Onepu Springs Rd	110.60
2-88070.09	24.3.06.53	Gray & Attewell	39 Shaw Rd	33.50
2-88070.10	24.3.07.51	Linea Investments	14 Stewart St, Whk	161.50
2-88070.11	24.3.04.92	SA & CA Thornton	2B Kowhai St, Ohope	467.50
2-88070.12	24.3.04.82	Paul & McIntyre	373 Hallett Rd	42.50
2-88070.13	24.3.07.34	Powell	48 Ocean Rd, Ohope	51.00
2-88070.15	24.3.06.109	P Rogers	199 Paparoa Rd	42.50
2-88070.16	24.3.06.80	B AR Perry	25 Park Road	42.50
2-88070.17	24.3.06.96	Hennessey	57 Kowhai St, Edgecumbe	85.00
2-88070.18	24.3.03.102	M Lyon	646 Manawahe Rd	131.50

SUB TOTAL	***1,193.60***
TOTAL	***8,039.88***
GST 12.5%	**1,005.06**
TOTAL INCLUDING GST	**9,044.94**

Tax Invoice

GST No: 56-380-906

23 November 2007
Project No: 2-88070.11
Invoice No: 1217044
Opus Contact: John Tailby

Whakatane District Council
Private Bag 1002
Whakatane
Attention: Mike Naude

WDC 06/11 Schedule Item 10.4.3
WDC Ref No. 24.3.04.92
SA & CA Thornton
2B Kowhai St, Ohope
Professional Services for the period ending 23 November 2007

Task 100WK Application Processing

Professional Personnel

	Hours	Rate	Amount	
Tailby, John	2.00	130.00	260.00	
Totals	2.00		260.00	
Total Labour				**260.00**

Reimbursable Expenses

Disbursements (incl Std Charges)		10.00	
Total Reimbursables		**10.00**	**10.00**
	Total this Task		**$270.00**

Taxes

GST (@ 12.5%)	12.50% of 270.00	33.75	
Total Taxes		**33.75**	**33.75**
	Total this Invoice		**$303.75**

Payment due by the 20th of the following month to: Private Bag 3057, Hamilton.
Payment may be made by direct credit to BNZ, Wgtn 02-0500-0055075-04.
Please fax remittance details to (07) 838-9760.