

SERENO VISTA

RESIDENTIAL SUBDIVISION
SERENO VISTA, BELLEVUE

REPORT ON SUBDIVISION EARTHWORKS
AND RECOMMENDATIONS FOR BUILDING

Our Ref: 17452
October 2005

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1.0 Introduction

The earthworks, roading and services for the Sereno Vista Subdivision located at 216 Bellevue Road are complete. 37 residential lots have been created as shown on deposited plan DP 360410. This plan is included in Appendix I to this report.

During the subdivision the long cul de sac of Sereno Vista was constructed.

This report describes the earthworks undertaken in the formation of the subdivision including the relevant standards adopted and enforced, the scope of the work, results and conclusions reached from extensive observation and testing during the earthworks. The report also contains recommendations for developing building sites and building restrictions where appropriate.

During this report reference is made to drawing 17452-EW11 which is included in Appendix I. This drawing shows relevant road and lot locations, areas of cut and fill and other data relevant to this report.

2.0 Scope of Work

The original topography of the subdivision area comprised an elevated ridgeline which ran in an east to west direction through Lots 1 to 6 and the road alignment before turning to the south along the road alignment to terminate at the cul de sac head to the north of Lots 22 and 23. A further narrower ridge extended from the cul de sac head area to the south east and terminated in lot 25.

Previous building occupation in the subdivision area was by a small house on a previously levelled platform on new lot 1, a house on the south facing-ridgeline opposite Lots 16, 17 and 27, a house at a slightly lower level on lot 22 and an implement shed on lot 25. These building positions are shown on project drawing 17452-EW1 included in Appendix I for reference.

A substantial gully feature existed to the south of the new road alignment within Lots 32 to 36 inclusive and extended to the base of slopes of up to 30 degrees within lot 37.

To the north of Lots 1 to 10 ground slopes steepened beyond the original ridgeline at 30 to 40 degrees. On these slopes the only form of instability seen was minor soil creep on the steeper sections.

To the west of the original ridgeline now within Lots 10, 11, 14, 15, 18 and 21 ground slopes of 25 to 45 degrees (steepest below lot 10), were present. These slopes were also regular and were grassed and used for pasture.

To the south east of Lots 21 to 25 steep slopes of up to 40 degrees were present. These slopes were covered in original or regenerating bush and some exotic weeds and lead down to a wet valley floor that extends north east towards Bellevue Road and is bounded to the north west by the Sereno Vista subdivision and to the south east by the rear yards and

properties with frontage on to Graham Place. The original slopes below Lots 21 to 25 have remained unaltered by the subsequent subdivision earthworks and other activities.

The earthworks undertaken during subdivision construction were originally shown on project drawing 17452-EW1 and the resulting depths of cut and filling undertaken are shown on 17452-EW11.

These earthworks comprised

- The reduction of the former ridgeline which ran westwards before turning to the south by depths of excavation of up to 9 m (at lot 27 and the adjacent road subgrade). Cuts of up to 4 m occurred in Lots 12 and 13 and lowering of ground levels on these Lots extended to "daylight" at the slopes present to the north of Lots 6 to 10.
- The lowering of the original ground in Lots 28 to 30 to ease gradients on the former sloping ground to the south.
- The lowering of the original ground to the south and east of Lots 20, 24, 25 and 26 to ease original ground slopes.
- The placement of structural filling in the former gully within Lots 32 to 37. Depths of filling of up to 9 m were placed.
- The placement of structural filling above and over the slopes present on Lots 11, 14 and 18 to extend the flatter slopes formed in cut from adjacent Lots 12, 13, 17, 19 and 20.
- The placement of structural filling within the upper area of lot 21 and Lots 22 and 23 to infill localised depressions and ease gradients down from adjacent Lots and the road cul de sac head.
- The construction of temporary stormwater and silt runoff detention ponds at locations shown on 17452-EW1 in Appendix I. These ponds were constructed to prevent contamination to waterways adjacent to or below the pond positions. The ponds were constructed as conditions of Consent No. 62757 issued by Environment Bay of Plenty. These ponds were not located on areas proposed as building sites and were removed after the 2005 winter season.

The filling within Lots 33 to 37 was undertaken in lifts of 2 m. Prior to commencement of the filling and after removal of unsuitable surface organic soils at the toe of the original slope a subsoil drain was installed. At each lift level a further horizontal subsoil drain was installed with an outfall down a chimney drain formed at the interface of the filling and the original slope which was unaltered on the eastern side of lot 37 (below the existing properties at 210 and 212 Bellevue Road.

As the filling levels were raised in Lots 33 to 37 benches were cut into the original sloping ground that had previously been stripped of topsoil and loose surface soils. The inorganic soils derived from the bench cuts were incorporated in the general structural filling.

The areas of cut and depth of fill shown on drawing 17452-EW11 were derived from surveyed contours of the finished surface taken on the completion of earthworks compared with a comprehensive topographical survey undertaken prior to commencement of the subdivision construction and surveys of depths of undercut before filling.

The earthworks for the subdivision were undertaken by C and C Earthmoving (2003) Ltd during the 2004-2005 earthworks season in compliance with Consent No. 62757 issued by

Environment Bay of Plenty. The principal contractor for the subdivision construction was Higgins Contractors BOP. The earthworks were completed in February 2005. Some minor buttress filling was later undertaken at the base of the fill batter within lot 37 to repair scour that had occurred during the previous winter period.

3.0 Previous Investigations

Prior to seeking approval for the subdivision a geotechnical assessment of the development area was included in the resource consent application for subdivision dated July 2004. A copy of the application is present on the Tauranga City Council subdivision file.

This assessment was based on the identification of the subsoils present on the subdivision area and those most likely to be found in areas of cut and undisturbed ground.

The investigation field work comprised

- 12 machine boreholes
- 3 handaugered boreholes
- A topographical survey

The locations of the boreholes are shown on 17452-EW11 and 17452-EW1. The machine drilled boreholes extended to depths of up to 14 m.

Logs of the soils identified in the boreholes are contained in Appendix IV.

The soil strengths were determined by shear vane and standard penetrometer tests (SPT). The tests were undertaken from the base of the boreholes as the boreholes were drilled. The insitu undrained shear strengths and SPT results are presented on the borehole logs.

PVC standpipes were installed in selected boreholes for groundwater monitoring purposes. The groundwater levels were checked during and subsequent to completion of the investigations.

Boreholes 1 – 5 and 9 – 12 were located on the more elevated ground. The soils encountered were typical of those found in the elevated areas of the Tauranga district being "younger" post Rotoehu and Rotoehu ashes overlaying "older" more weathered ashes characterised initially by dark brown "Hamilton" ash. The younger ashes were not as prevalent as usually found elsewhere in Tauranga indicating that past erosion during their deposition was more extreme on the ridge areas. There was no evidence to suggest that any previous earthworks had been undertaken during the original farm development other than localised tracking and the formation of the building sites for the original houses and shed.

At depth the Matua subgroup series of the Tauranga ground of soils were present.

These soils are described in more detail, including their derivation, by Briggs et al in Occasional Report No. 22 by University of Waikato titled "Geology of the Tauranga Area" (1996).

The remaining boreholes were put down to identify subsoil continuity so that geological profiles could be prepared for stability analyses of the steeper slopes present. At the bases of the slopes the upper ash soils were absent or were present as colluvium from past erosion. Estuarine sediments were also present at the lower levels indicating past inundation from rising harbour levels and overland flows down gullies and through watercourses.

These investigations showed that in the development of the subdivision the subsoils were suitable for use as filling even though conditioning and mixing would be required to achieve the compaction strengths and densities required for structural filling. Also, with the varying depths of cut across the stratigraphy which generally follow the original ground profile, the subsoil types and strengths were predicted to vary across individual lots.

4.0 Earthworks Standards

The performance specification required of the Contractor for the earthworks was based on the guidelines contained in NZS 4431:1989 "Code of Practice for Earthfill for Residential Development". Enforcement of the compaction requirements listed below satisfies the standards listed in Section 7 of NZS 4431.

Air voids percentage (as defined in NZS 4402: Part 1:1980)

- Structural Fill - average value less than 10% (any 10 tests)
- maximum single value 12%

Undrained shear strength (measured by insitu vane)

- Structural Fill - average value not less 150 kPa (any 10 tests)
- minimum single value 100 kPa

The earthworks were observed by engineering technicians from this office and compaction and strength control testing was undertaken by Evans Civil Engineering Services Ltd under their IANZ accredited procedures both on site and in their Ohauiti laboratory.

During the subdivision earthworks 64,000 m³ of soil were cut for filling. Compaction tests were undertaken at varying levels within the filling as it was placed. 51 tests were undertaken and are shown in position on drawing 17452-EW11 in Appendix I and the test results are tabulated in Appendix III.

5.0 Post Construction Testing

Post construction handaugered boreholes were put down on each of the lots where structural filling was not placed at locations shown on 17452-EW11. These boreholes were generally 1 m deep and were intended to confirm ground bearing conditions for shallow building foundations in the natural ground that had been modified in cut.

As the boreholes were being drilled undrained shear strengths were recorded with a hand held shear vane pushed in advance of the auger.

Summary logs of these boreholes and the shear strengths recorded are contained in Appendix IV.

6.0 Summary and Recommendations for Lot Development

6.1 Areas of Subdivision Construction Filling

Structural filling was placed on **Lots 11, 14, 15 (part), 18, 21 (part), 22, 23, 32 to 35, 36 (part) and 37.**

The depths of filling present on these lots are shown on 17452-EW11. The filling was placed in accordance with the methods and standards quoted in NZS 4431 under the management of S & L Consultants Ltd. Compaction testing on site confirmed that a high and uniform degree of compaction has been achieved suitable for the support of buildings.

A professional opinion (Appendix II of this report) in support of the suitability of the filled areas for the erection of buildings in terms of NZS 3604 is appended.

Within areas of structural filling on which buildings may be erected, however, the possibility of variation of soil type and strength may exist away from our observation or compaction test locations. The normal inspection of foundation conditions during construction of buildings by competent tradesmen as described in NZS 3604 and by building inspectors should therefore be undertaken. If for any reason areas of low soil strength are found professional geotechnical advice should be sought.

6.2 Areas of Natural Ground in Cut

During the large scale earthworks undertaken the original ground levels on **Lots 1 to 10, 11 (part), 12, 13, 16, 17, 19, 20, 24 to 31 and 32 (part)** were reduced in cut.

In areas of cut the subsoils present on these lots will be ash derivative soils typical of those found in the Tauranga area.

The varying depths of cut have however already exposed a variety of different soil types immediately below the topsoil overlay. This is because the more recent ashes that mantled the original ground surface have been partially or totally removed.

Post construction handaugered boreholes were put down on the lots in areas of cut at locations shown on 17452-EW11 and logs of the soils found in these boreholes are contained in Appendix IV. The boreholes indicated the various soil types present on each lot near the finished ground surface.

It is likely that further earthworks will be undertaken on those lots with sloping ground to create level building areas for concrete floor slabs. The post construction borehole logs

indicate the soil types that may be encountered in excavation depths of up to 1 m. The post construction logs also give an indication of the soil types that may be encountered at greater depths of cut. A composite indication of the soil types immediately under the surface cover in descending depth is as follows.

Soil Type	Post Construction Borehole Identification	Undrained shear strength (kPa)
Friable light brown ash SILT (younger ash)	1, 7, 8, 10, 20, 22, 24, 30, 31, 32	90 to greater than 200
Pumiceous SAND and SILTY SAND (younger ash)	2, 25, 29	more than 100
Brown or light brown moderately plastic silty CLAY and CLAY (soils found in areas of deep subdivision excavation)	3, 4, 5, 6, 9, 11, 12, 13, 14, 15, 16, 17, 18, 19, 26, 27, 28	100 to greater than 200

The relative depths at which these soils were present before the subdivision earthworks may be deduced from the presubdivision borelogs in Appendix IV.

If excavations are to be made to form a level building platform it should be expected that some lower strength soils or those that may lose strength during disturbance by earthmoving equipment due to their sensitivity will be present at building foundation support level.

The use of NZS 3604 for the detailing of building foundations assumes that "good ground" is present where the ultimate bearing capacity would be 300 kPa. The measurements of undrained shear strength recorded in the post construction boreholes indicates that such an ultimate bearing capacity would be present to adopt the use of surface foundations. However if these soils are disturbed by further earthmoving activities or they are found to be of variable of lower strength than the borehole data would indicate professional engineering advice should be sought. Foundations detailed in accordance with NZS 3604 may have to be deepened or widened accordingly.

It should be noted that a 300 mm wide foundation supporting a single storey building with heavy roof and external wall cladding and with a concrete ground floor rarely requires an ultimate value of more than 150 kPa.

If it is proposed to construct buildings that require substantial excavations it may be prudent for the building designer to undertake additional site tests so that the actual bearing conditions at the depths of the excavations can be predicted.

6.3 Areas of Undisturbed Ground

Excepting a small area on lot 36 adjacent to Bellevue Road (see 17452-EW11) and the levelled building platform on lot 1, all other areas of the lots on which building is likely have been modified by subdivision earthworks.

6.4 Land Stability

6.4.1 Building Restriction Areas

Steep slopes are present on this subdivision facing north, west and south.

Building restriction lines are shown on 17452-EW11 and DP 360410 to set buildings back from these steep slopes. These lines have been derived from numerical stability checks on the finished slope profiles present. The set backs generally comply with a projection from the base of the slope present through the upper building areas of 1 on 2.5 (22 degrees) to 1 on 2 (26 degrees).

The numerical analyses undertaken were reviews of those described in the "geotechnical assessment" section of the resource consent application for subdivision dated July 2004. The initial analyses were undertaken at five cross sections shown as profiles A to E on 17452-EW1. A minimum stability factor of safety of 1.5 was determined in analysing shallow circular failure surfaces. Soil strength parameters were deduced from the pre subdivision borehole data and test results and were in the range.

Materials	Effective Cohesion kPa	Internal Friction Angle	Density kN/m ³	Porewater Pressure Ratios
Clayey Younger Ashes	5.0	30	15.0	0.0
Sandy Younger Ashes	0.0	30	14.0	0.1-0.2
Older Ashes	8.0	30	16.0	0.3-0.4
Tauranga group: Clayey silts	3.0	30	14.0	0.0-0.1
Tauranga group: Sands	0.0	35	14.0	0.1

The porewater pressure ratios taken in the analyses allow for perched groundwater levels to occur in the younger and older ashes, even though this was not evident in the pre-subdivision investigations.

Generally the pre-subdivision boreholes showed the slopes present to be fully drained with no groundwater level rises in the standpipes installed in the deeper boreholes.

The slope profiles present as a result of the filling placed on Lots 32 to 35 were analysed based on the final surveyed profiles, the placement of structural filling to high density and strength standards and the placement of subsoil drains at uniform lifts in the filling. The

building restriction lines present on these lots have been determined from numerical analysis with the parameters adopted with effective cohesion being 8 kPa, an effective internal friction angle being 30 degrees and density from the compaction test results to be 16 kN/m³.

At the set back lines shown on Lots 3 to 11, 14, 15, 18, 21 to 25 and 32 to 35 inclusive, buildings placed at or above these lines would be in a position to meet the stability performance criteria of section B1 of the New Zealand Building Code.

Buildings requiring building consents under the Building Act 2004 should be excluded from areas beyond the building restriction lines and as shown as areas D, E, F, G, H, I, J, K, L, M, N, O, P, Q, U, V, W, Y, AA, AC, AD, AI, AJ, AK and AL on DP 360410.

It is further recommended that in these areas no further filling is placed even if supported behind retaining walls.

The building areas defined by restriction lines on Lots 10, 11, 14, 15 and 18 also prohibit buildings in the overland flow paths for surface water runoff that may occur down the steep paved accessways to those lots. No constrictions or diversions of the overland flows down the accessways to direct the runoff to the building areas should occur.

For lot 37 the nominated building site is located on relatively flat ground to the north of the end of the accessway from Sereno Vista. The position of this site is shown on 17452-EW11. Building may be undertaken outside of this designated area only under the advice of a geotechnical engineer prequalified Category 1 with the Tauranga City Council. In assessing the site the engineer should take into account the proximity of the slopes present, directions of overland stormwater flow paths and the probable variable nature of the buttress and other filling on the terrace below the slopes rising to Lots 31 to 33. In locating buildings due consideration should also be given to the locations and depths of the stormwater and sewer service connections at the end of the accessway.

6.4.2 Development on Sloping Sites

Where additional earthworks are undertaken on areas of lots not restricted for building activities as described in Section 6.4.1 above it is recommended that retaining walls be erected to support depths of cut or filling that exceed 1.5 m. Building consents are required for such walls and also those along boundaries where surcharges may occur from the development on the adjacent properties. For walls that do not require building consents construction is still required to the standards stated in the New Zealand Building Code.

Any filling located either under buildings or elsewhere should be placed in accordance with the principles described in NZS 4431 and the Council Code of Practice for Development. Any filling placed under floor slabs should be undertaken under engineering supervision.

In undertaking excavations into the sloping ground to create levelled building areas due regard should also be given to the support of properties above especially if structures on those properties are in close proximity to the common boundary. Any retaining wall design should take into account surcharge loadings that may be present from such structures and also those possible from upslope development

In the development of individual sites attention should be given to the control of surface water runoff both during and after house construction. Silt runoff during construction should be controlled by bunds or silt fences in accordance with the guidelines published by Environment Bay of Plenty. Downpipes should be fitted and reticulated to the stormwater service connection as soon as the roof is fixed. Final ground levels on lots after development should ensure that any overland flow paths are directed to the streets or to collection points at lower levels.

During the subdivision construction a temporary open drain was constructed on Lots 32 to 35 along the southern boundaries and through lot 37 to capture surface water runoff and prevent scouring of the filled slopes in lot 37 until a grass cover was established. Some surface erosion reoccurred during unprecedented rainfall intensities on 18 May 2005. Subsequent repair work on the eroded slopes has been successfully in arresting the erosion but it is recommended that the open drain remains in place until building work commences on each of these lots.

A permanent cut off drain has been constructed through lots 33 (part), 34, 35 and 37 to intercept any surface water flows from lots 32 to 35 after the temporary open drain has been infilled during residential development on these lots. The permanent drain comprises a compacted earth bund. The drain is lined with a synthetic mesh embedded in the topsoil cover to provide reinforcement to the grassed surface if high velocity flows occur. On lot 37 the overland flow route to the rock lined drain to the east is also lined with the synthetic mesh reinforcement.

On lots 33 to 35 and 37 where this drain is constructed care will be required by the lot owners to ensure that the reinforcement is not damaged by mowing or excavation in close proximity. Furthermore the owners of lots 33 to 35 should ensure that the alignment of the drain remains continuous with the channel being formed under fences.

On lot 37 the grass cover to the steep slopes below lots 32 to 35 should be maintained at all times. Regular inspections should be made for signs of slumping or erosion. If areas of concern are found professional geotechnical engineering advice should be sought.

6.5 Subdivision Retaining Walls

Substantial cantilevered timber pole retaining walls were erected during the subdivision construction on lot 1 and the boundary between Lots 1 and 2. These walls were constructed with approval by way of Building Consent No. 17680 issued by the Tauranga City Council. They were specifically designed to resist lateral earth pressures from the retained ground and a general surcharge of 2.5 kPa or from vehicle movements to the building site on lot 1.

In the future development of lot 1 the retaining walls should not be extended in height and no further filling or building development should take place within 2 m of the tops of the walls unless a specific study and design determines a closer encroachment based on no additional loading being imposed on the walls. Furthermore no further excavation should take place to lower the ground in front of the walls along the eastern side of the property.

In the future development of lot 2 no further excavation should take place to lower the ground in front of the walls on the common boundary with Lot 1.

6.6 Topsoil Thickness

The areas of the Sereno Vista Subdivision on building sites were stripped of topsoil at some time during the earthworks in cut and filling. The stripped topsoil was replaced from stockpiles. It should be expected that the topsoil will vary in thickness across part or all lot areas. No guarantee is implied or given that topsoil on any part of any lot is 200 mm to 300 mm deep or less and it is recommended that future owners or builders check topsoil depths when preparing site development plans and costings.

Post construction boreholes on Lots 10, 12 and 22 identified a localised area of topsoil cover at the borehole positions shown on 17452-EW11 as being in excess of 300 mm deep but not more than 400 mm.

6.7 Stormwater Reticulation

Stormwater runoff reticulation from roofs and all hardstanding areas is to be connected to the subdivision disposal system. Soakholes for stormwater disposal are not permitted.

Sloping ground exists on most lots within the subdivision and care should be taken by lot owners during the development and later maintenance of their properties to capture surface water and prevent concentrated discharges over sloping ground. This is particularly important at the ends of driveways where properties are below the subdivision road such as on lots 10 to 25 and 32 to 36.

The formed rights of way to lots 10, 11, 14 and 15 have been constructed with stormwater catchpits and channels at the ends of the formation. These stormwater collection systems have been installed to capture runoff during extreme storm events. However their serviceability is dependant on owners keeping the pits, channels and grate covers clear of any obstructions such as grass cuttings at all times.

7.0 Professional Opinion

A professional opinion in the format of G2 of Council's Code of Practice for Development in support of suitable residential building sites being present on all lots in the subdivision is contained in Appendix II of this report. A summary of the development undertaken on each lot and of the recommendations contained in this report is shown on Council form G2A also contained in Appendix II.

8.0 Applicability

Recommendations contained in this document are based on data from boreholes and the logging of soil exposures. Inferences about the nature and continuity of subsoils away from these locations are made but cannot be guaranteed.

In all circumstances, if variations in the subsoils occur which differ from that described or assumed to exist the site should be inspected by an engineer suitably qualified to make an informed judgement and provide advice on appropriate improvement measures.

This report has been prepared specifically for Sereno Vista Residential Subdivision as shown on DP 360410 and no responsibility is accepted by S & L Consultants Ltd for the use of any part of this report for other development sites or in any other context without their written consent.

S & L Consultants Ltd

Consulting Engineers, Surveyors and Planners

A handwritten signature in black ink, appearing to read 'M W Hughes', is positioned above the printed name.

M W Hughes
Geotechnical Engineer

31 October 2005

APPENDIX I

Drawings – Earthworks Completion Plan 17452-EW11

Proposed Earthworks Plan 17452-EW1

Deposited Plan DP 360410 (4 sheets)

KEY

- Cor / Fill Line
- 10 --- Depth of Fill
- 20 --- Depth of Cut
- Building Restriction Line (See DP 300403)
- Easement Boundary
- Construction Earthworks Completion Test
- Post Construction Borehole
- Pre Construction Machine Borehole
- Pre Construction Hand Augered Borehole
- Top of Slope
- Base of Slope

Drawn No.	DESCRIPTION	DATE	SIGNED
1	224 Application	11/05	
	NAME	DATE	
Designed			
Drawn	ASD	11/05	
Checked	MDK	11/05	
Approved			
Reviewed			



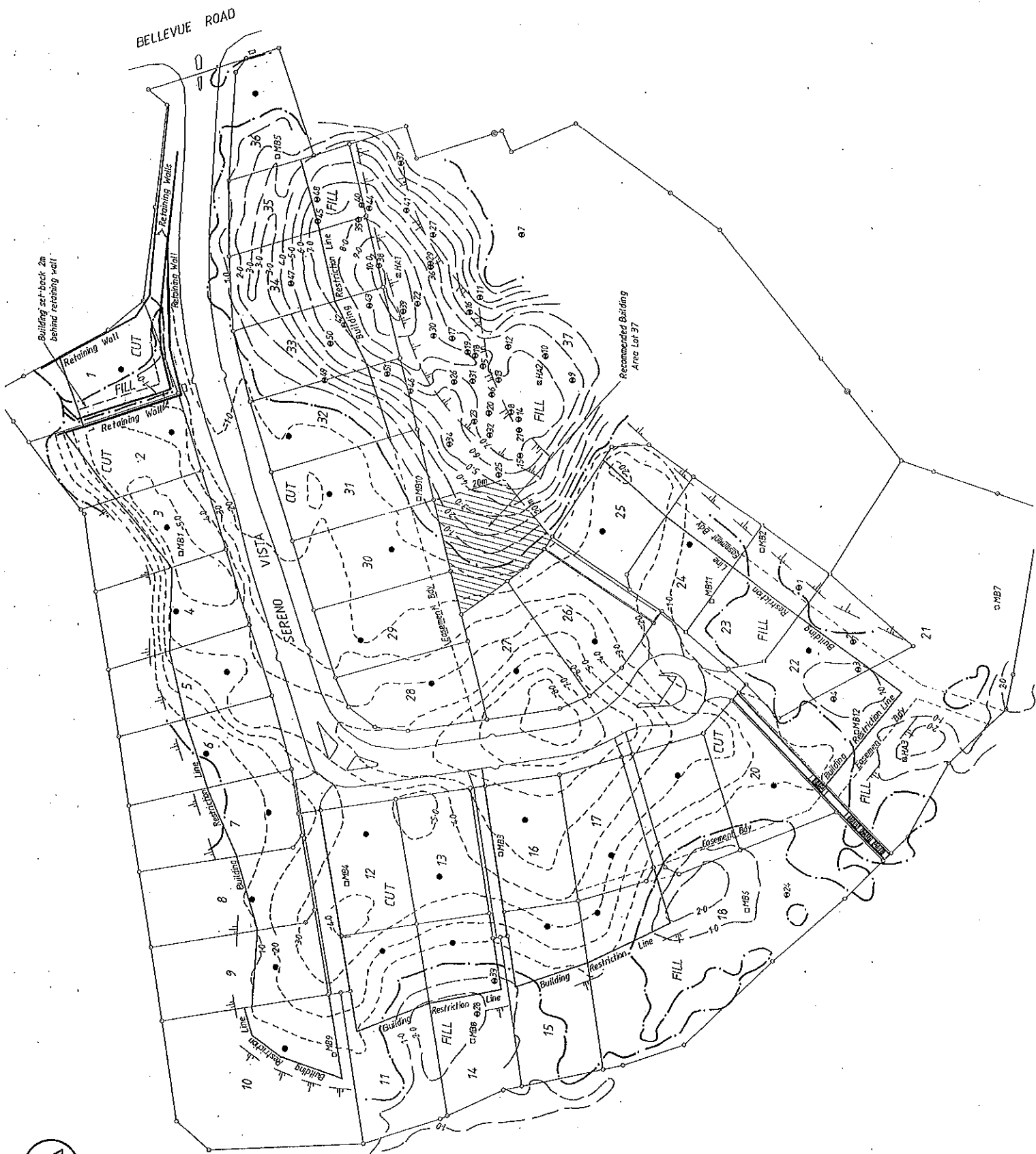
S&L CONSULTANTS LTD
SURVEYORS - ENGINEERS - PLANNERS
111 Chaucer Road, Tauranga, New Zealand
P.O. Box 100, Tauranga 3100
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TITLE
SERENO VISTA
RESIDENTIAL SUBDIVISION
FOR:
BELLEVUE ESTATES LIMITED

EARTHWORKS ASBUILT

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ORIGINAL SCALE
1:500 (A1)

DATE
11/05
DRAWING NO
17452-EW11
REVISIONS



GRAPHIC SCALE

Key

Design Contour
Tensile Band in section all within the earthwork area
Cut and Drain
Area of Fill
Area of Cut
Retaining Wall
Base of Slope
Top of Slope
Machine Erosion
Hand-drawn Boundary

Notes:

- 1) Contour are in terms of Material Dates
- 2) Retaining investigations dated 5th and 6th July 2004
- 3) The retaining structure is to be installed in accordance with the design and construction details, aggregate, earthwork and retaining structure
- 4) Contour is larger all faces along the line of the fill
- 5) The length and width of all work are measured at a point that is halfway up the internal height of the profile

NO.	REVISION	DATE	BY	CHKD
1	Original	17/04/04	SL	SL
2	Revised	21/05/04	SL	SL
3	Revised	21/05/04	SL	SL
4	Revised	21/05/04	SL	SL
5	Revised	21/05/04	SL	SL

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TITLE

Sereno Vista
Proposed Earthworks,
Sediment Control and
Geotechnical Plan

DATE

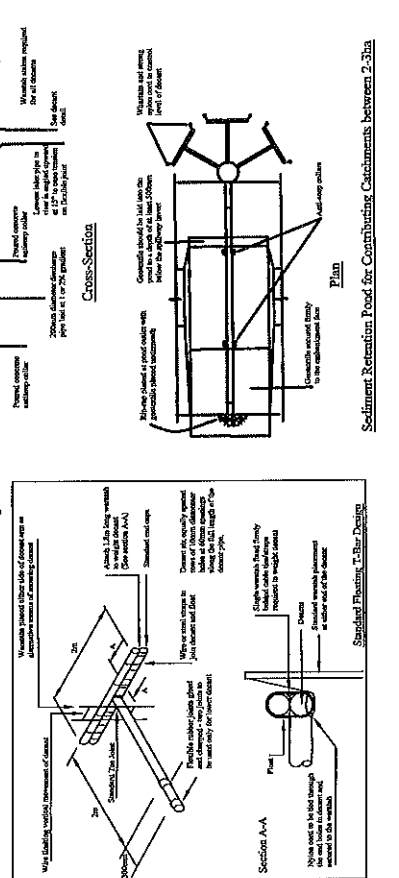
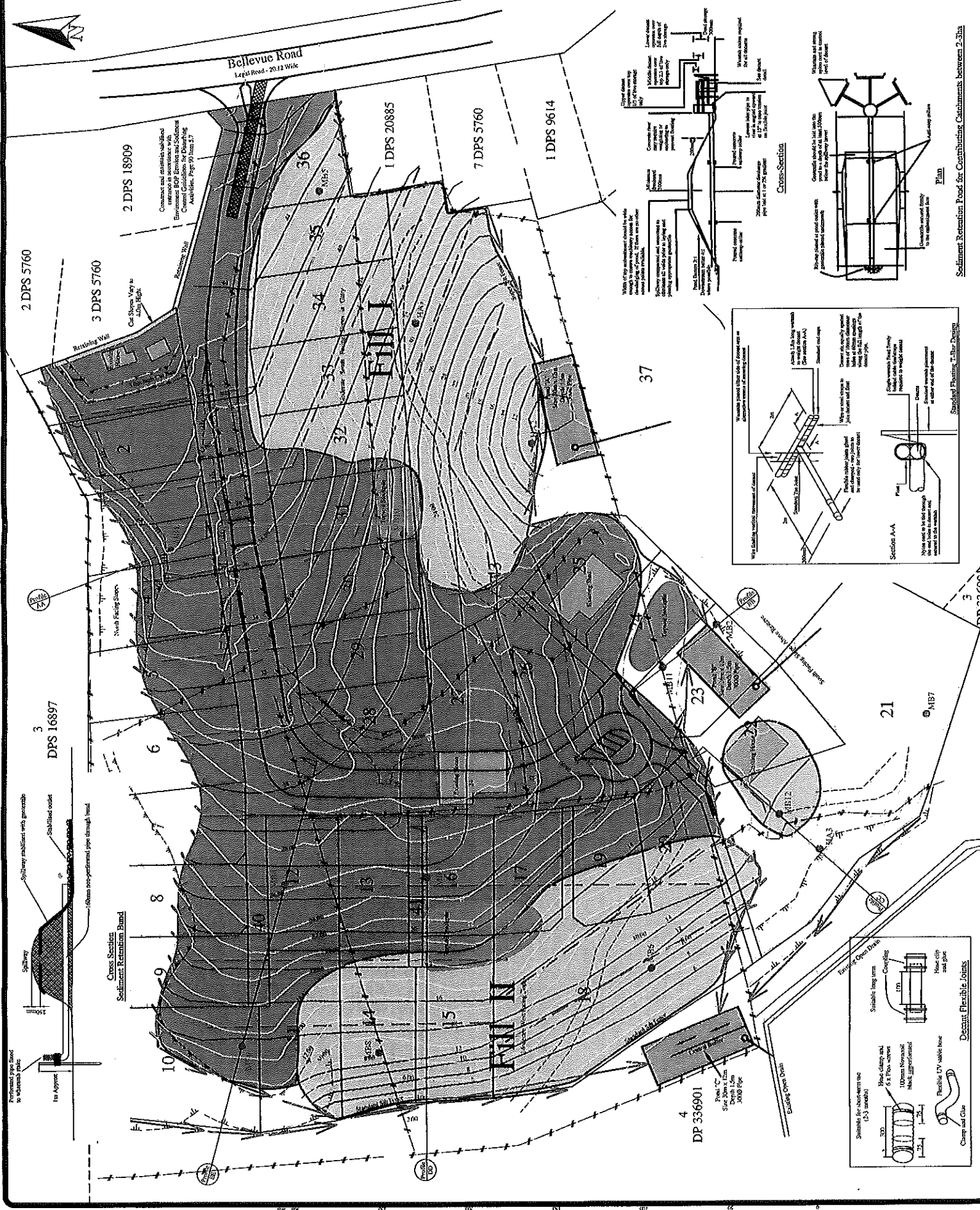
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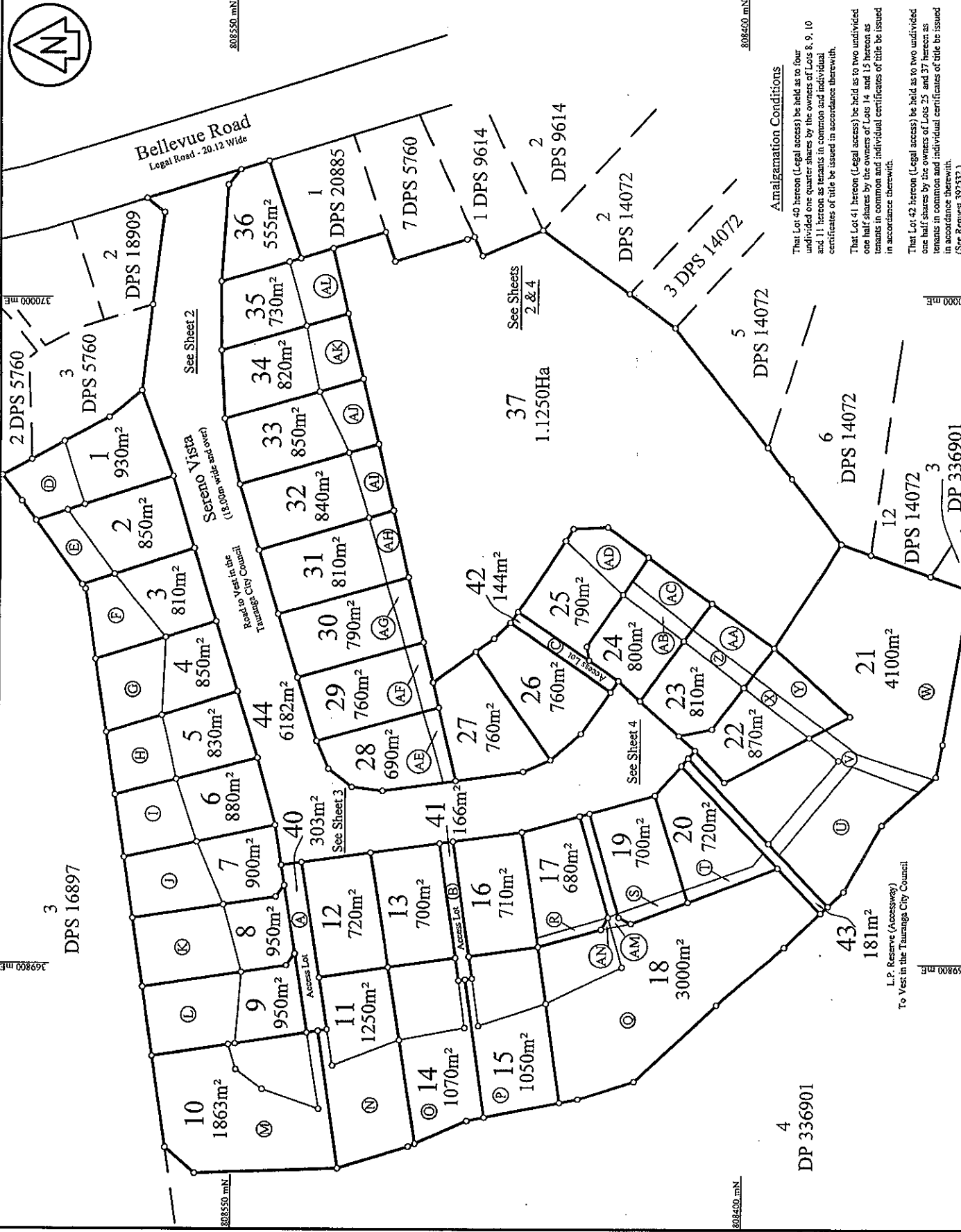
17452 - EW1

Copyright

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Sediment Retention Band for Contributing Catchments between 2-20



Approvals

I hereby certify that this plan was approved by the Tauranga City Council pursuant to Section 223 of the Resource Management Act 1991 on the 20 day of _____ 20____ subject to the granting or reserving of the easements set out in the memorandum hereon and subject to the amalgamation conditions set out hereon.

Registered Owners

Authorised Officer
SUB 6177

Memorandum of Easements

Purpose	Shown	Serv. Ten.	Dom. Ten.
ROW, Right to Convey Electricity, Water, Gas, Telecommunications & Computer Media	A	Lot 40 hereon	Lots 8, 9, 10 & 11 hereon
	B	Lot 41 hereon	Lots 14 & 15 hereon
	C	Lot 42 hereon	Lots 25 & 37 hereon

Proposed Easements in Gross

Purpose	Shown	Serv. Ten.	Grantee
Right to Drain Water and Sewage	B	Lot 17 hereon	Tauranga City Council
	S	Lot 19 hereon	
	T	Lot 20 hereon	
	V	Lot 21 hereon	
	X	Lot 22 hereon	
	Z	Lot 23 hereon	
	AB	Lot 24 hereon	
	AE	Lot 28 hereon	
	AF	Lot 29 hereon	
	AG	Lot 30 hereon	
	AH	Lot 31 hereon	
	AI	Lot 32 hereon	
	AL	Lot 35 hereon	
	AM	Lot 33 hereon	
AK	Lot 34 hereon		
AM & AN	Lot 18 hereon		

Notes:

1) All Existing Boundaries Adopted from DP 336901 except as shown otherwise.

2) Lots 1 - 37 and Areas D, E, F, G, H, I, J, K, L, M, N, O, P, Q, U, V, W, X, Y, Z, AA, AB, AC, AD, AE, AF, AG, AH, AI, AL, AM, AN will be subject to a restrictive covenant.

3) See Sheet 2 for C.T. allocations panel.

Class of Survey: 1

Total Area 5.4374ha

Comprised in CT 151002

John David Barnes

(4) The surveys to which this document relates are accurate, and were undertaken by me or under my direction in accordance with the Cadastral Survey Act 2002 and the Surveyor General's Rules for Cadastral Survey 2002.

(5) This document is accurate and has been created in accordance with the Act and the Rules.

Signature: _____ Date: _____

Printed Name: _____

Printed Title: _____

Printed Address: _____

Printed Phone: _____

Printed Email: _____

Approved as to Survey by Land Information NZ on _____

Deposited by Land Information NZ on _____

File _____

Reserved _____

DP 360410

Sheet 1 of 4 Sheets

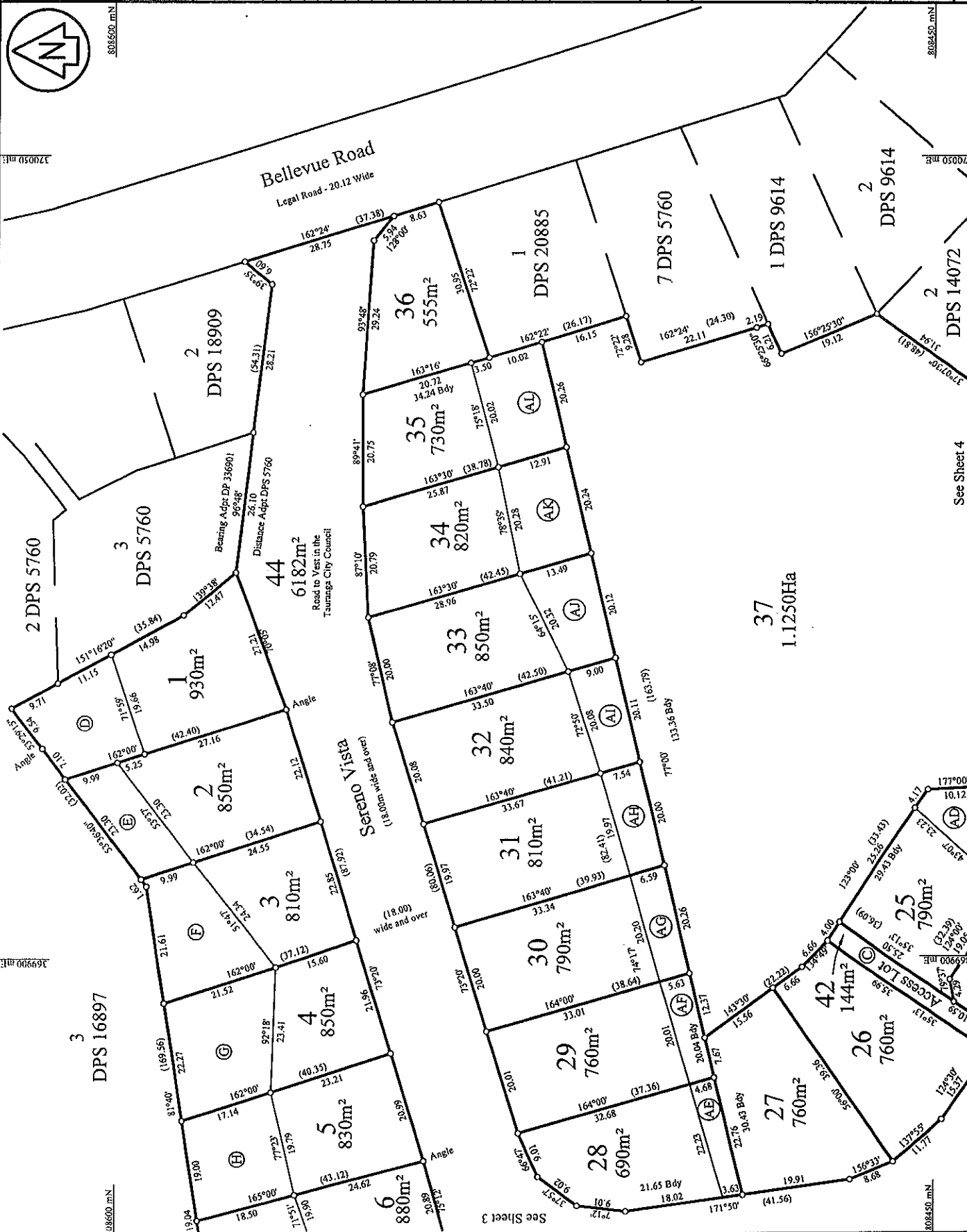
LAND DISTRICT
SOUTH AUCKLAND

Lots 1-37, 40-44 Being a Subdivision of
Lot 1 DP 336901

TERRITORIAL AUTHORITY TAURANGA CITY
Surveyed by S & L CONSULTANTS LTD E:17452
Scale 1:800 Date September 2005



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See Sheet 4

LAND DISTRICT
SOUTH AUCKLAND

**Lots 1-37, 40-44 Being a Subdivision of
Lot 1 DP 336901**

TERRITORIAL AUTHORITY TAURANGA CITY
Surveyed by S & L CONSULTANTS LTD F:17452

Scale 1:500

Date September 2005

Sheet 2 of 4 Sheets

DP 360410

Approved as to Survey by Land Information NZ on

Deposited by Land Information NZ on

John David Barnes

being a person entitled to practice as a licensed cadastral surveyor certify that

(e) The surveys to which this dataset relates are accurate, and were undertaken by me or under my direction in accordance with the Cadastral Survey Act 2002 and the Surveyor General's Rules for Cadastral Survey 2002/2-

(b) This dataset is accurate and has been created in accordance with

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Field Book

Figure 1

STAY AT HOME

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Approved as to Survey

4

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1. *Journal of the American Medical Association*, 1997; 277: 1039-1043.

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Instructions

Cheng 2 of 1 Page 2

Nikulin et al. • Ca^{2+} Signaling in the Hippocampus

1000 JOURNAL OF CLIMATE

See Sheet 1

Class of Survey: 1

Total Area

Comprised in

John David Barnes

being a person entitled to practice as a licensed cadastral surveyor certify that:
(a) The survey to which this dataset relates is accurate, and was undertaken by me or under my direction in accordance with the Cadastral Survey Act 2002 and the Surveyor General's Rules for Cadastral Survey 2002;
(b) This dataset is accurate and has been created in accordance with that Act and those Rules.

Signed: [Signature] Date: 31/10/2005

For Book: [Signature] Pages Book: P

Reference Plans

Examined: [Signature] Comments

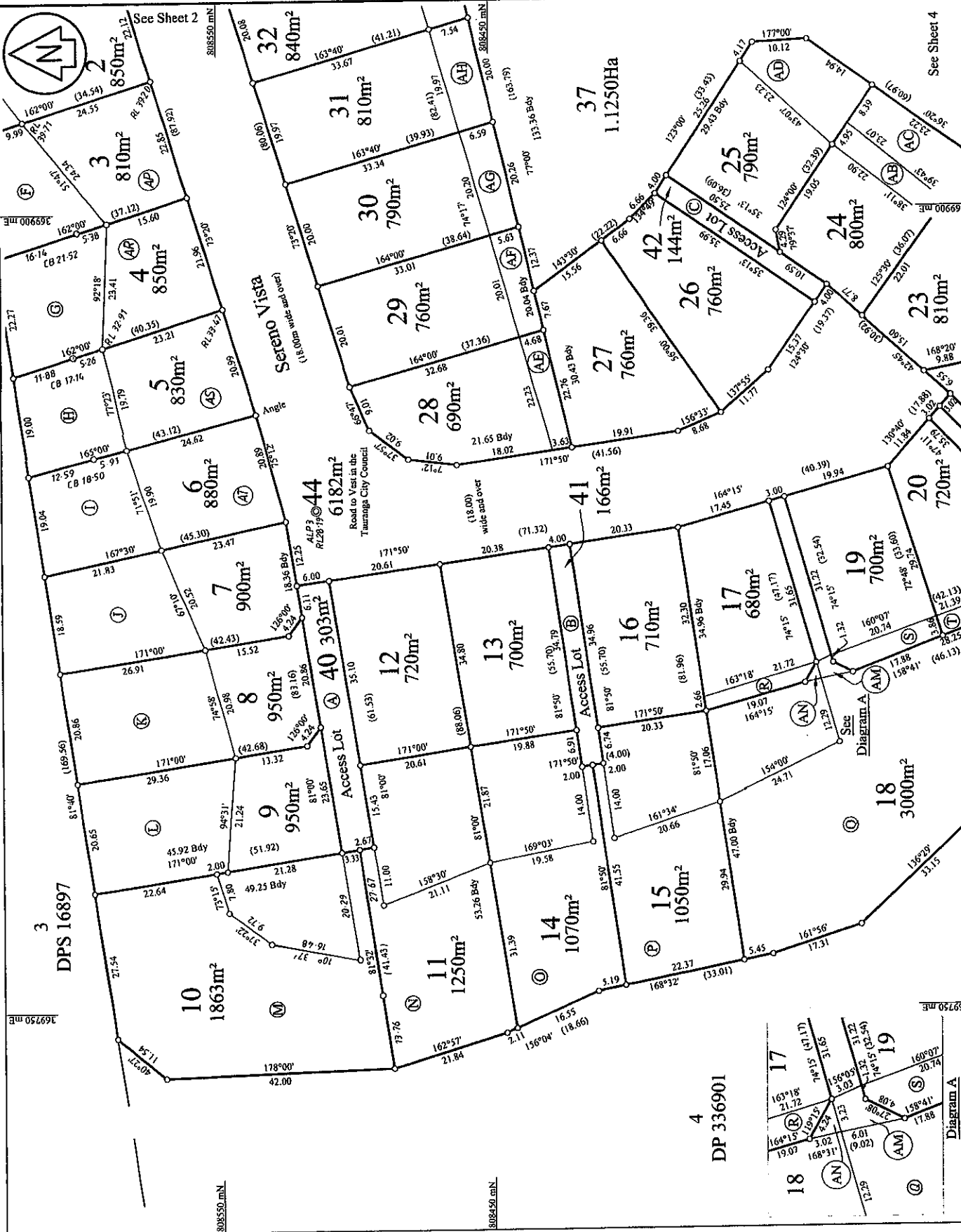
Approved as to Survey by Land Information NZ on

Deposited by Land Information NZ on

File Received

DP 360410

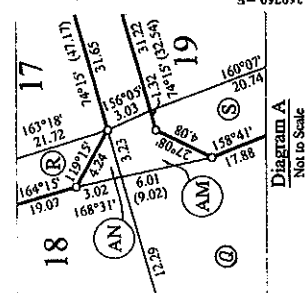
Sheet 3 of 4 Sheets



Lots 1-37, 40-44 Being a Subdivision of Lot 1 DP 336901

TERRITORIAL AUTHORITY TAURANGA CITY
Surveyed by S & L CONSULTANTS LTD F:17452
Scale 1:500 Date September 2005

LAND DISTRICT
SOUTH AUCKLAND



Approvals

See Sheet 1

See Sheet 3

See Sheet 1

Class of Survey: 1

Total Area

Comprised in

John David Barnes

being a person entitled to practice as a licensed cadastral surveyor under the

(a) The surveys to which this document relates are accurate, and were

undertaken by me or under my direction in accordance with the

Cadastral Survey Act 2002 and the Surveyor General's Rules for

Cadastral Survey 2002/02.

(b) This document is accurate and has been created in accordance with

the Act and Regulations.

Field Book

Reference Plans

Revised

Approved as to Survey by Land Information NZ on

Deposited by Land Information NZ on

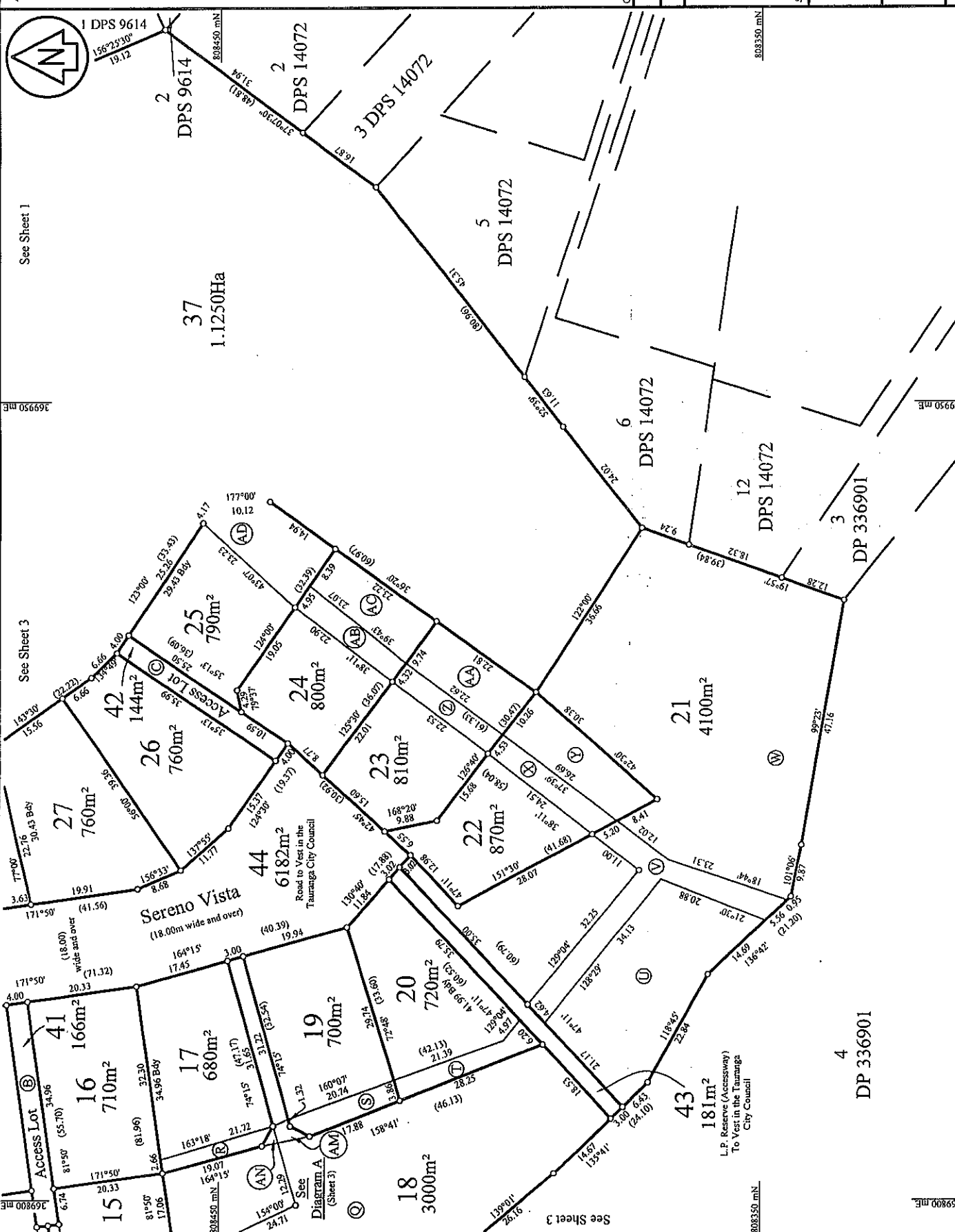
File

Revised

Drawings

DP 360410

Sheet 4 of 4 Sheets



Lots 1-37, 40-44 Being a Subdivision of
Lot 1 DP 336901

LAND DISTRICT
SOUTH AUCKLAND

TERRITORIAL AUTHORITY TAURANGA CITY
Surveyed by S & L CONSULTANTS LTD F.17452
Scale 1:500 Date September 2005

APPENDIX II

**Statement of Professional Opinion
as to the Suitability of Land for Building Development**

Lot Summary Report

SECTION 2

To: The Director of Environmental Services

STATEMENT OF PROFESSIONAL OPINION AS TO THE GEOTECHNICAL SUITABILITY OF LAND FOR BUILDING

DEVELOPMENT: Sereno Vista Subdivision

OWNER: Bellevue Estate Ltd

LOCATION: 216 Bellevue Road, Tauranga

I Michael William Hughes of S & L Consultants Ltd

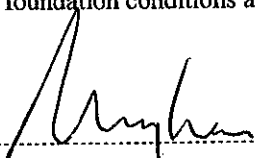
(Full Name)

P.O. Box 231, Tauranga

(Name and Address of Firm)

Hereby confirm that;

- 1) I am a professional person appropriately qualified with experience in geotechnical engineering to ascertain the suitability of the land for building development and was retained as the Soils Engineer to the above development.
- 2) An appropriate level of site investigation and construction supervision has been carried out under my direction and is described in my development evaluation dated 31 October 2005
- 3) In my professional opinion, not to be construed as a guarantee, I consider that;
 - (a) The areas shown in my report dated 31 October 2005 of each new allotment are suitable for the erection thereon of the building types appropriate to the zoning of the land, provided that;
Recommendations contained in my report are complied with and any building restrictions are observed
 - (b) The earth fills shown on the attached Plan No. 17452-EW11 have been placed in accordance with the Code of Practice for Development of the Tauranga City Council.
 - (c) The completed works give due regard to all land slope and foundation stability considerations.
 - (d) The filled ground is suitable for the erection thereon of residential buildings not requiring specific design in terms of NZS 3604:1999 and related documents providing that:
Recommendations contained in my report, section 6 are complied with and building restrictions are observed.
 - (e) The original ground not affected by filling is suitable for the erection thereon of residential buildings not requiring specific design in terms of NZS 3604:1999 and related documents. Ground bearing conditions for foundations may vary depending on future depths of cut to form levelled building sites.
4. This professional opinion is furnished to the Council and the owner for their purpose alone, on the express condition that it will not be relied upon by any other person and does not remove the necessity for the normal inspection of foundation conditions at the time of erection for any dwelling.

Signed 

Date 31 October 2005



**SUITABILITY OF LAND
FOR BUILDING DEVELOPMENT**

TAURANGA CITY COUNCIL

MAY 02

G 2 Δ

File Ref: 17452

File Ref: 17452

File Ref: 17452

Lots shown on 360410



The comments and notations included on this summary sheet are outlined in the support documents. These shall be read in conjunction with this summary.

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Lots shown on DP 360410



APPENDIX III

Compaction Test Results

Our ref: 17452

SERENO VISTA SUBDIVISION

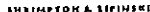
SUMMARY OF COMPACTION TEST RESULTS
Subdivision Filling 2004 - 2005

Date	Test No.	Lot No.	Air Voids (%)	Undrained shear strength kPa
19/10/2004	T01	Lot 23	2.7	186
	T02	Lot 22	2.2	161
	T03	Lot 22	5.3	177
	T04	Lot 21	5.9	155
21/10/2005	T05	Lot 37	4.9	188
	T06	Lot 37	3.7	156
	T07	Lot 37	13	168
	T08	Lot 37	5.3	161
	T09	Lot 37	4.9	164
	T10	Lot 37	6.8	156
11/11/2004	T11	Lot 37	0.0	175
	T12	Lot 37	3.4	198
	T13	Lot 37	2.7	193
	T14	Lot 37	4.5	168
	T15	Lot 37	3.1	159
	T16	Lot 37	3.9	216
19/11/2004	T17	Lot 37	1.2	181
	T18	Lot 37	2.5	192
	T19	Lot 37	1.5	216
	T20	Lot 37	2.0	199
	T21	Lot 37	2.5	171
	T22	Lot 37	0.0	163
29/11/2004	T23	Lot 37	5.1	207
	T24	Lot 18	8.2	Refusal
	T25	Lot 37	0.9	>221
	T26	Lot 37	1.1	169
8/12/2004	T27	Lot 37	2.7	179
	T28	Lot 14	2.8	159
	T29	Lot 37	8.5	178
	T30	Lot 37	0.0	152
13/12/2004	T31	Lot 37	2.3	169
	T32	Lot 37	1.8	180
	T33	Lot 14	1.6	168
	T34	Lot 37	1.5	189
15/01/2005	T35	Lot 34/35	8.6	188
	T36	Lot 37	5.9	175
	T37	Lot 37	10.3	172
	T38	Lot 34/37	3.2	177
19/01/2005	T39	Lot 37	2.8	>215
	T40	Lot 35/37	4.1	>213
	T41	Lot 37	8.5	180
	T42	Lot 33	2.5	171
29/01/2005	T43	Lot 33	5.6	182
	T44	Lot 37	4.9	Refusal
	T45	Lot 35	0.6	192
	T46	Lot 32/37	0.0	Refusal
1/02/2005	T47	Lot 34	0.0	Refusal
	T48	Lot 35	8.5	167
25/02/2005	T49	Lot 32/33	4.1	160
	T50	Lot 33	5.2	189
	T51	Lot 32	4.0	165

APPENDIX IV

Post construction borehole logs

Pre construction borehole logs



Sheet: 1 Of: 1

Job No. 17452

Date Excavated: 17-10-05

RL Ground:

Logged By: DTK

CF 10455

Undrained Shear Strength
(kPa)

Description of Soil

BH 1

Brown CLAYEY SILT moist stiff friable

grades light brown slightly fine sandy

End of Borehole

BH 2

Black TOPSOIL 300 deep moist stiff friable

Creemish light brown SILTY fine SAND moist med. dense

Grades: creamish light brown fine SAND
moist medium dense

Creamish light brown SLLT moist very stiff

Light grey fine SAND moist medium dense

Dark brown CLAYEY SILT moist very stiff plastic

End of Borehole

EXCAVATION METHOD:



Borehole No. 3 and 4

Site: BELLEVUE ESTATE LTD SEREND VISTA SUBDIVISION

Sheet: 1 Of: 1

Job No. 17452

Date Excavated: 17-10-05

RL Ground:

Logged By: DTK

Description of Soil	Soil Symbol	Depth (m)	Miniature Shear Vane	Groundwater Level	Pilcon DR 2275 CF 1.0455 Undrained Shear Strength (kPa)		
					50	100	150
BH 3							
Black TOPSOIL 200 deep moist stiff friable	X X	0.0					
Yellowish brown SILT slightly clayey moist very stiff friable	X X	0.2					
	X X	0.4	180/20				
	X X	0.7	146/20				
	X X	0.9	150/25				
	X X	1.0					
End of Borehole		1.1	124/22				
BH 4							
Black TOPSOIL 300 deep moist stiff friable	X X	0.0					
Brown CLAYEY SILT very moist very stiff slightly plastic	X X	0.3					
	X X	0.4	131/20				
	X X	0.7	119/19				
	X X	0.9	84/17				
	X X	1.0					
almost wet		1.1	138/17				
End of Borehole							

EXCAVATION METHOD:



Borehole No. 5 and 6

Site: BELLEVUE ESTATE LTD SEREND VISTA SUBDIVISION

Sheet: 1 Of: 1

Job No. 17452

Date Excavated: 17-10-05

RL Ground:

Logged By: DTK

Pilcon DR 2275
CF 10455
Undrained Shear Strength
(kPa)

50 100 150

BH 5

Black TOPSOIL 100 deep moist stiff friable
Brown CLAYEY SILT moist very stiff plastic

becomes grey mottled black

End of Borehole

BH 6

Black TOPSOIL 200 deep moist stiff friable

Brown CLAYEY SILT moist hard almost friable

becomes very stiff

Organic brown SILT slightly clayey moist very stiff

End of Borehole

EXCAVATION METHOD:

EXCAVATION METHOD:



Borehole No. 9 and 10

Site: BELLEVUE ESTATE LTD SEREND VISTA SUBDIVISION

Sheet: 1 Of: 1

Job No. 17452

Date Excavated: 17-10-05

RL Ground:

Logged By: DTK

Description of Soil	Soil Symbol	Depth (m)	Miniature Shear Vane	Groundwater Level	Pilcon DR 2275 CF 1.955 Undrained Shear Strength (kPa)
					50 100 150
BH 9					
Black TOPSOIL 200 deep moist stiff friable	X-X	0.0		No free groundwater	
Brown CLAYEY SILT moist very stiff plastic	X-X	0.2			
	X-X	0.4	103/47		
	X-X	0.6	94/41		
	X-X	0.8	132/41		
	X-X	1.0			
End of Borehole		1.1	92/26		
BH 10					
Black TOPSOIL 400 deep moist stiff friable	X-X	0.0		No free groundwater encountered	
	X-X	0.1			
	X-X	0.2			
Brown CLAYEY SILT very moist very stiff friable	X-X	0.4			
	X-X	0.5	146/39		
	X-X	0.7	146/33		
becomes orangish brown	X-X	0.8	134/29		
	X-X	0.9			
grades light brown firm	X-X	1.0			
	X-X	1.1	39/25		
	X-X	1.4	58/23		
Creamy light brown SANDY SILT very moist stiff	X-X	1.6			
Brownish light grey fine SAND sl silty moist loose	X-X	1.7	61/39		
Light brown SILT moist stiff	X-X	1.8			
Light brown CLAYEY SILT very moist very stiff plastic	X-X	1.9	151/29		
grades golden brown	X-X	2.0			
End of Borehole		2.1	>200		

EXCAVATION METHOD:

Borehole No. 11 and 12

Site: BELLEVUE ESTATE LTD SERENO VISTA SUBDIVISION

Sheet: 1 Of: 1

Job No. 17452

Date Excavated: 17-10-05

RL Ground:

Logged By: DTK

Pilcon DR 2275 CF 10455 Undrained Shear Strength (kPa)

Description of Soil

BH 11

Black TOPSOIL 300 deep moist stiff friable

Light brown SILT slightly sandy slightly clayey
moist hard

creamy light brown mottled orange speckled black
very moist

End of Borehole

BH 12

Black TOPSOIL 400 deep moist stiff friable

Brown CLAYEY SILT slightly sandy very moist stiff

becomes orangish brown moist very stiff

End of Borehole

EXCAVATION METHOD:

Borehole No. 13 and 14

Site: BELLEVUE ESTATE LTD SEREND VISTA SUBDIVISION

Sheet: 1 Of: 1

Job No. 17452

Date Excavated: 17-10-05

RL Ground:

Logged By: DTK

Pilcon DR 2275

CF 10455

Undrained Shear Strength
(kPa)

Description of Soil

BH 13

Black TOPSOIL 100 deep moist stiff friable

Brown CLAYEY SILT moist very stiff

becomes golden brown plastic

End of Borehole

BH 14

Black TOPSOIL 300 deep moist stiff friable

Brown CLAYEY SILT very moist very stiff
almost friable

becomes orangish brown slightly sandy
speckled black

End of Borehole

EXCAVATION METHOD:



Borehole No. 15 and 16

Site: BELLEVUE ESTATE LTD SEREND VISTA SUBDIVISION

Sheet: 1 Of: 1

Job No. 17452

Date Excavated: 17-10-05

RL Ground:

Logged By: DTK

Description of Soil	Soil Symbol	Depth (m)	Miniature Shear Vane	Groundwater Level	Undrained Shear Strength (kPa)		
					50	100	150
BH 15							
Black TOPSOIL 200 deep moist stiff friable	XX XX	0.0 0.1		No free groundwater			
Brown CLAYEY SILT moist very stiff friable	XX X	0.2					
	XX	0.4	153/54				
becomes light brown plastic	XX X	0.3					
	XX	0.7	73/16				
becomes very moist stiff	XX X	0.8					
	XX	0.9	73/16				
End of Borehole		1.0 1.1	64/16				
BH 16							
Black TOPSOIL 300 deep moist stiff friable	XX XX XX	0.0 0.1 0.2		No free groundwater			
Brown CLAYEY SILT moist hard	X	0.3					
becomes light greyish brown very moist	XY	0.4	>200				
becomes brown mottled orange slightly sandy	X	0.5					
	XY	0.6					
	X	0.7					
becomes golden brown slightly sandy moist	XX	0.8	>200				
	X	0.9					
End of Borehole		1.0	UTP				

EXCAVATION METHOD:



Borehole No. 17 and 18

Site: BELLEVUE ESTATE LTD SEREND VISTA SUBDIVISION

Sheet: 1 Of: 1

Job No. 17452

Date Excavated: 17-10-05

RL Ground:

Logged By: DTK

Description of Soil	Soil Symbol	Depth (m)	Miniature Shear Vane	Ground water Level	Undrained Shear Strength (kPa)		
					50	100	150
BH 17							
Black TOP SOIL 300 deep moist stiff friable	X X X X	0.0		No free groundwater			
	X X X X	0.03	113/38				
Drangish brown CLAYEY SILT very moist very stiff plastic	X X X X	0.6	>200				
grades slightly sandy	X X X X	0.9	185/28				
	X X X X	1.0	>200				
End of Borehole		1.1					
BH 18							
Black TOP SOIL 200 deep moist stiff friable	X X X X	0.0		No free groundwater			
	X X X X	0.2	138/39				
Brown CLAYEY SILT very moist very stiff plastic	X X X X	0.4	151/28				
grades friable	X X X X	0.7	131/28				
	X X X X	0.9	100/32				
becomes light brown		1.0					
grades slightly sandy		1.1					
End of Borehole							

EXCAVATION METHOD:

Borehole No. 19 and 20

Sheet: 1 Of: 1

Site: BELLEVUE ESTATE LTD SEREND VISTA SUBDIVISION

Job No. 17452

Date Excavated: 17-10-05

RL Ground:

Logged By: DTK

Description of Soil	Soil Symbol	Depth (m)	Miniature Shear Vane	Groundwater Level	Undrained Shear Strength (kPa)		
					50	100	150
BH 19							
Black TOPSOIL 200 deep moist stiff friable	XX -X-	0.0 0.1		No free groundwater			
Brown CLAYEY SILT moist very stiff	XX -X- XX -X- XX -X- XX -X-	0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9	162/ 29	No free groundwater			
grades light brown		1.0	178/ 28				
End of Borehole		1.1	164/ 39				

EXCAVATION METHOD:



Borehole No. 22 and 24

Site: BELLEVUE ESTATE LTD SEREND VISTA SUBDIVISION

Sheet: 1 Of: 1

Job No. 17452

Date Excavated: 17-10-05

RL Ground:

Logged By: DTK

Description of Soil	Soil Symbol	Depth (m)	Miniature Shear Vane	Groundwater Level	Undrained Shear Strength (kPa)		
					50	100	150
BH 22							
Black TOPSOIL 400 deep moist stiff friable	X X X X X X X X	0.0 0.1 0.2 0.3		No free groundwater			
Mixed brown CLAYEY SILT slightly sandy moist very stiff	X X X X X X X X X X	0.4 0.5 0.6 0.7 0.8	4TP 179/42				
becomes light brown not mixed becomes orangish brown	X X X X	0.9 1.0	>200				
End of Borehole		1.1 1.2	>200				
BH 24							
Black TOPSOIL 200 deep moist stiff friable	X X X X	0.0 0.1		No free groundwater encountered			
Brown CLAYEY SILT moist very stiff friable	X X X X	0.2 0.3					
Light brown SANDY SILT slightly clayey moist friable	X X X X X X X X X X X X X X X X X X X X	0.4 0.5 0.6 0.7 0.8 0.9 1.0 1.1 1.2 1.3	>200 159/42 143/32 175/57				
becomes golden brown	X X X X X X X X X X X X X X X X	1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1	96/31 89/22 96/25 65/25				
Light brown SILT slightly clayey moist stiff grades slightly sandy	X X X X	1.7 1.8	89/22 96/25				
End of Borehole		2.0 2.1	65/25				

EXCAVATION METHOD:

Borehole No. 25 and 26

Site: BELLEVUE ESTATE LTD SEREND VISTA SUBDIVISION

Sheet: 1 Of: 1

Job No. 17452

Date Excavated: 17-10-05

RL Ground:

Logged By: DTK

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EXCAVATION METHOD:

EXCAVATION METHOD:



Borehole No. 29 and 30

Site: BELLEVUE ESTATE LTD SEREND VISTA SUBDIVISION

Sheet: 1 Of: 1

Job No. 17452

Date Excavated: 17-10-05

RL Ground:

Logged By: DTK

Description of Soil	Soil Symbol	Depth (m)	Miniature Shear Vane	Groundwater Level	Undrained Shear Strength (kPa)		
					50	100	150
BH 29							
Black TOP SOIL 300 deep moist stiff friable	xx -x-	0.0		No free groundwater			
	xx						
Brown CLAYEY SILT moist very stiff	-x- xx	0.3					
Grades cream SILTY SAND very moist medium dense	xx xx xx xx xx xx xx	0.5	156/35				
	xx xx xx xx	0.8	111/25				
Cream SILT very moist stiff	x	0.9					
End of Borehole		1.0					
		1.1	92/23				
						</	



Borehole No. 31 and 32

Site: BELLEVUE ESTATE LTD SEREND VISTA SUBDIVISION

Sheet: 1 Of: 1

Job No. 17452

Date Excavated: 17-10-05

RL Ground:

Logged By: DTK

Description of Soil	Soil Symbol	Depth (m)	Miniature Shear Vane	Groundwater Level	Pilcon DR 2275 CF 10455 Undrained Shear Strength (kPa)		
					50	100	150
BH 31							
Black TOPSOIL 200 deep moist firm friable	XX XX	0.0 0.1					
Dark brown CLAYEY SILT moist very stiff plastic	XX	0.2					
becomes golden brown very moist	XX	0.3	182/41				
becomes light brown	XX	0.4					
becomes creamy light brown	XX	0.6	105/25				
Cream SILTY SAND very moist stiff	XX XX XX	0.7 0.8 0.9		No free groundwater			
End of Borehole		1.0 1.1	73/32 64/49				
BH 32							
Black TOPSOIL 100 deep moist stiff friable	XX	0.0					
Brown CLAYEY SILT moist very stiff friable	XX XX	0.1 0.3					
grades light brown	XX	0.4	220				
grades golden light brown friable	XX	0.6	162/47				
grades light brown	XX	0.7					
End of Borehole	XX	0.9	128/28	No free groundwater			
		1.0 1.1	83/21				

EXCAVATION METHOD:



Borehole No. 36 and

Site: BELLEVUE ESTATE LTD SEREND VISTA SUBDIVISION

Sheet: 1 Of: 1

Job No. 17452

Date Excavated: 17-10-05

RL Ground:

Logged By: DTK

Description of Soil	Soil Symbol	Depth (m)	Miniature Shear Vane	Ground water Level	Pilcon DR 2275 CF 10455 Undrained Shear Strength (kPa)		
					50	100	150
BH 36							
Black TOP SOIL 200 deep moist stiff friable	XX	0.0					
	XX	0.1					
Mixed brown CLAYEY SILT very moist very stiff	XX	0.2					
	XX	0.3					
	XX	0.4	185/48				
	XX	0.5					
	XX	0.6	100/23				
	XX	0.7					
	XX	0.8	100/22				
	XX	0.9					
End of Borehole		1.0	86/12				
		1.1					
		1.2					
		1.3					
		1.4					
		1.5					
		1.6					
		1.7					
		1.8					
		1.9					
		2.0					
		2.1					
		2.2					
		2.3					
		2.4					
		2.5					
		2.6					
		2.7					
		2.8					
		2.9					
		3.0					
		3.1					
		3.2					
		3.3					
		3.4					
		3.5					
		3.6					
		3.7					
		3.8					
		3.9					
		4.0					
		4.1					
		4.2					
		4.3					
		4.4					
		4.5					
		4.6					
		4.7					
		4.8					
		4.9					
		5.0					
		5.1					
		5.2					
		5.3					
		5.4					
		5.5					
		5.6					
		5.7					
		5.8					
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		6.7					
		6.8					
		6.9					
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		7.4					
		7.5					
		7.6					
		7.7					
		7.8					
		7.9					
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Borehole Log. MB1

Sheet: 1 Of: 2

Site: BELLEVUE SUBDIVISION - PRESIDENTIAL

Job No. 17452.

Date Excavated: M. 5/7/04

RL Ground:

Logged By: MA

Description of Soil

Soil Symbol

Depth (m)

SPT

CORRECTION

Undrained Shear Strength (kPa)

50 100 150

FIELD LOG

SILT: clayey, orange, stiff moist

sandy, non cohesive, dilatant
cream, loose, moist

pumice sand, gray, loose, dry

CLAY, Dark brown, very stiff moist

SILT: clayey, cohesive, Dark brown
orange, very stiff, moist

brown yellow.

SPT: very clayey, cohesive brown yellow
silt, very stiff, moist
as SPT but brownSPT: very clayey, cohesive, brown
silt, very stiff, moist
pale yellow.

6.0

2.5

8.5

$$6.0 + 2.5 = 8.5 \text{ s/n}$$
$$6.0 + 1.0 \text{ m} + 2.5 = 7.1 \text{ m} - 1.5 = 7.6 \text{ m}$$

yellow orange clayey silt
very stiff

cream clayey silt, very stiff

cream, clayey, cohesive silt
very stiff

YOUNGER ASHES

OLDER ASHES

TBS

EXCAVATION METHOD: 7.5 mm ROTARY MACHINE: MOROOKA.



Borehole Log. MB1

Sheet: 2 Of: 2

Site: BELLEVUE ESTATE PRESUBDIVISION INVESTIGATIONS

Job No. 17452 Date Excavated: M. 5/7/04 RL Ground:

Logged By: MUA

Description of Soil

Soil Symbol

Depth (m)

SPT

CORE REMAINING

Undrained Shear Strength (kPa)

50 100 150

FIELD LOG

SILT: very clayey, cohesive, cream grey
with manganese, stiff, most
sensitive

SPT: very clayey, cohesive cream
grey silt with manganese, very stiff

BOR @ 12.50m: TARGET DEPTH

STAND PIPE

12.5m DOWN

0.3m ABOVE

12.8m TOTAL

SOIL ABOVE DRY

EXCAVATION METHOD: 150mm Ø ROTARY MACHINE MOROOKA



Borehole Log. MB 2.

Sheet: 1 Of: 2

Site: BELLEVUE ESTATE PRESUBDIVISION INVESTIGATION

Job No. 17482

Date Excavated: m-5/7/04

RL Ground:

Logged By: MTA

Description of Soil	Soil Symbol	Depth (m)	SPT	CORRECTION	Undrained Shear Strength (kPa)		
					50	100	150
FIELD LOG							
SILT: Sandy, non cohesive, cream	x x	0					
SAND: pale grey, loose, wet.	x	10		100%			
CLAY: Dark brown, very stiff.	x x	20					
SILT Dark brown clayey, cohesive silt, very stiff, 80% moist	x x	22	1	450			
Some sand, cohesive brown grey	x	30	2 3 N=5	100%			
	x x	40					
coarse gravel, gritty, glassy, with some pumice gravels up to 50mm, dense, light brown orange mottled grey and pink.	x x	50	3 4 N=7	450			
Some sand, slightly cohesive cream grey, very stiff, slightly moist.	x x	60		100%			
SPT: clayey silt, some sand slightly cohesive, cream grey, very stiff.	x	64	4 6 N=13	450			
As per SPT.	x	70		100			
	x x	80					
clayey, some sand, slightly cohesive, cream grey, very stiff	x	84	4 4 7 N=11	450			
	x	90					

EXCAVATION METHOD: MACHINE ROTARY.



Borehole Log. MB 2

Sheet: 2 Of: 2

Site: BELLEVUE ESTATE PRESURDIVISION INVESTIGATIONS

Job No. 17482 Date Excavated: 11/5/04 RL Ground:

Logged By: MAA

Description of Soil

FIELD LOG

SILT: clayey, some sand, slightly cohesive, cream, very stiff moist

SAND silty, non cohesive, cream grey with fine gravel up to 2mm dense as per SPT

gritty sand, cream grey with fine gravel up to 2mm dense as per SPT

Soil Symbol

Depth (m)

SPT

Cone Resistance

Undrained Shear Strength (kPa)

50 100 150

EOB @ 14.0m: TARGET DEPTH

PVC - 14.0m down
0.5m up
14.5m TOTAL

BOREHOLE DRY

EXCAVATION METHOD: MACHINE ROTARY



Borehole Log. MB3

Sheet: 1 Of: 1

Site: BELLEVUE ESTATE PRESUBDIVISION INVESTIGATIONS.

Job No. 17052

Date Excavated: 11/5/03

RL Ground:

Logged By: MMT

Description of Soil	Soil Symbol	Depth (m)	Cone Resistance	Undrained Shear Strength (kPa)		
				50	100	150
FIELD LOG						
TOPSOIL						
SILT: clayey, cohesive, brown orange stiff	x	0				
	x	1				
becomes sandy, cream, loose moist		2				
		2				
CLAY: Dark brown, very stiff		3				
cream brown		4				
		5				
pale cream brown.		6				
		7				
Dark brown orange silt clay very stiff, moist		8				
		9				
		10				
SILT: cohesive, Dark brown, very stiff/hard	x	11				
	x	12				
Dark brown, cohesive, very clayey silt, very stiff	y	13				
	y	14				
BOB @ 9.0m - TARGET DEPTH		15				

EXCAVATION METHOD: MACHINE ROTARY

Borehole Log. **MB4**Sheet: **1** Of: **1**Site: **BELLEUE ESTATE PRESUBDIVISION INVESTIGATIONS**Job No. **17452** Date Excavated: **11/17/04** RL Ground:Logged By: **MMT**

Description of Soil	Soil Symbol	Depth (m)	SPT	Undrained Shear Strength (kPa)		
				50	100	150
FIELD LOG						
Silt, clayey, cohesive dark brown orange, very stiff. mast	xx	0				
		1.0				
becomes sandy, cream, loose	YOUNGER ASHES x	2.0	1 1 2			
		3.0				
puccia sand, loose, gray, mast						
CLAY: Dark brown, very stiff						
S.C.S: clayey, Dark brown orange, very stiff	xx	4.0	1 3 3			
		5.0				
Sandy pale brown.	OLDER ASHES x	6.0				
		7.0				
BOB @ 6.0m: TARBED DEPTH						
		8.0				
BOREHOLE DRY		9.0				

EXCAVATION METHOD: **MACHINE ROTARY**



Borehole Log. MBS

Sheet: 1 Of: 1

Site: BELLEVUE ESTATE PRESUBDIVISION INVESTIGATIONS.

Job No. 17452 Date Excavated: TU-6/7/04 RL Ground:

Logged By: MMB

Description of Soil	Soil Symbol	Depth (m)	SPT	Undrained Shear Strength (kPa)		
				50	100	150
FIELD LOG						
Topsoil	xx	0				
SILT: some sand, slightly cohesive pale brown, stiff	xx	10				
Moist	xx	20				
	xx	20	1 2 2			
			N=4			
CLAY: cohesive, Dark brown, very stiff	xx	30				
Brown	xx	40				
	xx	40	2 3 3			
			N=6			
	xx	50				
	xx	60				
	xx	60	2 2 3			
			N=5			
	xx	70				
	xx	80				
	xx	90				
	xx	90	2 2 2			
			N=4			
BOREHOLE DRY						
Brown silty clay very stiff, moist	xx	90				
@ 9.0m: TARGET DEPTH						

EXCAVATION METHOD: MACHINE ROTARY



Borehole Log. MB 6

Site: BELLEVUE ESTATE PRESERVATION INVESTIGATIONS

Sheet: 1 Of: 1

Job No. 17452 Date Excavated: Tu-6/7/04 RL Ground:

Logged By: MMT

Description of Soil	Soil Symbol	Depth (m)	SPT	CORRECTION	Undrained Shear Strength (kPa)
					50 100 150
FIELD NO. 606.					
organic black grey silt, soft	ORGANIC				
silt: sandy, non organic, cream, soft	ESTUARINE SEDIMENTS			100g	
SAND: silty, cream, loose				450	
medium dense.				100	
CLAY: cream, very stiff				450	
SILT: very clayey, cohesive, orange				100	
very stiff				450	
SPT: clayey cohesive orange silt				100	
very stiff				450	
as per SPT				100	
	ASHES			450	
SPT: clayey, cohesive, Dark orange				100	
silt, very stiff				450	
EOB @ 6.5m @ 6.5m: TARGET DEPTH				100	
PVC 6.0m DOWN				450	
0.5m up.				100	
6.5m TOTAL.				450	

EXCAVATION METHOD: MACHINE ROTARY.



Borehole Log. MB7

Sheet: 1 Of: 1

Site: BELLEVUE ESTATE PRESUBDIVISION INVESTIGATION

Job No. 17452

Date Excavated: Tu. 6/7/04

RL Ground:

Logged By: MAB

Description of Soil	Soil Symbol	Depth (m)	SPT	CORRECTION	Undrained Shear Strength (kPa)		
					50	100	150
FIELD LOG							
peaty silt	xx	0					
silt: sandy, grey, soft	xx	0					
CLAY: grey, soft	xx	0					
	xx	10					
	xx	20					
SPT: Soft grey clay: 450 RECOVERY	xx	20					
as per SPT	xx	20					
	xx	30					
	xx	40					
SPT 450	xx	40					
RECOVERY	xx	40					
SOFT grey clay	xx	40					
Sandy, silt, cream, soft	xx	40					
CLAY: Grey, soft	xx	40					
	xx	50					
	xx	60					
SPT: Soft grey clayey	xx	60					
	xx	70					
FOR 6.5m: TARGET DEPTH	xx	70					
	xx	80					
	xx	90					
PVC	xx	90					
6.5m DOWN	xx	90					
0.5m UP	xx	90					
6.5m TOTAL	xx	90					

EXCAVATION METHOD: MACHINE ROTARY



Borehole Log. MB 8

Site: BELLEVUE ESTATE PRESURVISION INVESTIGATIONS

Sheet: 1 Of: 1

Job No. 17452

Date Excavated: Tu. 6/7/04

RL Ground:

Logged By: MAA

Description of Soil	Soil Symbol	Depth (m)	SPT	CORRECTION	Undrained Shear Strength (kPa)		
					50	100	150
FIELD LOG							
TOPSOIL							
SILT: very sandy, cream, soft	xx	0					
	xx	1					
CLAY: white cream, very stiff	xx	2					
	xx	3					
SILT: very clayey, cohesive, orange very stiff	xx	4					
	x	5					
Sandy, non cohesive, cream	xx	6					
	xx	7					
pumice sandy cream silt very stiff & sensitive dilatant sandy cream silt	xx	8					
	xx	9					
	xx	10					
	xx	11					
	xx	12					
	xx	13					
	xx	14					
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	xx	99					
	xx	100					

BOB @ 5.5m.

BOREHOLE DRY

EXCAVATION METHOD: MACHINE ROTARY



Borehole Log. MB9

Site: BELLEVUE ESTATE PRESUBDIVISION INVESTIGATIONS

Sheet: 1 Of: 2

Job No. 17452

Date Excavated: 11-6-10

RL Ground:

Logged By: MJA

Description of Soil	Soil Symbol	Depth (m)	SPT	CORRECTION	Undrained Shear Strength (kPa)		
					50	100	150
FIELD LOG							
TOPSOIL							
SILT: clayey, cohesive, Dark brown orange, very stiff	x x	0					
COARSE, gritty, bright orange occasional sand, brown	x x	10					
SPT: Sandy cream silt, medium Dense to loose, moist	x x	20					
Pumice sand, pale grey, loose, Dry	x x	30					
CLAY: Dark brown, stiff, moist	x x	40					
SILT: very clayey, cohesive, Dark orange brown	x x	50					
SPT: clayey brown orange silt gritty orange silt	x x	60					
SILT: gritty, cohesive, orange, very stiff	x x	70					
Some sand, slightly cohesive pale cream brown, stiff, moist sensitive.	x x	80					
SPT: COARSE DARK BROWN orange silt cream, slightly cohesive sandy silt as per test 150 in SPT	x x	90					
SPT: SAND: medium cream with black orange manganese bands hard to Dense	x x	100					

EXCAVATION METHOD: MACHINE ROTARY



Borehole Log. MB9

Sheet: 2 Of: 2

Site: BELLEVUE ESTATE PRESUBDIVISION INVESTIGATIONS

Job No. 17452 Date Excavated: 10/6/1977 RL Ground:

Logged By:

Description of Soil

Soil Symbol

Depth (m)

SAT

CONE
RESISTANCEUndrained Shear Strength
(kPa)

50 100 150

FIELD LOG

SAND: silty, cream, medium dense
moist, sensitivegritty cream sand, medium dense
loose sensitive, moist

END @ 10.5m: TARGET DEPTH

Borehole Dry

EXCAVATION METHOD: MACHINE ROTARY



Borehole Log. MB10

Sheet: 1 Of: 1

Site: BELLEME ESTATE PRESUBDIVISION INVESTIGATION

Job No. 17452

Date Excavated: Th. 6/7/04

RL Ground:

Logged By: MAB

Description of Soil	Soil Symbol	Depth (m)	SPT	CORE RECOVERY	Undrained Shear Strength (kPa)		
					50	100	150
FIELD LOG.							
Topsoil							
SILT: clayey, cohesive, Dark brown orange, very stiff, moist	XY	0-10		100%			
some sand	X	10-20	1 2 2	N=4	450		
	XX	20-30		100%			
CLAY: Dark Brown, stiff, moist	/	30-40	2 2 3	N=5	450		
SILT Dark orange brown	XY	40-50					
Dark brown orange	X	50-60	2 2 4	N=6	450		
becoming red orange.	XX	60-70		100%			
EOB @ 5.5m: TARGET DEPTH	1	70-80					
BOREHOLE DRY		80-90					

EXCAVATION METHOD: MACHINE ROTARY



Borehole Log. MB 11

Site: BELLEVUE ESTATE PRESUR DIVISION INVESTIGATIONS.

Sheet: 1 Of: 1

Job No. 17452

Date Excavated: TU 6/7/04

RL Ground:

Logged By: MB

Description of Soil	Soil Symbol	Depth (m)	SPT	CORE RECOVERY	Undrained Shear Strength (kPa)		
					50	100	150
FIELD LAB							
TOPSOIL							
SILT: clayey, cohesive, brown yellow stiff, slightly moist	YOUNGER ASHES	0-10		100%			
Sandy, pale yellow, loose moist		10-20	N=2	450			
CLAY: Dark brown, very stiff		20-30		100%			
SILT: clayey, cohesive, dark brown orange, very stiff, moist		30-40	N=4	450			
	OLDER ASHES	40-60		100%			
EOR @ 6.0m: TARGET DEPTH							
NOTE: SPT DEPTHS DETERMINED IN ADJACENT HOLE DRILLED TO IDENTIFY STRATA DEPTHS							

EXCAVATION METHOD: MACHINE ROTARY.



Borehole Log. MB 12

Site: BELLEVUE ESTATE PRESURDIVISION INVESTIGATIONS.

Sheet: 1 Of: 2

Job No. 17452

Date Excavated: Tn = 6/7/04

RL Ground:

Logged By: MHA

Description of Soil	Soil Symbol	Depth (m)	SPT	CONE RECOVERIES	Undrained Shear Strength (kPa)		
					50	100	150
FIELD LOG.							
TOPSOIL							
SILT: clayey, cohesive, Dark brown orange, Very stiff, slightly moist	X	0					
	X	10					
	X	20					
Very sandy, non cohesive, cream form, moist	X	30					
fine sand, grey, loose, wet.	X	40					
CLAY: Dark brown, stiff, moist	X	50					
SILT: Very clayey, cohesive, Dark brown orange, very stiff, moist	X	60					
SPT: As per 3.4 - 4.0m.	X	70					
clayey, brown orange, very stiff: Becomes pale orange with depth.	X	80					
	X	90					
SPT: Very clayey pale brown yellow soft, very stiff, moist	X	100					
	X	110					
gritty, non cohesive, bright orange, very stiff, slightly moist	X	120					
	X	130					
sandy, slightly cohesive pale yellow, stiff, some manganese	X	140					
sandy, non cohesive, cream stiff, moist	X	150					

EXCAVATION METHOD: MACHINE ROTARY



Borehole Log. MB 12

Site: BELLEVUE PRESUBDIVISION INVESTIGATIONS

Sheet: 2 Of: 2

Job No. 17452

Date Excavated: Tn. 6/2/04

RL Ground:

Logged By: MHA

Description of Soil

Soil Symbol

Depth (m)

Undrained Shear Strength (kPa)

FIELD LOG

SILT: Sandy, non cohesive, cream
stiff, moist

EOB @ 10.0m: TARGET DEPTH

BOREHOLE DRY

SPT	-	10.0m	Down
		0.5m	up
		10.5m	TOTAL

EXCAVATION METHOD:

