MARLBOROUGH DISTRICT COUNCIL

TREMORNE AVENUE REZONING

PLAN CHANGE 47

WAIRAU/AWATERE RESOURCE MANAGEMENT PLAN

Contents

Tremorne Avenue Rezoning - Plan Change 47

Wairau/Awatere Resource Management Plan (WARMP)

1 Introduction

This report sets out an evaluation of proposed Plan Change 47 to the Wairau/Awatere Resource Management Plan (WARMP) introduced by Marlborough District Council (MDC).

The plan change proposes to

(i) rezone an area of Industrial 1 zoned land located in the Tremorne Avenue, Algarve Close and Hilton Place area to Urban Residential 2. Currently this area contains residential housing and a vacant undeveloped area; and

(ii) rezone existing reserve areas in proximity to Tremorne Avenue area from Industrial 1 and Urban Residential 2 Zone to Local Recreation Zone and Conservation Zone.

(iii) Insert a Specifically Identified Activity in Appendix G for Lot 15 DP 395434

(iv) Insert a Specifically Identified Activity in Appendix G for Lots 16 to 20 DP 348832 and Lot 2 DP 352510

(v) Remove Industrial 1 and Urban Residential 2 zones from Timandra Place, Tremorne Avenue, Algarve Close, De Castro Drive, Hilton Place and Avening Close.

This report contains the following sections in respect of the Plan Change:

- Description of Plan Change Area
- Background
- Consultation
- Need for Plan Change
- Proposed Provisions of Plan Change
- Statutory Assessment including Section 32 analysis.
- Conclusion

2 Description of Plan Change Area

The Plan Change area is shown in Figure 1 below. The area is generally located on both sides of Tremorne Avenue although the area to the south of the avenue is mainly confined to reserve areas and five existing residential lots located at the north end of Hilton Place.

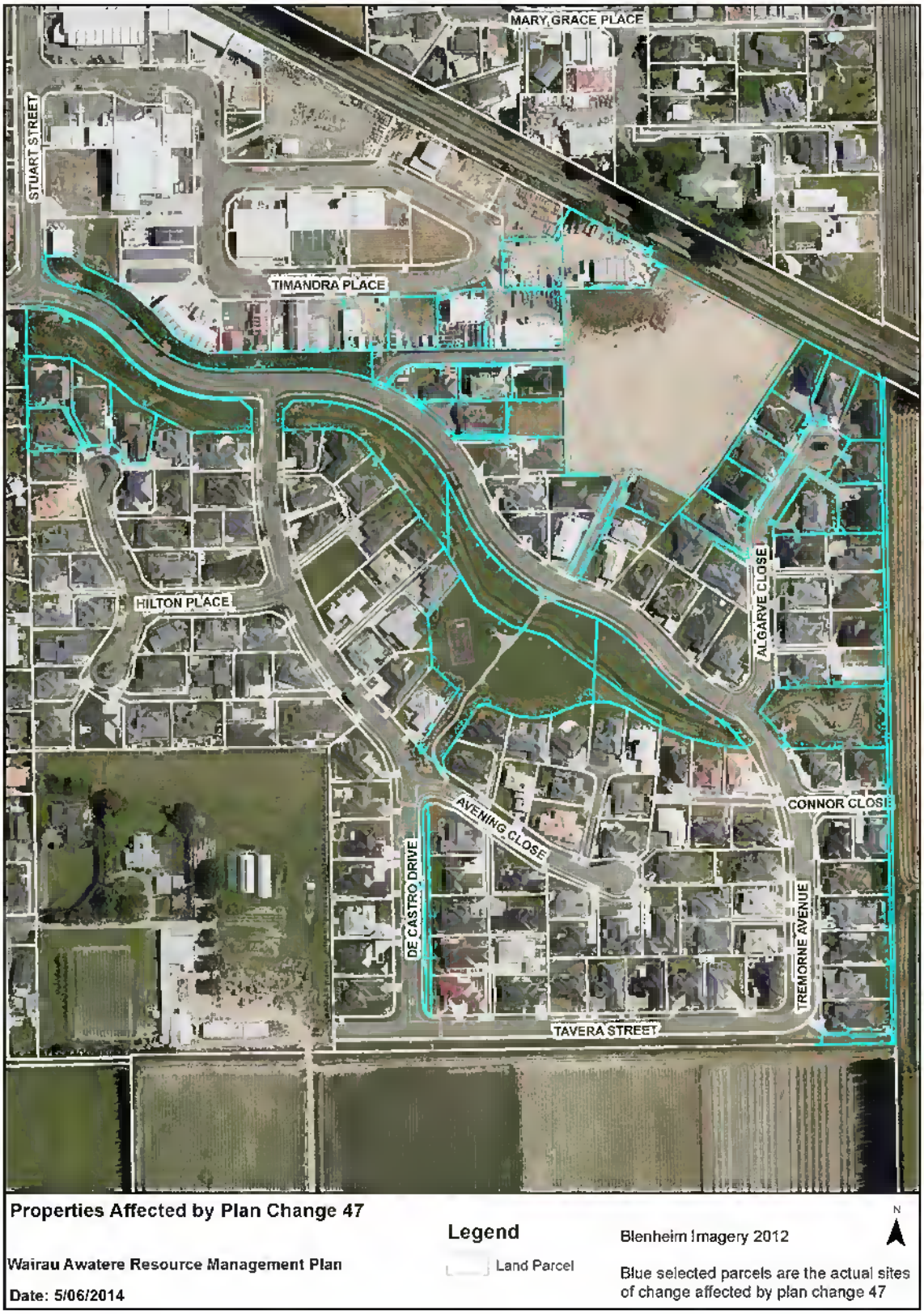
To the north of Tremorne Avenue are 23 residential lots affected by the plan change. These residential lots generally have dwellings located on them except for Lot 15 DP 395434 which is vacant. The dwellings have been constructed in the last 10 years or so on lots that are between 500m^2 - 1,000m^2. Lot 15, 1.4ha in area, is a rear site which has 2 accesses off Tremorne Avenue. The residential lots are part of the Camborne Green subdivision that has been developed over the last 10 years or so.

The reserve areas are generally in the vicinity of Tremorne Avenue. The areas are mainly grassed and landscaped and contain a stream that runs parallel to Tremorne Avenue. A reserve containing a drain also runs from the Main South Railway Line to Tavera Street.

Adjoining the northern boundary of the north access to Lot 15 and the northern boundary of Lot 15 is an industrial area occupied by small industries that are accessed off Timandra Place (the relevant lots are legally described as Lots 16 to 20 DP 348832 and Lot 2 DP 352510). Immediately adjoining the undeveloped Lot 15 are a panel beating operation and a construction yard depot. The Main South Railway Line adjoins the remainder of the northern boundary of Lot 15, with a pedestrian/cycleway also contained within the rail corridor.

The legal descriptions of the sites subject to the plan change are described in Section 5.

Figure 1

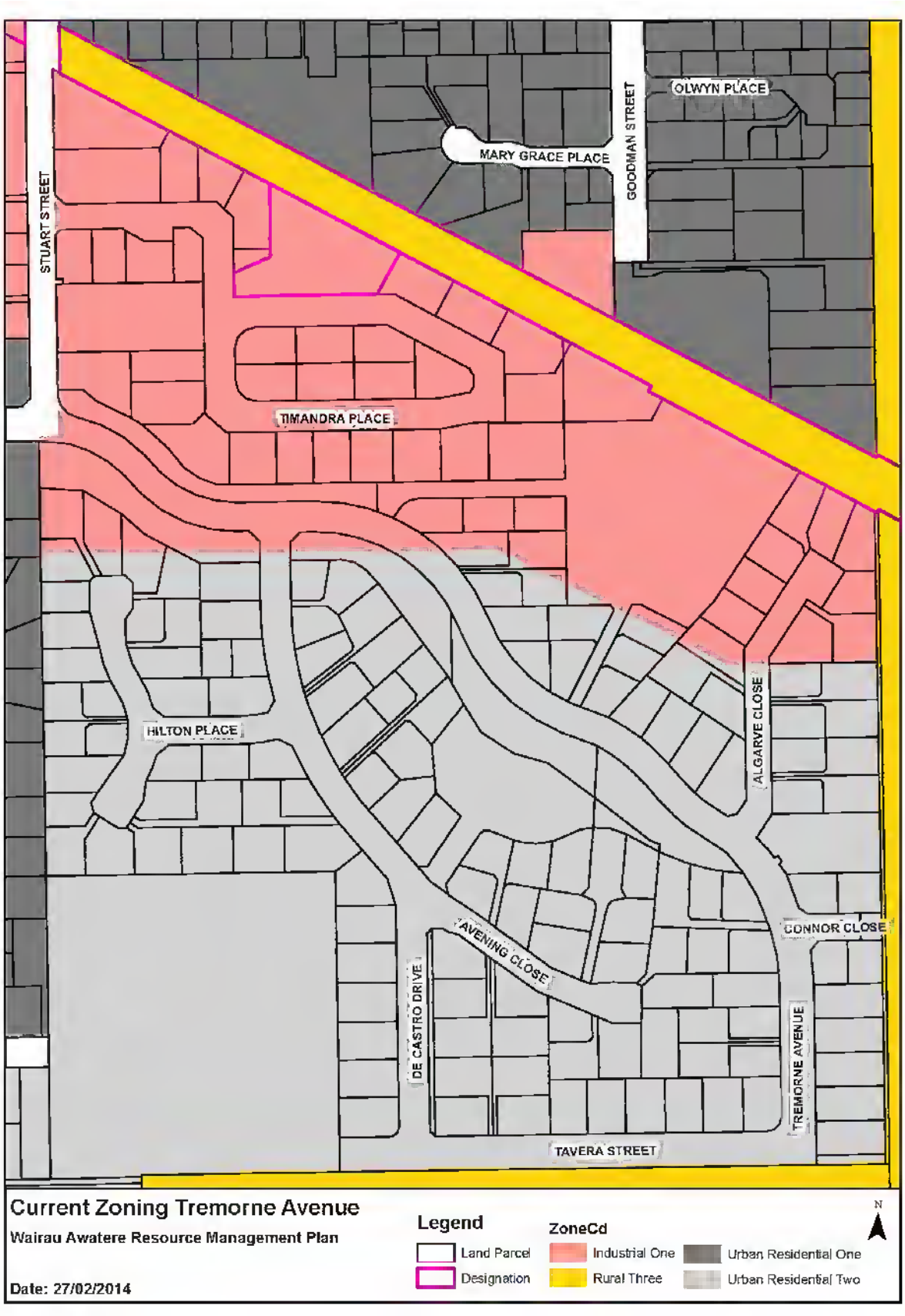

MARY GRACE PLACE
STUART STREET
TIMANDRA PLACE
HILTON PLACE
ALGARVE CLOSE
CONNOR CLOSE
AVENING CLOSE
DE CASTRO DRIVE
TREMORNE AVENUE
TAVERA STREET
Properties Affected by Plan Change 47
Wairau Awatere Resource Management Plan
Date: 5/06/2014
Legend
Land Parcel
Blenheim Imagery 2012
Blue selected parcels are the actual sites of change affected by plan change 47
N

3 Background

3.1 Introduction

When the WARMP was publicly notified in 1997 the area subject to Plan Change 47 was proposed to be zoned Industrial 1 and Rural 3. Following a submission from a landowner to the WARMP an area of the rural zoned land was rezoned Urban Residential 2. The boundary between the Industrial 1 and Urban Residential 2 Zones was somewhat arbitrary and did not follow cadastral boundaries as is shown on Figure 2 below which shows the current zoning and cadastre.

Figure 2


STUART STREET
MARY GRACE PLACE
GOODMAN STREET
OLWYN PLACE
TIMANDRA PLACE
HILTON PLACE
ALGARVE CLOSE
CONNOR CLOSE
AVENING CLOSE
DE CASTRO DRIVE
TREMORNE AVENUE
TAVERA STREET
Current Zoning Tremorne Avenue
Wairau Awatere Resource Management Plan
Date: 27/02/2014
Legend
Land Parcel
Designation
ZoneCd
Industrial One
Rural Three
Urban Residential One
Urban Residential Two
N

Subsequently the Industrial 1 zoned area was developed for both industrial and residential development. Residential development occurred at the north end of Algarve Close and Hilton Place and in the south part of the zone adjacent to Tremorne Avenue. It is noted that some of the residential allotments are split by a residential and industrial zoning as a result of subsequent subdivision design. The industrial development occurred around Timandra Place in the Industrial 1 Zone.

3.2 Residential Development

Development of the industrial zoned land for residential purposes was enabled by various resource consents. For example Resource Consent No U030169 (subdivision and land use) issued in November 2003 to J and RK de Castro Ltd, created Lots 11-20 DP 362155 in Algarve Place.

Resource Consent No. U070331 (subdivision and land use) which is particularly relevant to this plan change, was issued in June 2007 to J and RK de Castro Ltd (attached as **Appendix 1**). The subdivision created 15 allotments in which Lots 1-14 had areas of between 500m^2 and 800m^2 and Lot 15, a rear site off Trenmore Avenue, comprising approximately 1.4 ha. Certificates of title subsequently issued and as indicated above nearly all of Lots 1-14 now have dwellings erected on them.

Lot 15 DP DP 395434 remains undeveloped. This site and an adjoining parcel of land were originally to be used for a church and private school but the development but did not proceed (as the facilities established elsewhere). Resource Consent No. U070331 subsequently indicated Lot 15 would be used for integrated residential development (which to date has not occurred).

Resource Consent No. U070331 contained a number of conditions including:

- Condition 28 of the subdivision consent, which stated that the subdivision was granted on the basis that those lots zoned Industrial 1 (Lots 1-4, 7,14 and 15) were to be only used for residential purposes in which the provisions of the Urban Residential 2 Zone were to apply until such time as the land had been zoned Urban Residential 2. Council noted that it was proposed to prepare a Variation to facilitate this change but that if the Variation was not sufficiently advanced at Section 224 stage then a consent notice referring to the above was to attach to Lots 1-4, 7, 14 and 15. Council began preparing the Variation but it did not proceed following a request from J and RK de Castro Ltd not to proceed. Subsequently the consent notices did attach to the titles when they were issued under DP 395434.

- Condition 1 of the land use consent requires the submission of a landscaping plan apparently in respect of the northern boundary of the access leg to Lot 15 and the erection of an acoustic fence along the same boundary. The landscaping and fence have been installed. A plan also showed landscaping on the northern boundary of Lot 15 DP 395434 but this has not been implemented and is not specifically referred to in the conditions or reasons of the decision.

- A note attached to the land use decision in respect of the future development of Lot 15 referred to the:

  - requirement of an appropriate buffer of at least 6 metres wide in respect of the adjoining industrial development to the north and;

  - the relatively narrow access legs to serve future development on Lot 15 DP 395434 in which it was noted that the accesses may limit development in terms of the standards for access in the WARMP.

In respect of the last matter, Lot 15 has two accesses off Tremorne Avenue which are contained within the relevant Certificate of Title. The first access to the north is approximately 100m in length and also provides access to two residential lots. The legal width is 10 m and the carriageway width 6m. The second access to the south is approximately 70m in length and also provides access to two residential lots. The legal width is 8m and the width of the carriageway 6m. Both accesses have a footpath.

The resource consents also created number of roads including Timandra Place, Tremorne Avenue, Algarve Close, De Castro Drive, Hilton Place and Avening Close.

On 18 July 2013, J and RK de Castro Ltd who still owned Lot 15 DP 395434, was placed in receivership.[1]

Given that the Variation/Plan Change referred to above has not yet proceeded there are currently 23 "residential lots" (including Lot 15 DP 395434) which are either wholly or partially zoned Industrial 1. All of these lots except for Lot 15 have dwellings erected on them.

The receiver of Lot 15 has requested that the plan change now proceed and the residents whose lots are zoned Industrial 1 have also expressed a desire to proceed with the plan change. In addition doubts have been raised as to the validity of the consent notices issued under Condition 28 of U070331 authorising the residential development. Accordingly Council now proposes that Plan Change 47 proceed along its statutory course in order to provide certainty and clarity.

It is noted that there was also some delay in resuming the plan change process while a geotechnical investigation was undertaken in respect of Lot 15 (the only undeveloped lot) to determine its suitability for residential activity. Council has generally required geotechnical reports for sites since the Canterbury earthquakes in 2010/11. A geotechnical report undertaken for J and RK de Castro Ltd (in receivership) indicates that Lot 15 DP 395434 has liquefaction potential but that this can be mitigated by appropriate foundation design. The effect of lateral spreading from the Opawa River and the stream to the south is considered to be low to moderate which again can be mitigated by foundation design (refer to **Appendix 2** for report). Council has reviewed this report and concurs with its findings and considers that there are sufficient provisions in the WARMP to ensure that appropriate foundation design is considered at the time of subdivision consent.

3.3 Industrial Development

In the context of this plan change, industrial activities have been established on Lots 16 to 20 DP 348832 and Lot 2 DP 352510 off Timandra Place. These activities were established when the adjoining zoning to the south was Industrial 1 and accordingly amenity standards were not as high if the adjoining site was zoned Residential. Buildings on the sites are generally 0-3 m from the boundary adjoining Lot 15 DP 395434 as there is no requirement to provide yard space. Accordingly as part of the plan change it is proposed to insert provisions which protect the on going operation of these activities.

3.4 Reserve Areas

As indicated above part of the area, mainly in proximity to the south side of Tremorne Avenue, located in both the Industrial 1 and Urban Residential 2 Zones was set aside for reserve area as part of the overall development of the areas. Currently these reserve areas retain their industrial and residential zoning and it is considered appropriate to rezone the parcels of land to a recreation zoning. A reserve containing a drain also runs from the Main South Railway Line to Tavera Street and is proposed to be rezoned Conservation.

3.5 Roads

Since the time the land was originally zoned, roads have been created within the area as part of subdivision consents. These roads are shown as either Industrial 1 or Urban Residential 2 whereas in the WARMP they are designated and it is normal Council practice for there to be no zoning applied to them. Accordingly it is proposed to remove the zoning from the respective roads.

[1] Refer Companies Office website - www.business.govt.nz.

3.6 Summary

Overall, the Council considers that having a zoning inconsistent with the actual use of land or inconsistent with how other similar land is treated in the Plan, is not an effective or efficient way to manage land use. The proposed changes to the Plan therefore, seek to:

- Regularise the zoning to be consistent with pattern of land use that has been allowed through the resource consent process.
- Protect the existing rights of the industrial land owners and the amenity of future residential occupiers in the area.
- Uplift the zoning from roads and change zonings for reserves to Local Recreation Zone and Conservation Zone.

These changes are discussed in more detail below in Section 5.

4 Consultation

The following consultation has taken place which has assisted in informing the plan change:

- Consultation initially took place in October 2006. At that time concerns raised through consultation were all in relation to the zoning of the land which was previously identified to be developed for the church and school (and included Lot 15 DP 395434). The majority of responses received (17 from 28), requested the option of establishing some type of buffer along the northern boundary of the area whilst zoning the remainder Urban Residential 2. No respondent requested either the option to leave the zoning as it is, or to rezone the lots fully Industrial 1.

  Feedback on the specific type of 'buffer' was discussed including the placing reserves and/or a road in such a way so as to form a buffer during subdivision design.

  Consultation with J and RK de Castro Ltd also occurred at this time, and who now advised of the intention to develop the lots for residential purposes rather than the church and school. The company also did not object to the option of including in the District Plan specific rules that would protect the existing rights of the owners of the adjoining industrial land operators while at the same time protecting residential amenity.

- Following the request to put the plan change on hold and subsequent issues relating to J and RK de Castro Ltd going into receivership, no further consultation was undertaken until 2013 when the receiver of J and RK de Castro Ltd expressed a desire for the plan change to proceed.
- A meeting with local industrial owners/occupiers occurred on March 26 2014 in which the plan change was discussed with two parties. Generally the parties favoured retaining the status quo (ie Industrial 1 zoning) and were not satisfied that the provision of a buffer would address their concerns relating to reverse sensitivity.
- A meeting occurred with local residents on 26 March 2014 which was attended by approximately 30 residents. The residents were unanimous that in general they wanted the Urban Residential 2 zoning to proceed. The consent notices authorising residential activity and potential for liquefaction in the area was also discussed.

5 Proposed Provisions of Plan Change

The following is proposed in respect of the Plan Change 47 (changes shown as *italics underlined)*

1. Amend Planning Maps 162 and 163 of the WARMP by deleting the Industrial 1 Zoning and rezoning with Urban Residential 2 Zone in respect of the following sites

Legal Description	Current Address / Physical Location
Lot 11 DP 362155	20 Algarve Close
Lot 12 DP 362155	22 Algarve Close
Lot 13 DP 362155	24 Algarve Close
Lot 14 DP 362155	26 Algarve Close
Lot 15 DP 362155	19 Algarve Close
Lot 16 DP 362155	17 Algarve Close
Lot 17 DP 362155	15 Algarve Close
Lot 18 DP 362155	11 Algarve Close
Lot 19 DP 362155	9 Algarve Close
Lot 20 DP 362155	7 Algarve Close
Lot 9 DP 323472	12 Hilton Place
Lot 10 DP 323472	14 Hilton Place
Lot 11 DP 323472	16 Hilton Place
Lot 12 DP 323472	18 Hilton Place
Lot 13 DP 323472	20 Hilton Place
Lot 1 DP 395434	7 Tremorne Avenue
Lot 2 DP 395434	7A Tremorne Avenue
Lot 3 DP 395434	7B Tremorne Avenue
Lot 4 DP 395434	9A Tremorne Avenue
Lot 5 DP 395434	9 Tremorne Avenue
Lot 7 DP 395434	11A Tremorne Avenue
Lot 14 DP 395434	23B Tremorne Avenue
Lot 15 DP 395434	3 Tremorne Avenue

2. Amend Planning Maps 162 and 163 of the WARMP by deleting the Industrial 1 Zoning and rezoning with Local Recreation Zone and Conservation Zone in respect of the following sites:

Legal Description	**Current Address/ Physical Location**	**Proposed Zoning**
Lot 143 DP 323472	Situated to south of Tremorne Avenue, between Stuart Street and De Castro Drive	Local Recreation

	intersection.	
Lot 8 DP 336893	Reserve situated to south of Tremorne Avenue, east of De Castro Drive intersection.	Local Recreation
Lot 102 DP 384861	Reserve to south of Tremorne Avenue.	Local Recreation
Lot 101 DP 384861	Large reserve to south of Tremorne Avenue.	Local Recreation
Lot 2 DP 362155	Situated to south of Tremorne Avenue, opposite Algarve Close intersection.	Local Recreation
Lot 6 DP 336893	Contains earth bund between Tremorne Avenue and Timandra Place.	Local Recreation
Lot 1001 DP 384861	Strip adjacent to De Castro Drive	Local Recreation
Lot 1 DP 362155	Narrow strip between Main South Railway Line and Tavera Street	Conservation
Lot 1 DP 370613	Situated corner of Tremorne Avenue and Tavera Street	Conservation

3. Remove Industrial 1 and Urban Residential 2 zones from Timandra Place, Tremorne Avenue, Algarve Close, De Castro Drive, Hilton Place and Avening Close.

4. (i) Amend Planning Map 162 of the WARMP by inserting a Specifically Identified Activity Site (Appendix G) – 11 and;

(ii) Insert Diagram notated 11 in Appendix G;

in respect of the following site:

Legal Description	**Current Address / Physical Location**
Lot 15 DP 395434	3 Tremorne Avenue

5. (i) Amend Planning Map 162 of the WARMP by inserting a Specifically Identified Activity Site (Appendix G) – 12 and;

(ii) Insert Diagram notated 12 in Appendix G;

in respect of the following sites:

Legal Description	Current Address / Physical Location
Lot 16 DP 348332	24 Timandra Place
Lot 17 DP 348332	26 Timandra Place
Lot 18 DP 348332	28 Timandra Place
Lot 19 DP 348332	30 Timandra Place
Lot 20 DP 348332	32 Timandra Place
Lot 2 DP 352510	32 Timandra Place

These changes are shown on the attached plan in **Appendix 3**

6. Add the following to Appendix G - Register of Specifically Identified Activities of the WARMP:

11. 3 Tremorne Avenue, Blenheim (on land described as Lot 15 DP 395434)

11.1 This schedule applies to the site shown on planning map 162 and the attached diagram with the notation 11.

11.2 The Urban Residential 2 Zone provisions shall apply to this site provided that no habitable buildings shall be erected in the buffer area identified on the site. Habitable buildings include a dwelling house or unit, sleep out, visitor accommodation or other habitable building.

11.3 The erection of habitable buildings within the buffer area is a ***discretionary activity.***

12. Amenity Controls (on land described as Lots 16 to 20 DP 348832 and Lot 2 DP 352510)

12.1 This schedule applies to the sites shown on planning map 162 and the attached diagram with the notation 12.

12.2 For the purpose of this Schedule and this Plan, any reference to site boundaries is to the boundaries of a scheduled site.

12.3 The 'Amenities' provisions at Rule 37.1.3 shall be applied to Lots 16 to 20 DP 348832 and Lot 2 DP 352510 as though these sites do not adjoin an Urban Residential Zone boundary.

Overall the proposed change will better reflect the existing development on the ground in respect of the existing residential, reserve and road development and provide the opportunity for residential development on Lot 15 DP 395434. The rezoning also "tidies up" the zoning of allotments that have both industrial and residential zoning that has occurred as a result of subdivision design (Item 1 above).

The Local Recreation Zone and Conservation Zone will apply to those areas of reserve in both the Industrial 1 and Urban Residential 2 Zones which have been implemented as part of subdivision consents. The Industrial 1 and Urban Residential 2 zoning is proposed to be removed from those roads created as part of the subdivision consents above (Items 2 and 3 above).

In recognition of the Industrial 1 Zone located on the north west boundary it is proposed to implement a buffer area within Lot 15 DP 395434 and to allow existing activities in the adjoining industrial area to continue to be subject to the Industrial 1 amenity provisions (Items 4, 5 and 6 above).

In respect of the buffer area, non habitable buildings are not allowed to be erected in order to mitigate adverse effects on residential activities and mitigate reverse sensitivity effects. The buffer area is proposed to be 12m in width which is twice the width required for a setback in the Industrial 1 Zone where it adjoins an Urban Residential 2 Zone (Rule 37.1.3.4.2 specifies a setback of 6m). The width recognizes that activities in the Industrial 1 zone area are already operational and buildings are located between 0-3 m from the site boundary.

The 12m width is also consistent with the setback of dwellings from the southern boundary of industrial sites located in Timandra Place and is consistent with Resource Consent No. UO70331 which referred to a minimum buffer of 6m in the "Note" to the decision.

In order to facilitate the implementation of the buffer area it is proposed to schedule Lot 15 DP 395434 in Appendix G-Register of Specifically Identified Activities of the WARMP as a new Item 11. The Urban Residential 2 zone provisions will apply but with the proviso that habitable buildings cannot be erected in the buffer area without resource consent.

In relation to amenities, the Amenities Rules (37.1.3) of the Industrial 1 zone require stricter controls on activities where they adjoin a Urban Residential Zone in such matters as noise, lighting, building setbacks, outdoor storage and landscaping. Given that Lot 15 was zoned Industrial 1 when the adjoining activities established in Timandra Place it is considered fair and reasonable that these activities continue to be subject to the amenity controls that applied at the time of their establishment. Again these provisions will be implemented by way of the Appendix G Register as a new Item 12.

The above provisions will enable residential development to proceed on Lot 15 while at the same time recognizing that adjoining industrial activities are entitled to continue operate without undue constraints arising from reverse sensitivity effects.

The existing accesses to Lot 15 DP 395434 enable a maximum of 7 lots to be subdivided from Lot 15 DP 395434 in accordance with Rule 28.2.3 of the WARMP[2]. Potentially the number of lots could be increased depending on the nature of the development by way of further resource consent. It is noted the existing accesses are of sufficient width to allow 2 way traffic and also contain a footpath.

6 Statutory Assessment

6.1 Introduction

The following sections of the RMA are of particular relevance to the plan change-Section 32, Section 72, Section 74 and Section 75-and these are discussed below.

6.2 Section 32 of the Act

Section 32 of the RMA requires an evaluation of the plan change, including the extent to which the objectives are the most appropriate to achieve the purpose of the RMA; and whether the proposed provisions are the most appropriate way to achieve the objectives by identifying other options and assessing the efficiency and effectiveness of the provisions. An assessment must identify the benefits and costs including opportunities for economic growth and employment.

In particular Section 32(1) and (2) state as follows:

(1) An evaluation report required under this Act must—

(a) examine the extent to which the objectives of the proposal being evaluated are the most appropriate way to achieve the purpose of this Act; and

[2] Refer to Rule 28.2.3 Standards for Access to Rear Lots (Controlled Subdivision Activities) for Residential Zones – A maximum of 5-6 lots is permitted and which require a minimum width of 6m and a minimum formation width of 5 m. In respect of lot 15 DP 395434 this allows a total of 12 lots based on 2 accesses. However 5 rear lots (Lots 2,3,9,13 and 14 DP 395434 already have access from the accesses (assumes Lots 1,11 and 12 DP 395434 have access from Tremorne Avenue).

(b) examine whether the provisions in the proposal are the most appropriate way to achieve the objectives by—

(i) identifying other reasonably practicable options for achieving the objectives; and

(ii) assessing the efficiency and effectiveness of the provisions in achieving the objectives; and

(iii) summarising the reasons for deciding on the provisions; and

(c) contain a level of detail that corresponds to the scale and significance of the environmental, economic, social, and cultural effects that are anticipated from the implementation of the proposal.

(2) An assessment under subsection (1)(b)(ii) must—

(a) identify and assess the benefits and costs of the environmental, economic, social, and cultural effects that are anticipated from the implementation of the provisions, including the opportunities for—

(i) economic growth that are anticipated to be provided or reduced; and

(ii) employment that are anticipated to be provided or reduced; and

(b) if practicable, quantify the benefits and costs referred to in paragraph (a); and

(c) assess the risk of acting or not acting if there is uncertain or insufficient information about the subject matter of the provisions.

Section 32(3) indicates that if a proposal is amending an existing plan (which is the case here as it is a plan change) the examination under Section 32(1)(b) must relate to the provisions and objectives of the plan change and the objectives of the existing plan to the extent that they are relevant to the plan change.

6.3 Options

The options identified for the management of the area subject to the plan change in terms of Section 32(1)(b)(i) are:

Option 1 - Status quo which retains the existing zoning or;

Option 2 - Rezone sites to Urban Residential 2, Local Recreation and Conservation and roads and insert provisions relating to industrial/residential interface as proposed or;

Option 3 - Rezone the site to a zone(s) not currently in the WARMP or;

Option 4 - Rezone the site at the time of the WARMP review.

Options 3 and 4 are not considered further because in respect of the former it is inefficient to draft new zones when the existing WARMP zones are in accordance with existing and proposed development in the area. In respect of the latter option the time frames for the review are likely to result in undue delay for development.

Accordingly only Options 1 and 2 are considered in more detail below.

The use of the Appendix G provisions is considered to be the most appropriate in implementing the buffer area and the application of the amenity provisions in the Industrial 1 Zone. Appendix G is an existing mechanism in the WARMP and is utilised for property specific provisions such as the ones proposed here. The alternative to utilising the Appendix G provisions is to insert provisions in the Urban Residential, Industrial and Subdivision rules but given the one off nature of the issue, the Appendix G provisions are considered administratively more efficient.

6.4 Objectives and Policies

It is not proposed to amend any of the existing objectives or policies in the WARMP. The provisions which are of most relevance to the Plan Change in terms of Section 32(1)(a) are found in Chapter 11.0 Urban Environments, Chapter 13.0 Open Space/Recreation and Chapter 19.0 Land Transport and these are discussed in more detail below.

11.0 Urban Environments

The Urban Environments Chapter recognises three major land use components in the urban environments – Residential, Business and Industrial. Section 11.2 Residential Environments and Industrial Area 11.4 are the most relevant to the Plan Change.

11.2 Residential Environments

The proposed Plan Change proposes to rezone the existing residential subdivisions (including Lot 15 DP 395434) to Urban Residential 2. The relevant objectives and policies relating to the zone are as follows:

11.2.2 Objectives and Policies

Objective 1 The maintenance and creation of residential environments which provide for the existing and future needs of the community

The relevant policies include Policy 1.1 which is to accommodate residential growth and development of Blenheim within the current boundaries of the town and Policy 1.2 which is to enable the development of infill sites where they can make use of the capacity of existing services, and any adverse effects on amenity values can be avoided.

Objective 2 To ensure that growth occurs in locations suitable for residential development

The relevant policies include Policy 2.1 which is to avoid development in areas subject to natural hazards and Policy 2.7 is to ensure urban growth does not adversely impact on the life supporting capacity of soils or on the productive capacity of rural land.

Objective 4 The maintenance and enhancement of the amenities and visual character of residential environments.

The relevant policies include Policy 4.1 which is to maintain and enhance the amenities and visual character of Urban Residential areas; Policies 4.3 and 4.4 to control the bulk and location of buildings and Policy 4.5 which is to maintain a low to medium density of development.

Objective 5 The development of residential areas at a rate which ensures the maintenance and enhancement of community health standards.

The accompanying policies (Policies 5.1-5.7) seek to ensure that services such as sewage disposal and water supply do not compromise community health or contaminate the environment.

Comment

Generally the plan change will achieve the Residential Environments objectives and policies. In particular the plan change area is located within the current boundaries of Blenheim; an infill site will be developed which makes use of existing services and amenity values will be able to be maintained to some extent with the introduction of the buffer area. The existing residential development is consistent with the Urban Residential 2 provisions in terms of bulk and location.

In terms of natural hazards, liquefaction is the most relevant. The geotechnical report for Lot 15 establishes that subject to specific subdivision design the site is suitable for residential purposes.

The productive capacity of soils is not affected by the rezoning given the existing urban nature of the relevant sites.

The site can also be serviced without difficulty in terms of Objective 5.

11.4 Industrial Areas

The proposed Plan Change proposes to delete the Industrial 1 Zoning in the specified areas. The relevant objectives and policies relating to the zone are as follows:

Objective 1 Containing the effects of industrial activity within the boundaries of industrial zones.

The relevant policies include Policy 1.1 which is to avoid, remedy or mitigate any adverse effects of industrial activity beyond the boundaries of Industrial Zones; Policy 1.2 which is to avoid, remedy or mitigate adverse effects within industrial areas; Policy 1.4 which is to enable light industry and service activities, along with general industrial activity, within the Industrial 1 Zones; Policy 1.8 which is to avoid, remedy or mitigate the effects of industrial activity on any adjoining residential areas; and Policy 1.11 which is to avoid, remedy or mitigate the effects of any discharges or waste generated by industrial activity.

Comment

Given the extent of existing residential development in the Industrial 1 zone the objectives and policies are not achieved.

In addition, Lot 15 DP 395434 is a rear site adjoining a number of residential activities and whose accesses also serve a number of residences. It is considered that the above provisions would not necessarily be achieved given the potential effects beyond the boundary on adjoining residential areas from industrial development of the lot.

The proposed amenity provisions will enable existing industrial activities to continue without undue restraint but the proposed buffer area provisions will assist to reduce effects on residential areas.

13.0 Open Space/Recreation

The proposed Plan Change proposes to rezone existing reserve and open space areas as Local Recreation Zone and Conservation. The relevant objectives and policies relating to the zone are as follows:

Objective 1 Open spaces and recreational facilities that are equitably distributed and conveniently located throughout the District.

The accompanying Policies 1.1-1.2 are to identify areas where there are deficiencies in the provision of open space and recreational facilities and to provide for these in convenient locations and accessible to users.

Objective 3 To recognise the role of reserves and covenanted areas in protecting and enhancing the natural environment.

The accompanying Policies 3.1-3.3 are to support the establishment of reserves including freshwater resources to maintain and enhance the District's conservation values.

Comment

The proposed rezoning of the existing reserves is consistent with the objectives and policies of Chapter 13 as they provide for the needs of the residents, and the reserves, particularly those adjacent to the stream by Tremorne Avenue and the drain, will enhance conservation values.

19.0 Land Transport

Chapter 19 sets out the policy framework for the district's land transport network. Roads were created at the time of subdivision and have vested in the Council as road reserve. Where roads vest in the Council, the Plan states in terms of General Rule 27.5.2.8.1 that such roads are designated. The Council's practice for designated roads is that these are not zoned in the Plan and the plan change will be consistent with this.

6.4.1 Benefits/Costs and Effectiveness and Efficiency

Options 1and 2 are summarised in terms of benefits/costs and effectiveness and efficiency in terms of Section 32 (1) and (2) of the RMA:

OPTION 1 Status Quo

Benefits / Costs	***Effectiveness / Efficiency***
Benefits • No change to WARMP so no costs for plan change preparation. • Lot 15 DP 395434 remains available for industrial development (although there is generally sufficient industrial land available elsewhere in Blenheim).[3] • The operation of existing industrial activities is not affected. • Management of reserve areas unlikely to change as a result of the zoning. **Costs** • In terms of the Industrial 1 Zoning, its provisions no longer reflect the existing development which undermines the integrity of the WARMP. • The Industrial I Zoning makes it more difficult to develop Lot 15 DP 395434 for residential purposes. • Residential development may not result in employment creation to the same extent as if it was developed for industrial purposes in the longer term. However, as indicated above, there is generally sufficient industrial zoned land in Blenheim and opportunities for employment are likely to remain the same if there is available land. • Development of land for industrial purposes may have an adverse impact on the amenity of surrounding residential environment, including those lots served by the existing accesses contained within Lot 15 DP 395434. • The Industrial 1 zoning unnecessarily constrains existing residential activities by requiring resource consent for activities ancillary to the residential use such as home stays and home occupations. • The existing zoning of the reserves may give a misleading picture of their purpose and potentially allows development of the areas for non-recreation/reserve purposes (although it is acknowledged the reserves are in Council ownership). • Doubts as to validity of consent notices attaching to Resource Consent No. U070331 authorising residential activities in Industrial 1 zone.	**Effectiveness** • Medium effectiveness as many of zone provisions are of limited relevance in terms of existing development. • Low effectiveness if consent notices attaching to Resource consent No.U070331 are not valid. **Efficiency** • Administration of the WARMP unlikely to be efficient given the existing activities differ from the zoning. • Use of Lot 15 DP 395434 for industrial purposes may not be efficient given adjoining residential activities.

[3] See Environment Court Decision Colonial Vineyard Ltd v MDC (Decision No [2014] NZEnvC 55) Paras 75-97

OPTION 2

Rezone sites to Urban Residential 2 (including provision of Appendix G provisions), Local Recreation, Conservation and Roads (as proposed)

Benefits / Costs	***Effectiveness / Efficiency***
Benefits • Existing provisions enable easier integration into WARMP • Rezoning better reflects development that has occurred within the rezoned area. • Buffer area provided to mitigate effects between Industrial 1 Zone and Urban Residential 2 Zone on Lot 15 DP 395434. • Amenity controls enable existing industrial activities to operate in accordance with Industrial 1 Zone provisions. • Local Recreation and Conservation zones are appropriate and can be applied with minimal change. • Local Recreation and Conservation zones better reflect the use of the areas and makes development of these resources for non-recreation/conservation activities more difficult should the occasion arise. • Removes doubt as to residential development authorised by consent notices attaching to Resource Consent No. U070331. • Removes the requirement for existing residential activities to apply for resource consent for ancillary activities such as homestays and home occupations. **Costs** • Residential zone will adjoin Industrial 1 Zone at the Lot 15 DP 395434 boundary which could result in adverse effects on residential activities and reverse sensitivity effects. However a buffer area is proposed to separate activities as it relates to habitable dwellings. Consent notices could be placed on certificates of title for residential development in respect of the buffer area and amenity provisions relating to adjoining industrial sites. • The potential for more intensive residential subdivision of Lot 15 DP 395434 is restricted by the existing accesses. • Additional traffic along the accesses may impact on existing lots in terms of safety and amenity. However these effects are likely to be less than those generated by industrial activities given the heavier nature of the vehicles. It is not	**Effectiveness** • Medium-High effectiveness as it recognizes existing development and provides specific mechanisms in the form of a buffer area and amenity provisions to recognize adverse effects (including reverse sensitivity effects) across the zone boundary. • Effectiveness may be affected by the necessity to apply for resource consent to increase the allotments that can be served by the existing accesses in respect of Lot15 DP 395434. • High effectiveness in removing doubts in respect of residential development allowed by consent notices attaching to Resource Consent No. U070331. **Efficiency** • Generally considered to be efficient as it recognises existing uses, enables a better use of Lot 15 DP 395434 and implements provisions to address the industrial/residential interface.

Benefits / Costs	*Effectiveness / Efficiency*
realistic to assume that Lot 15 DP 395434 will remain vacant.	

6.4.2 Risk of Uncertainty or Insufficient Information

In this section, the risk of acting or not acting where there is uncertainty or insufficient information about the subject matter of the policies, rules, or other methods is examined (Section 32(2)(c) of RMA). It is considered that generally there is not uncertain or insufficient information given the existing development in place and future development is likely to be of a conventional nature. There is some uncertainty of the nature of the effects across the zone boundary but the continuation of the existing activities without having to comply with the provisions relating to the proximity of residential activities, is balanced by the requirement to provide a buffer area on Lot 15 DP 395434.

There is some uncertainty as the number of allotments that can be subdivided from Lot 15 DP 395434 given the width of the existing accesses, but if the number is in excess of the permitted maximum, resource consent procedures are in place to assess such an application. Accordingly it is not considered this uncertain information is not a reason not to act. Subdivision of the site for industrial purposes is also restricted by the number of lots with a maximum of four allowed from an access.

In terms of liquefaction , the geotechnical report establishes that provided appropriate foundation design is undertaken residential development can proceed.

6.4.3 Determination

Overall, the proposed Plan Change to rezone the area Urban Residential 2 and Local Recreation is considered the most appropriate in achieving the purpose of the Act. The existing Industrial objective (and relevant policies) is not considered appropriate given the existing residential development that has occurred and the location of Lot 15 DP 395434. Development of the site for industrial purposes could result in adverse effects on surrounding residential areas. There is also doubt as to the validity of the consent notices, which in any event, were always intended as an interim measure until a variation/plan change was initiated.

The proposed provisions relating to the industrial/residential interface will however ensure the Industrial objective and policies are still applicable to the existing industrial operators in Timandra Place.

The plan change will better achieve the objectives and policies of the Residential Environments by recognising the existing residential development and providing for infill residential. The inclusion of a buffer area will assist in reducing adverse effects (including reverse sensitivity effects).

The objectives and policies of the Open Space Recreation Chapter will be better achieved by the plan change than the industrial and urban residential zoning given that the existing reserves are more in accordance with the provisions of the Local Recreation and Conservation zones. Similarly the removal of the zones from the existing roads is consistent with the WARMP provisions.

The benefits generally outweigh the costs and the plan change is considered to be more efficient and effective than the existing provisions. There is not insufficient or uncertain information that precludes the plan change.

Accordingly Option 2 is considered to better achieve the objectives and policies of the WARMP than retention of the status quo.

6.5 Section 72 of the RMA

Section 72 of the RMA states the purpose of a plan change is to assist authorities to carry out their functions in order to achieve the purpose of the Act. The functions of Council include “the integrated management of

the effects, use and development of land and associated natural and physical resources of the district" (Section 31(1) (a)).

Part 2 (Sections 5-8) sets out the purpose of the Act. The Industrial 1 Zone is not considered to be sustainable management in terms of Section 5 given the existing development in the zone and the potential adverse effects that could arise from permitted development. Residential development is considered to be a better outcome for the area while Local Recreation and Conservation zonings are more accurate and provide greater protection of the reserve assets.

The proposed plan change provisions are consistent with relevant existing objectives and policies relating to Residential Environments and Open Space/Recreation and as such can be assumed to meet the purpose of the RMA.

In terms of Section 6 of the RMA there are no matters of particular national importance that appear particularly relevant. The sites are not identified as being of significance in terms of landscapes, indigenous vegetation, or cultural and historical resources (Sections 6 (b), (c), (e), and (f) respectively). The rezoning should however assist in the preservation of the stream adjacent to Tremorne Avenue and the drain (Section 6 (a)).

Other matters in Section 7 of the RMA have been had regard to. The plan change should enable a more efficient use and development of resources on the site (Section 7(b)) while overall existing amenity values, ecosytems and the quality of the environment will at least be maintained and likely enhanced (Sections 7(c), (d),and (f) by the rezoning.

In terms of Section 8 Iwi have not indicated any opposition to the Plan Change.

6.6 Section 74 of the RMA

Section 74(1) of the RMA states Council shall change a district plan in accordance with its functions under Section 31 of the Act, Part 2 of the Act, Section 32 of the Act and any regulations (although it is acknowledged MDC is a unitary authority and the WARMP is a combined plan although regional functions are not considered particularly relevant). In changing a plan, regard must be had to any strategies prepared under other Acts (section 74(2)(b) of the Act).

The functions of Council, Part 2 and Section 32 are dealt with above. In respect of other strategies the most relevant are the Council growth strategy documents which were prepared under the Local Government Act 2002 and the final document Growing Marlborough adopted by Council in March 2013. The proposed rezoning is not in conflict with the growth strategy as it envisages infill residential development. There is also sufficient industrial land provided so as not to make Lot 15 DP 395434 a critical asset in terms of supply.

No other strategies are considered relevant.

6.7 Section 75 of the RMA

Section 75 (3) of the RMA states effect must be given to any national policy statements and the regional policy statement.

There are not any national policy statements that are considered to be particularly relevant.

The Marlborough Regional Policy Statement (RPS) was made operative in 1995. The RPS does not directly address the issue of residential development site but the following objectives and policies are considered to have some relevance to the plan change.

7.1.2 OBJECTIVE – QUALITY OF LIFE

To maintain and enhance the quality of life of the people of Marlborough while ensuring that activities do not adversely affect the environment

7.1.7 POLICY - AMENITY VALUES

Promote the enhancement of the amenity values provided by the unique character of Marlborough settlements and locations

7.1.9 OBJECTIVE – PROVISION FOR ACTIVITIES

To enable present and future generations to provide for their wellbeing by allowing use, development and protection of resources provided any adverse effects of activities are avoided, remedied or mitigated.

7.1.10 POLICY - TYPE, SCALE & LOCATION OF ACTIVITIES

To enable appropriate type, scale and location of activities by:

- *clustering activities with similar effects;*
- *ensuring activities reflect the character and facilities available in the communities in which they are located;*

7.1.14 OBJECTIVE - COMMUNITY INFRASTRUCTURE

Provide for the safe and efficient operation of community infrastructure in a sustainable way.

7.1.21 POLICY - NETWORK UTILITIES AND PUBLIC WORKS

Enable the maintenance, enhancement and operation of utility networks needed by the community to ensure their health, safety and wellbeing.

The plan change site is consistent with the above provisions in that:

- It will provide for housing while not causing adverse effects on the environment
- The quality of life and amenity values will be protected by the proposed zoning and ensure adverse effects are avoided, remedied or mitigated. The residential activities are effectively "clustered".
- The sites are serviced by reticulated infrastructure.
- The zoning of the reserve areas will provide greater certainty and protection in terms of their assets thereby enhancing amenity values.

As such the plan change will give effect to the RPS.

7 Conclusion

Based on the assessment above, the overall conclusion is that the proposed plan change better achieves the objectives of the Wairau/Awatere Resource Management Plan than the existing Plan provisions. It is also concluded that the benefits of the proposed plan change outweigh the costs.

This plan change is considered necessary in order to have zones applied to the sites, that reflect existing development and the previous Council decisions in relation to the sites. Further, the scheduling of a number of sites in relation to setback and other amenity requirements is considered the most appropriate means of protecting rights while at the same time providing an amenity that is compatible with the uses of these parcels of land and the surrounding sites.

The Council considers that the process it has gone through has assisted in reaching a point where the proposed change to the WARMP will ultimately achieve better outcomes for the community.

Appendix 1

MARLBOROUGH
DISTRICT COUNCIL
ISO 9001:2000
Form Ref CI 607

Section 127 of the Resource Management Act 1991

In the Matter of an Application to Change or Cancel Conditions of Resource Consent

File Reference:	U070331
Consent Holder:	J and R K de Castro Limited
U070331 is a Resource Consent to:	Subdivide Lot 1 DP 336896 and Lot 3 DP 352510 to create 15 allotments ranging in size from 500 square metres to 1.4 hectares and to erect dwellings on the residential lots created
Location:	Tremorne Avenue, Blenheim
Proposal:	To cancel condition 2 of the Land Use (Activity) consent
Condition 2 Presently States:	*"That an acoustic fence at least 2 metres high shall be erected along the northern boundary of the northern access leg to Lot 15. The design and completed construction shall be certified by an acoustic engineer, and the certification shall be provided to the Council"*

Decision on Application to Change or Cancel Conditions of Resource Consent

Pursuant to Section 127 of the Resource Management Act 1991 the following decision has been made by the Marlborough District Council:

To cancel condition 2 of the Land Use (Activity) consent

Reasons for Decision

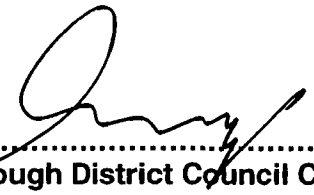
Condition 2 of the Land Use (Activity) consent was included in error in the decision document.

Initial

Other Matters

This decision is to be read in conjunction with the original decision dated 29 June 2007 and attached.

Authorised under the Marlborough District Council's Instrument of Delegation by:



.....

Marlborough District Council Commissioner

Dated this 16th **day of** OCTOBER **2007**

MARLBOROUGH
DISTRICT COUNCIL

ISO 9001:2000
Form Ref CI 711

RC

RESOURCE MANAGEMENT ACT 1991

Decision on Application for Resource Consent

RESOURCE CONSENT No: U070331

APPLICANT: J & RK de Castro Limited

This document contains a record of decision(s) on the following application for resource consent(s):

SUBDIVISION (ALLOTMENT CREATION)

LAND USE (ACTIVITY)

DECISION DATE:

29 June 2007

MARLBOROUGH DISTRICT COUNCIL
SEYMOUR SQUARE, P O BOX 443
BLENHEIM
NEW ZEALAND

TELEPHONE (0064) 3 520 7400
FACSIMILIE (0064) 3 520 7496
EMAIL mdc@marlborough.govt.nz
WEB www.marlborough.govt.nz

Important Information

A resource consent is comprised of:

- A decision document (subject to the outcome of any appeals/objections), and;
- The application for resource consent, except where modified by conditions.

An information sheet is attached which sets out the provisions of the Resource Management Act 1991.

It is important that you keep this document in a safe place; together with any future amendments that may be made to conditions of the resource consent.

RESOURCE CONSENT DECISION

Decision No: U070331

Applicant: J & RK de Castro Limited

Location of Activity: Tremorne Avenue, Blenheim

Legal Description: Lot 1 DP 336896 and Lot 3 DP 352510

Grid Reference:

Easting	2590967
Northing	5964809

Subdivision (Allotment Creation)

Pursuant to the Resource Management Act 1991 a resource consent has been GRANTED:

- Subdivision of Lot 1 DP 336896 and Lot 3 DP 352510 to create 15 allotments ranging in size from 500 square metres to 1.4 hectares.

This resource consent is subject to compliance with the following conditions:

01 That the subdivision shall proceed in general accordance with the application and scheme plan prepared by Connell Wagner Limited, Project No. 23097.001, Drawing No. R001, Rev. 02, dated 19 January 2007 and held on Council file U070331.

Power

02 That totally underground electrical reticulation shall be provided to all lots. (Note: a site may need to be provided for a transformer.) The consent holder shall liaise with an authorised electricity supplier for the provision of reticulation and then lodge with the Council written confirmation from that authorised supplier that the lots have been adequately serviced with low voltage electricity reticulation.

Telecommunications

03 That totally underground telecommunications reticulation shall be provided to all lots. The consent holder shall liaise with an authorised telecommunications supplier for the provision of reticulation and then lodge with the Council written confirmation from that authorised supplier that the lots have been adequately serviced with telecommunications reticulation.

Road

04 That a 3.5 metre wide concrete vehicle crossing shall be constructed from the kerb to the boundary of each lot and widened where necessary to ensure that a 99 percentile car can track within the vehicle crossing.

05 That a 6 metre wide heavy duty vehicle crossing shall be constructed from the kerb to the boundary at both access legs to Lot 15 (shown as rights of way "A" and "C" on the scheme plan).

Initial

Landscaping

06 That landscaping required under the conditions of the land use consent shall be completed prior to release of the section 224 certificate.

Minimum ground level

07 That all lots shall have a finished ground level of not less than RL 13.80 metres (Marlborough District Council Services Datum). On completion, the works shall be certified by a registered surveyor or a chartered professional engineer.

Storm water

08 That storm water mains designed to comply with Council's code of practice for subdivision and land development shall be installed to serve the subdivision.

09 That a 100mm diameter storm water laterals shall be installed to serve each lot.

Water

10 That water mains designed to comply with Council's code of practice for subdivision and land development shall be installed the full length of the right of way shown as "A" on the scheme plan, with a fire hydrant placed at the eastern end.

(Note: The Council will not accept a proposal to install a main along the right of way shown as "C" on the scheme plan, nor will the Council accept a ring main through private property for reasons of risk management. The applicant has amended the engineering drawings to reflect this requirement.)

11 That water laterals shall be installed to serve each lot as follows:

a) The consent holder shall install the laterals and tobys to Lots 1, 2 and 3.

b) The consent holder shall pay a connection fee of $875.00 incl GST per connection to the existing water main, ie. 11 connections (Lots 4 -14) x $875.00 = $9,625.00 incl GST.

12 That individual 25mm ID water pipelines shall be installed from water lateral valve boxes at the road boundary and shall be extended within the rights of way to the boundary of Lots 4, 7, 9, 13 and 14.

Sewer

13 That sewer mains designed to comply with Council's code of practice for subdivision and land development shall be installed the full length of the subdivision. The Council will not accept a lesser standard than stiffness of SN8 for PVC pipes.

14 That sewer laterals shall be installed to serve each lot. The Council will not accept a lesser standard than stiffness of SN8 for PVC pipes.

Rights of Way/Access Legs to Lot 15

15 That the right of way shown as "A" on the scheme plan shall be formed and two-coat sealed to a minimum width of 6.5 metres together with the installation of services underground. Drainage channels and sumps shall be constructed to collect the storm water off the right of way.

16 That the right of way shown as "C" on the scheme plan shall be formed and two-coat sealed to a minimum width of 5.5 metres together with the installation of services underground. Drainage channels and sumps shall be constructed to collect the storm water off the right of way.

Initial

17 That the right of way shown as "B" on the scheme plan shall be formed and two-coat sealed to a minimum width of 2.5 metres together with the installation of services underground. Drainage channels and sumps shall be constructed to collect the storm water off the right of way.

18 That a 1.4 metre wide concrete footpath shall be constructed along the side of the rights of way shown as "A" and "C" on the scheme plan.

Construction

19 That a site management strategy shall be prepared and submitted for approval to the Team Leader, Resource Consents, Marlborough District Council. The strategy must be approved by the Team Leader at least 5 working days prior to any construction work commencing on site.

The site management strategy shall address the matters listed in rule 2.17.3 (Standard Requirements), but shall include the following minimum specific provisions:

(i) That a water cart shall be available to prevent dust resulting from site works from adversely affecting the residential development nearby.

(ii) That only the land required for the proposed roads and underground service routes shall be opened up by works and completed before any grassed areas on lots are disturbed by excavation/cultivation.

(iii) Hours of work shall be restricted to the following: 7.00am - 6.00pm during summer Monday to Saturday inclusive, or 7.30am - 6.00pm Monday to Saturday during winter months. No work should be permitted outside these hours, or on Sundays or Public Holidays unless for emergencies

20 That all construction work shall be in accordance with the approved site management strategy.

21 That the consent holder shall give 5 days notice in writing to the Marlborough District Council of intention to commence work on each stage.

Easements

22 That the right of way easements appurtenant to the appropriate lots as indicted in the application shall be created and duly granted or reserved pursuant to section 220(1)(f) of the Resource Management Act 1991.

23 That the necessary service easements shall be created and duly granted or reserved pursuant to section 220(1)(f) of the Resource Management Act 1991.

Financial contributions

24 That a contribution of $500.00 + GST towards the district roading network shall be paid by the consent holder for each new lot created, with the exception of Lot 15, i.e. 14 x $500.00 = $7,000.00 + GST = $7,875.

25 That a sewer network upgrade levy of $1,520.00 incl GST (CCI Dec 2006) per site shall be paid, i.e. 13 x $1,520.00 = $19,760.00 incl GST. The amount to be paid will be recalculated to the current CCI figure at time of payment.

26 That a water network upgrade levy of $18,299.00 incl GST (CCI Dec 2006) per hectare shall be paid, i.e. 0.84 hectares x $18,299.00 = 15,371.20 incl GST. The amount to be paid will be recalculated to the current CCI figure at time of payment.

Initial

Reserve Fund

27 That Council, being satisfied that the subdivision is adequately served by reserves, requires in terms of section 108(2)(a) of the Resource Management Act 1991, a reserve fund contribution assessed at 7.5% of the land value of 6 of the newly created allotments. The value shall be determined by a valuation acceptable to the Council, the fee for which shall be paid by the consent holder. The valuation shall not be older than 6 months at time of payment.

(Note: The figure of 6 lots was arrived at by subtracting 141 lots, being the number of residential lots originally approved under U001216, from the total number of residential lots which will have been created following approval of this application U070331. That is, 147 lots created minus 141 = 6 additional lots.)

Consent Notice

28 This subdivision has been granted on the basis that the Industrial 1 zoned land being subdivided shall be used for residential development and shall not be used for industrial purposes. The Council proposes to notify a variation to the Proposed Wairau/Awatere Resource Management Plan to rezone the Industrial 1 part of the land which is the subject of this application. Should that Variation not be sufficiently advanced at time of release of the section 224 certificate to ensure that the land in question can not be developed as of right for industrial purposes, it will be necessary to register a consent notice on the title of the relevant lots.

Accordingly, the following condition shall be complied with on a continuing basis by the future owners of lots wholly or partially zoned "Industrial 1" at time of subdivision:

"Lots 1 - 4, Lot 7, Lot 14 and Lot 15 shall not be used for industrial purposes. Instead, the Rules in the Proposed Wairau/Awatere Resource Management Plan for the Urban Residential 2 zone shall apply to those lots, until such time as the land has been rezoned to Urban Residential 2."

A consent notice pursuant to Section 221 of the Resource Management Act 1991 recording the above condition shall be registered on the titles to issue of Lots 1 - 4, Lot 7, Lot 14 and Lot 15. The consent notice shall be prepared by the Council and all costs associated with the preparation and registration of the notice shall be met by the consent holder.

Documentation

29 That drawings and specifications prepared by a chartered professional engineer or surveyor who has established credentials with the Council shall be provided for each stage of the subdivision. These plans and specifications shall be in the form prescribed by the code of practice for subdivision and land development and shall be submitted to the Council prior to any work commencing. The drawings shall be ""A1"" size at a scale of 1:500. A scale of 1:250 or 1:200 will only be permitted if the whole development plan fits on a single ""A1"" sheet at that scale."

30 That the engineering works shall be designed and carried out under the supervision of a chartered professional engineer, who shall certify all works immediately on completion. Schedules 1A, 1B and 1C from NZS 4404:2004 shall be completed by the certifying engineer and shall be provided to the Council to complete this condition. The certifying engineer is required to CCTV the sewer and storm water pipelines and to confirm that this has been completed at time of certification of the works.

31 That "as built" plans of all services and filled areas at a scale of not less than 1:500 shall be provided to the Council, and shall include coordinates (NZMG) of all surface features. The completed as built plans shall also be provided to the Council in an electronic form in CADD format.

Initial

32 That any land filling undertaken for residential development shall be designed and supervised by a chartered professional engineer and all fill works shall comply with NZS 4431:1989. On completion of the works, the supervising engineer shall provide the Council with a completed certificate in the form set out in NZS 4431:1989.

33 That at the first opportunity after earthworks are complete, when climate conditions are suitable for seed germination, all bare ground surfaces shall be sown with a suitable grass/legume seed mix.

Asset vesting

34 That the following schedule shall be completed for Council asset vesting. Note: only include items which the Council will be taking ownership of, i.e. do not include rights of way, but do include services protected by Council easement.

Vehicle crossing cost $.....

Water pipe (PVC) cost $.....

Water pipe (PE) cost $.....

Water valves/hydrants etc cost $.....

Sewer pipe cost $.....

Storm water pipe (PVC) cost $.....

Storm water pipe (concrete) cost $.....

Storm water pipe (steel) cost $.....

REASONS FOR DECISION

The proposed subdivision and subsequent development for residential purposes will be Stage 7 of the high quality residential development known as Camborne Green. The size and layout of the proposed lots is consistent with the style of development in previous stages, with the exception of Lot 15, which is a large lot intended to be used for integrated residential development.

The proposed lots meet the controlled activity standards for subdivision in the Urban Residential 2 and Industrial 1 zones. The Council intends in the near future to notify a variation to the Proposed Wairau/Awatere Resource Management Plan to rezone the Industrial 1 area of the land in question to Urban Residential 2. Until the variation is approved, conditions of consent will ensure that the plan rules for the Urban Residential 2 zone are applied to the industrial zoned land.

Subject to implementation of the recommended conditions of consent, the proposal is considered to be consistent with the objectives and policies for residential environments in the Proposed Wairau/Awatere Resource Management Plan. It is further considered that the recommended conditions will mitigate the effects of the proposal on the environment.

OTHER MATTERS

1. Unless otherwise specified, this is the full text of the decision.

Lapse Date

2. If no lapse date is specified in the conditions of this consent, the consent will lapse 5 years after the decision date, unless the consent has been actioned (given effect to).

   The lapse date is subject to the provisions of section 125 of the Resource Management Act 1991.

Initial

Appeal Information

3. If intending to appeal this decision, the appeal must be lodged with the Environment Court within 15 working days of the receipt of this decision.

Authorised under the Marlborough District Council's Instrument of Delegation by:

.....

Marlborough District Council Commissioner/Delegated Officer

Dated this 29th **day of** June **2007**

RESOURCE CONSENT DECISION

Decision No: U070331

Applicant: J & RK de Castro Limited

Location of Activity: Tremorne Avenue, Blenheim

Legal Description: Lot 1 DP 336896 and Lot 3 DP 352510

Grid Reference:

Easting	2590965
Northing	5964857

Land Use (Activity)

Pursuant to the Resource Management Act 1991 a resource consent has been GRANTED:

- To enable dwellings to be built on the residential lots created from the subdivision of Lot 1 DP 336896 and Lot 3 DP 352510.

This resource consent is subject to compliance with the following conditions:

Landscaping

1 That, as volunteered by the applicant, a landscape plan shall be provided to the Team Leader, Resource Consents for consideration and approval in conjunction with the Reserves and Amenities Manager, prior to the commencement of work. All approved landscaping shall be completed to the satisfaction of the Reserves and Amenities Manager. Maintenance of the landscaping shall be the responsibility of the consent holder.

2 That an acoustic fence at least 2 metres high shall be erected along the northern boundary of the northern access leg to Lot 15. The design and completed construction shall be certified by an acoustic engineer, and the certification shall be provided to the Council.

REASONS FOR DECISION

The Council intends in the near future to notify a variation to the Proposed Wairau/Awatere Resource Management Plan to rezone the Industrial 1 area of the land in question to Urban Residential 2. Until the variation is approved, residential activity on the lots zoned Industrial 1 would be a non-complying activity.

This Land Use consent will give a blanket approval to enable residential development to take place on the relevant lots, thereby avoiding the need for each future owner to apply for consent to use the land for residential purposes.

It is considered that the installation of landscaping along the northern boundary of the northern access leg to Lot 15 will mitigate the effects of industrial activity on the residential development.

Initial

OTHER MATTERS

1. Unless otherwise specified, this is the full text of the decision.

Lapse Date

2. If no lapse date is specified in the conditions of this consent, the consent will lapse 5 years after the decision date, unless the consent has been actioned (given effect to).

   The lapse date is subject to the provisions of section 125 of the Resource Management Act 1991.

Appeal Information

3. If intending to appeal this decision, the appeal must be lodged with the Environment Court within 15 working days of the receipt of this decision.

Authorised under the Marlborough District Council's Instrument of Delegation by:

.....

Marlborough District Council Commissioner/Delegated Officer

Dated this 29th **day of** June **2007**

IMPORTANT NOTES

01 Future development of Lot 15:

The consent holder's attention is drawn to the following matters regarding the future development of Lot 15:

(a) An appropriate buffer between the industrial area to the north will be required at time of development of Lot 15. The buffer will need to be a minimum of 6 meters wide.

(b) The relatively narrow access legs proposed to serve a future development on Lot 15 may limit development options for the lot. Should further subdivision of Lot 15 be contemplated, the number of lots/units served are unlikely to comply with the controlled activity standards for access in the Proposed Wairau/Awatere Resource Management Plan.

(c) A development levy or reserve fund contribution, and possibly a contribution to the District Roading Network, will be required at time of development of Lot 15.

02 Lots shall be numbered as follows:

Lot 1: 7 Tremorne Avenue
Lot 2: 7A Tremorne Avenue
Lot 3: 7B Tremorne Avenue
Lot 4: 9A Tremorne Avenue
Lot 5: 9 Tremorne Avenue
Lot 6: 11 Tremorne Avenue
Lot 7: 11A Tremorne Avenue
Lot 8: 13 Tremorne Avenue
Lot 9: 17A Tremorne Avenue
Lot 10: 15 Tremorne Avenue
Lot 11: 17 Tremorne Avenue
Lot 12: 23 Tremorne Avenue
Lot 13: 23A Tremorne Avenue
Lot 14: 23B Tremorne Avenue
Lot 15: 3, 5, 19 and 21 Tremorne Avenue

Reserve Fund contributions:

03 Lot 15 in this subdivision was considered to be the parent lot, therefore, no reserve fund contribution for that lot has been paid. At time of development or further subdivision of Lot 15, reserve fund contributions will be payable for the units/lots..

04 Te Runanga a Rangitane o Wairau requested that the following requirement be brought to the attention of the consent holder:

That if any artefacts or historical, cultural or archaeological sites are uncovered on the property, the following shall be complied with:

(a) Work shall cease immediately;

(b) Advice of the discovery shall be given, as soon as possible, to the Historic Places Trust and Te Runanga a Rangitane o Wairau;

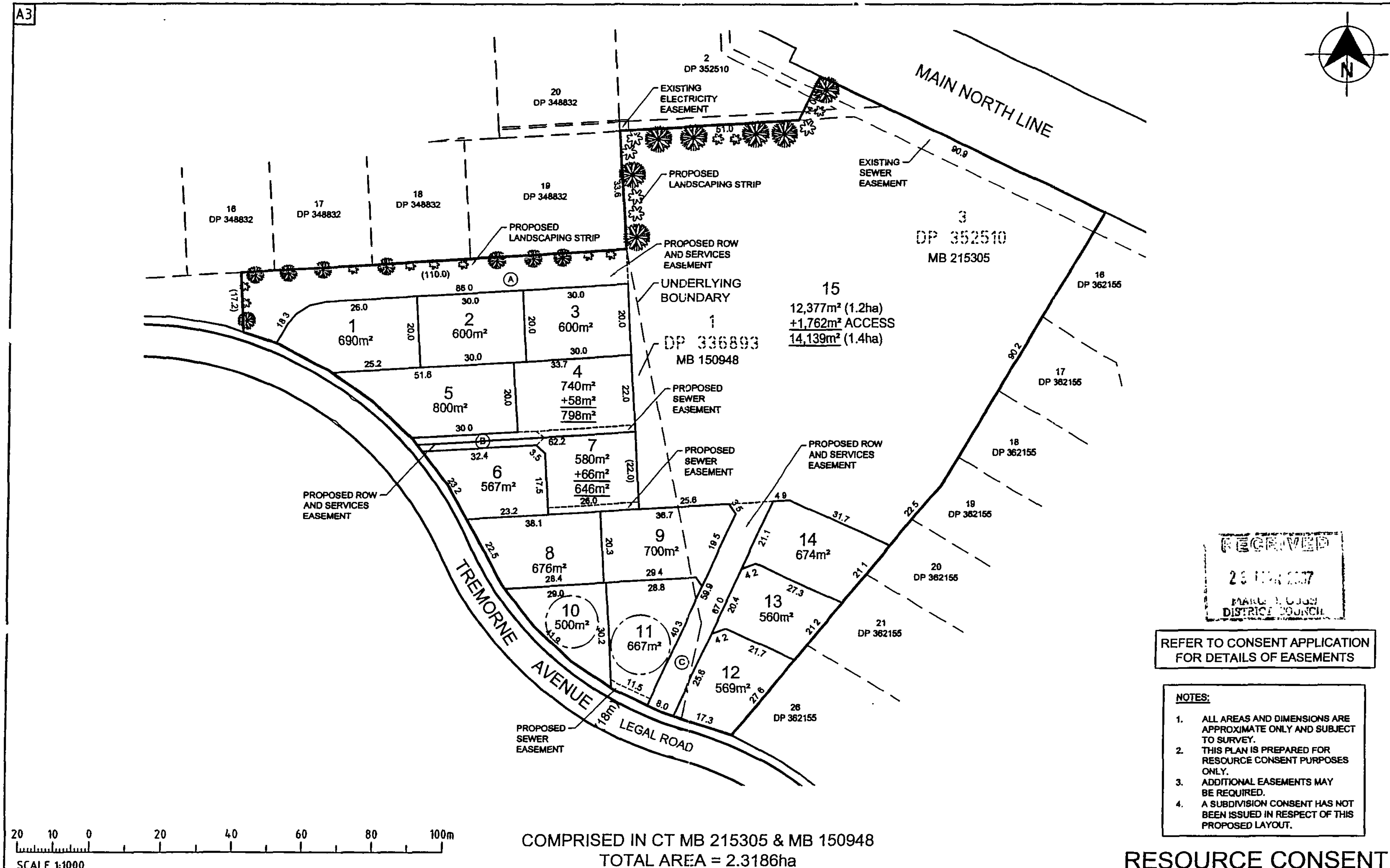
(c) No work shall recommence until 72 hours after advice has been given to the Historic Places Trust or Iwi, or agreement has been reached between the parties regarding appropriate protection measures, whichever is the sooner.

The consent holder is also referred to section 1.4.2 , Urban Residential Zones, in the Proposed Wairau/Awatere Resource Management Plan, which states that: ""Notwithstanding any permitted activity status herein, an authorisation from the New Zealand Historic Places Trust is required before any person may destroy, damage or modify the whole or part of any historical, cultural or archaeological site".

ANNOTATION HISTORY

Date	Reason for Amendment/Alteration
16/10/07	To cancel condition 2 of the land use (activity) consent.

\\dkl....O:\Resourceconsent\2007\070251-070500\U070331-J & RK de Castro Limited-Decision Document.doc Saved 12/10/2007 09:40:00



REFER TO CONSENT APPLICATION FOR DETAILS OF EASEMENTS

NOTES:

1. ALL AREAS AND DIMENSIONS ARE APPROXIMATE ONLY AND SUBJECT TO SURVEY.
2. THIS PLAN IS PREPARED FOR RESOURCE CONSENT PURPOSES ONLY.
3. ADDITIONAL EASEMENTS MAY BE REQUIRED.
4. A SUBDIVISION CONSENT HAS NOT BEEN ISSUED IN RESPECT OF THIS PROPOSED LAYOUT.

COMPRISED IN CT MB 215305 & MB 150948

TOTAL AREA = 2.3186ha

RESOURCE CONSENT

No.	Date	Revision Details	By	Ver	App.
02	26.03.07	ISSUED FOR RESOURCE CONSENT	LK		
01	19.01.07	ISSUED FOR INFORMATION	LK		

Connell Wagner

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Client: J & RK de CASTRO LIMITED

Project: CAMBORNE GREEN DEVELOPMENT STAGE 7

Drawn	Signed	Date
LK		19.01.07
Designed: VAN	Signed	19.01.07
Verified	Signed	Date
Approved	Signed	Date

Drawing Title: LOTS 1 – 15 BEING A SBDN OF LOT 1 DP 336893 AND LOT 3 DP 352510

CW Project No. 23097.001

Scale 1:1000

Drawing No. R001 Rev. 02

Appendix 2

aurecon

3 Tremorne Avenue, Blenheim
Geotechnical Investigation Report

Reference: 239195

Prepared for: J & RK de Castro Ltd (In Receivership)

Revision: 1

28 November 2013

Document control record

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Client		J & RK de Castro Ltd (In Receivership)	**Client contact**			
Rev	**Date**	**Revision details/status**	**Prepared by**	**Author**	**Verifier**	**Approver**
0	21 November 2013	Draft for review	T. Plunket	T. Plunket	-	-
1	28 November 2013	Issue to client	T. Plunket	T. Plunket	J. Muirson	I. McPherson
Current revision		**1**				

Approval			
Author signature		Approver signature	
Name	T. Plunket	Name	I. McPherson
Title	Geotechnical Engineer	Title	Technical Director

Contents

Appendices

Executive Summary

The property at 3 Tremorne Avenue in Blenheim is currently an undeveloped area of land located on the east side of Blenheim. J & RK de Castro Ltd (In Receivership) has engaged Aurecon New Zealand Ltd to provide a geotechnical engineering assessment of the property, which is to be provided to prospective purchasers of the property.

Aurecon undertook an investigation comprising six cone penetration tests, four hand auger boreholes and four dynamic cone penetrometer tests. The geotechnical information indicates the site is underlain by *Stiff to Hard* Silts underlain by *Medium Dense to Dense* Gravels with interbedded layers of *Medium Dense* Sands to the depth of the investigation (6.8m). The groundwater was measured at approximately 1.3m below ground level at the site during at the time of the investigation.

The liquefaction analysis indicates the site has a liquefaction potential. Liquefaction induced settlements and potential ground damage are likely to be limited in a serviceability limit state (SLS) but in larger earthquake events liquefaction induced settlements in the order of 20mm to 50mm could occur and the induced ground damage is likely to be minor to moderate. The level of ground damage is likely to be dictated by the dense gravel layer present underlying the site. The liquefaction assessment is detailed in this report.

Lateral spreading associated with the Opawa River is likely to have limited effect on the site but the site could be affected by lateral spreading associated with the stormwater drain to the south.

As the site has liquefaction potential, buildings will require enhanced foundations. For residential buildings such foundation systems that could be used are detailed in the MBIE Guidelines (2012). Based on our assessment an enhance raft foundations may be suitable provided the building is a typical light weight residential structure but this would need to be confirmed with additional geotechnical testing if the site is developed.

If the site is to be used for industrial purposes then any buildings will require specific foundation design, which allows for the liquefaction potential and associated settlements.

Based on the DCP results a Geotechnical Ultimate Bearing Capacity of 200kPa is available from a depth of 0.2m below existing ground level.

If the site is to be developed for residential or industrial purposes further geotechnical investigation will be required. The geotechnical investigations should include geotechnical boreholes to confirm the ground conditions at depth as well as fully quantify the liquefaction potential.

This report shall be read as a whole. Our limitations are attached as Section 6 of this report.

1. Introduction

The property at 3 Tremorne Avenue in Blenheim is currently an undeveloped area of land located on the east side of Blenheim. The property owner is in receivership and as part of the receivership process the site is to be sold. As part of this process a geotechnical investigation has been requested to provide prospective purchases an indication of the ground conditions and potential geotechnical issues.

J & RK de Castro Ltd (In Receivership) has engaged Aurecon New Zealand Ltd to provide a geotechnical engineering assessment of the property, which is to be provided to prospective purchasers of the property. Currently the site is held in one title and it is unknown whether it would be developed for residential or industrial purposes.

Aurecon has undertaken the following as part of the geotechnical investigation:

- Review of readily available published records/reports.
- A site walk over and reconnaissance of the direct surroundings to determine any site specific hazards from a geotechnical perspective.
- Undertake six Cone Penetration Tests (CPT) to assess the nature of the soil at depth.
- Carry out four Dynamic Cone Penetration Test (DCPs) and four hand auger boreholes to obtain information on the near surface soil profile.
- Undertake a detailed liquefaction assessment using the onsite testing and CPT logs .
- Prepare a geotechnical report which details our geotechnical investigation, liquefaction assessment and the potential geotechnical issues with the site.

The conditions of our engagement and our limitation are set out in our fee proposal dated 15 October 2013. Authorisation for the works was given via a signed short form agreement on 29 October 2013.

2. Site Conditions

2.1 Site Description

The site is located at 3 Tremorne Avenue in Blenheim as shown in Figures 1 and 2 in Appendix A and has a legal description of Lot 15 DP395434. The main features are as follows:

- The site is approximately 1.4 hectares in plan area.
- The site is surrounded by residential and light industrial properties apart from the north-western boundary which is bounded by a railway line.
- The site is mostly flat apart from an area of stockpiled soils on the northern boundary.
- The site is located approximately 600m south of the Opawa River.
- The site is vegetated by grass including the stockpile.
- There are no buildings on site.
- We understand parts of the site have had at least 0.8m of structural fill placed.

2.2 Site Access

The site is accessed from Tremorne Avenue via two Right of ways driveway entrances. The first entrance is located on the southern property boundary and the second entrance is on the western property boundary.

2.3 Drainage

No open water channels are present on site but we understand that underground utility services (including reticulated sewer and stormwater lines) are present onsite.

2.4 Regional Geology

The regional geology of the site is described by GNS Geological Unit QMap as "*Swamp deposits consisting of poorly consolidated silt; mud; peat and sand (Q1a)*".

3. Geotechnical Investigation

3.1 Objective and Scope

The objective of the geotechnical investigations was to obtain information on the ground and groundwater conditions for the geotechnical assessment of the site. The scope of works comprised the following:

- A review of historic subsurface information including geotechnical information published in the recent Blenheim Urban Growth Study Geotechnical Evaluation.
- A review of regional seismicity and earthquake hazards.
- Undertaking six Cone Penetration Tests (CPT) to determine the nature of the soil profile at depth and to provide information for a liquefaction assessment.
- Carrying out four hand auger boreholes and four Dynamic Cone Penetrometer (DCP) tests to provide information on the near surface soil profile.

The results of the reviews and site investigation are described in the following sections.

It is noted that the site is currently held in one title and it is unknown whether it would be developed for residential or industrial purposes. Therefore the level of investigation detailed above has been carried out to allow a preliminary assessment of the ground conditions. If the site is developed for residential or industrial purposes then further geotechnical investigation will be required.

3.2 Historical Subsurface Information

The Marlborough District Council GIS System (MDC 2013) has been reviewed to identify borehole logs near the site. The approximate locations are shown in Figure 2 in Appendix A, and a summary of the borehole logs are provided in Table 1.

Table 1 – Summary of Marlborough District Council Borehole Logs

Hole Reference	Approximate Distance From Site	Summary of Log
P28W/0702	45m West	"*Soil*" to 0.6m. "*Sandy yellow clay and blue pug*" to 2.7m. "*Water-bearing gravel*" to end of borehole at 3.7m.
P28W/0715	40m East	"*Soil*" to 0.5m. "*Sandy yellow clay grading into blue pug*" to 2.5m. "*Black sand and gravel*" to 14.6m. "*Tight clay bound gravel*" to 16.2m. "*Water-bearing gravel*" to end of borehole at 16.8m.
Well 10466*	400m North West	Topsoil to 0.6m. Silt to 2.6m. Gravelly Sand to 3.7m. Predominantly Gravel to 8.0m with a layer of Sand between 6.4m and 6.9m. Sand to 9.4m. Silt to 11.0m. Predominately Sand and Silty Sand to 13.6m. Clayey Silt to 15.4m. Silty Sandy Gravel to end of borehole at 18.47m.

*Well 10466 included as comprises a good quality geotechnical borehole log carried out as part of MDC sewer upgrade.

These borehole logs indicate that gravel is present from approximately 3m depth which in underlain by sand and silts from a depth of 8m with further gravel layer at 15.5m depth.

3.3 Blenheim Urban Growth Geotechnical Evaluation

The Marlborough District Council has undertaken a Blenheim wide geotechnical assessment to identify the land suitable for future development. The assessment was carried out for the Marlborough District Council by Opus International Consultants and the results are presented in the following reports.

- Blenheim Urban Growth Study Geotechnical Evaluation, Site Investigations Factual Report, dated March 2012
- Blenheim Urban Growth Study Geotechnical Evaluation, Interpretive Report, dated May 2012.

The site of interest was not directly covered by this assessment but land to the east and south was included. As part of the assessment geotechnical investigation comprising of CPTs and geotechnical boreholes were undertaken, of which one borehole and three CPTs are nearby. The approximate locations are shown in Figure 2 in Appendix A, and a summary of the logs are provided in Table 2.

Table 2 – Summary of Urban Growth Geotechnical Data

Hole Reference	Approximate Distance From Site	Summary of Log
BH3	850m South	Clayey Silt to 2.5m. Sandy Silt to 7.0m. Sandy Silty Gravel to 14.0m. Silty Gravel to end of borehole at 15.0m.
CPT7	360m North East	Sands and Silts to 3m. Medium dense Sands with layers of Silts and Loose Sands to 13m. Silts to refusal of CPT at 17.5m*.
CPT10	480m South East	Sands and Silts to 5m. Medium dense Sands with thin Silt layers to 9m. Medium dense Sands to 13.5m. Silts to refusal of CPT at 18.5m*.
CPT13	600m South	Sands and Silts to 3.0m. Predominately medium dense Sands to 9.5m. Silts to 10.5m. Silts and Sands to 12.0m. Silts to 15.0m. Silts and Sands to refusal of CPT at 16.4m*.

*Refusal of CPTs likely at the start of dense gravelly layer.

These CPT results indicate to the south ground conditions comprise of silt and loose sand overlying medium dense to dense sand and gravel from a depth of 5m, which in turn is underlain by silt and sand from a depth of 10m. The borehole further to the south indicates sandy silt to approximately 7m overlying gravel to a depth of 15m. To the east the CPTs indicate silt overlying loose to medium dense sand and gravel, which in turn is underlain by sand from a depth of 13m to 18m.

To the south the ground conditions in CPT13 appear to be similar to those of the Marlborough District Council boreholes logs near the site, while to the east the ground conditions appear to vary. The borehole log indicates consistent gravel layer from a depth of 7m but as the borehole is located closer to the Wither Hills the presence of the consistent gravel layer is not unexpected.

3.4 Regional Seismicity and Earthquake Hazard

Blenheim is located within an area of high seismicity, as shown by the recent earthquakes focused around the Cook Straight. It is also located near the active Wairau and Awatere faults. The two largest historical earthquakes of Magnitudes 7 or greater occurred on the Awatere Fault in 1848 and the Hope fault in 1888 (Robertson and Smith 2004).

Using historical seismicity, Smith and Berryman (1983) estimated that an earthquake is likely to produce ground shaking in Blenheim of Modified Mecalli Intensity MM VII approximately once every 58 years, and MM IX approximately once every 210 years.

The site is located in close proximity to a number of active faults. The summary data for average return times and maximum magnitudes for the Marlborough faults are shown in Table 3.

Table 3 – Marlborough Faults – Average Return Time and Maximum Magnitude (data from Benson et al. 2001 and Stirling et al. 1998)

Fault	Average Return Period (years)*	Maximum Magnitude (M_w)
Wairau	1000-2300	7.9
Awatere	577-1607	7.8
Clarence	900	7.5
Kekerengu	788	7.2
Elliot	1064	6.9
Jordon	1808-3357	7.2
Hope NE **(1888)** **SW**	100-300 120 100-300	7.3 7.3 7.3

***Ranges are derived from estimates of intervals between individual inferred paleo-earthquakes.**

Based on earthquake scenario modelling undertaken by Robertson and Smith (2004) it has been estimated that the site will be affected mostly by movement on the Awatere and Wairau faults. It is estimated that the Awatere fault will likely cause a PGA between 0.1g and 0.5g with Magnitudes between M7.6 and M8.9, and the Wairau fault will likely cause a PGA between 0.3g and 0.9g with Magnitudes between M8.3 and M9+.

3.5 2013 Aurecon Investigations

The investigation comprised of six CPTs, four hand auger boreholes and four DCPs carried out over the site. These tests are discussed in the following sections.

3.5.1 CPT Results

Six CPTs were undertaken by McMillian Drilling Group on 11 November 2013 to effective refusal between depths of 2.6m and 6.8m. Groundwater was measured in all holes after the completion of testing. The locations of the CPTs are shown on Figure 3 in Appendix A and logs are shown in Appendix B. The logs are summarised in Table 4.

Table 4 – Summary of CPTs

Test Reference	Depth to Groundwater (m bgl)	Summary of Log
CPT1	1.30	Interbedded Sands, Silty Sands, Sandy Silts and Silts to 2.7m. Sandy Gravels to Dense Sands to the refusal of the CPT at 3.3m.
CPT2	1.35	Interbedded Silty Sands, Sandy Silts and Silts to 2.6m. Sands to 3.0m. Sandy Gravels to Dense Sands to the refusal of the CPT at 3.3m.
CPT3	1.35	Interbedded Sands, Silty Sands, Sandy Silts and Silts to 3.4m. Predominately Sandy Gravels to Dense Sands with layers of Sands to the refusal of the CPT at 6.8m.
CPT4	1.30	Interbedded Silty Sands, Sandy Silts and Silts to 2.0m. Sands to 2.2m. Sandy Gravels to Dense Sands to refusal of CPT at 2.6m.
CPT5	1.30	Interbedded Silty Sands, Sandy Silts and Silts to 2.1m. Sands to 2.3m. Sandy Gravels to Dense Sands to refusal of CPT at 3.0m.
CPT6	1.25	Interbedded Silty Sands, Sandy Silts and Silts to 2.4m. Sands to 2.9m. Sandy Gravels to Dense Sands to refusal of CPT at 3.2m.

Due to the presence of the dense sand and gravel from a shallow depth the CPTs refused at shallow depths. However one CPT did achieve a depth of 6.8m and the soil profile of the CPT is similar to that of the Marlborough District Council borehole information and the Urban Growth geotechnical information to the south of the site. This would indicate a reasonably consist soil profile through the area with sand and silt to 3m depth overlying medium dense to dense sand and gravel to approximately 8m, which in turn is underlain by sand and silt to at least 15m depth.

3.5.2 Hand Auger Boreholes and Dynamic Cone Penetrometer Tests

Four hand auger boreholes and four dynamic cone penetrometer tests (DCP) were undertaken around the site. The DCPs were undertaken beside the hand auger boreholes. The DCPs encountered effective refusal at depths between 2.3m and 3.2m. The hand augers were terminated when it became too difficult to auger due encountering *very stiff* silts between depths of 1.2m and 1.45m.

The test locations are shown in Figure 3 in Appendix A and the logs are shown in Appendix C together with an explanatory sheet outlining the terms and symbols used on the hand auger logs. The hand auger borehole logs and DCP logs are summarised in the following tables.

Table 5 – Summary of Hand Auger Boreholes

Test Reference	Depth to Groundwater (m bgl)	Summary of Log
HA1	Not encountered	Topsoil/Fill to 0.15m. Silt to end of borehole at 1.45m.
HA2	Not encountered	Topsoil/Fill to 0.1m. Silt to end of borehole at 1.2m.
HA3	Not encountered	Topsoil/Fill to 0.1m. Silt to end of borehole at 1.2m.
HA4	Not encountered	Topsoil/Fill to 0.15m. Silt to end of borehole at 1.25m.

Table 6 – Summary of DCP tests

Test Reference	Depth of Test (m bgl)	Depth at Which DCP Shows Consistently Greater than 2 Blows per 100mm of Penetration (m bgl)	Depth at Which DCP Shows Consistently Greater than 5 Blows per 100mm of Penetration (m bgl)
DCP1	2.9	Ground Surface	1.7
DCP2	3.2	Ground Surface	1.6
DCP3	2.3	Ground Surface	1.2
DCP4	2.8	Ground Surface	1.2

4. Engineering Considerations

4.1 General

The property at 3 Tremorne Avenue in Blenheim is currently an undeveloped area of land located on the east side of Blenheim. As part of the receivership process a geotechnical investigation has been requested to provide prospective purchases an indication of the ground conditions and potential geotechnical issues. It is unknown whether the site will be developed for residential or industrial purposes.

Based on the geotechnical investigation results the geotechnical aspects that need to be considered for this site are as follows:

- Ground conditions based on our geotechnical investigation results and surrounding geotechnical information.
- Site flexibility.
- Liquefaction potential.
- Foundation conditions.

Each of these is discussed in the following sections.

4.2 Ground Model

Based on the investigation results we infer the following ground model for the site.

Table 7 – Summary of ground conditions underlying 3 Tremorne Avenue

Geological Unit	Depth to Top of Unit (m)	Depth to Bottom of Unit (m)	Material
1	0 (Ground Surface)	0.1 to 0.15	Topsoil
2	0.1 to 0.15	2.1 to 3.4	*Stiff to Hard* Silts
3	2.1 to 3.4	6.8+ (Depth of Investigation)	*Medium Dense to Dense* Gravels with interbedded *Medium Dense* Sands

The ground water level is likely to be at approximately 1.3m depth and artesian at depth.

The level of investigation was carried out to allow a preliminary assessment of the ground conditions. Further geotechnical investigation will be required as part of any site development and should include geotechnical boreholes.

4.3 Site Subsoil Classification

We have assessed the site flexibility on the following:

- Logs indicate underlying ground conditions consist of predominately silts, sands and gravels to a depth of 18.47m below ground level (i.e. deepest investigation in close proximity to the site) and investigations around Blenheim show these layers extend to significant depths.
- Clause 3.1.3 and Table 3.2 of NZS 1170.5:2004.

We consider the site subsoil category in terms of NZS 1170.5:2004 Clause 3.1.3.2 as Class D (Deep Soil Site).

4.4 Liquefaction Assessment

4.4.1 General

Under cyclic loading (i.e. during an earthquake) loose, non-cohesive materials such as gravels, sands, silty-sand, tend to decrease in volume. This tendency to decrease in volume is much greater in loose than in dense soils. When loose non-cohesive soils are saturated and rapid loading occurs under undrained conditions, soil densification causes pore water pressure to increase. This increase in pore water pressure results in a loss of soil strength due to a decrease in effective stress and eventually liquefaction occurs when the effective stress drops to zero. Liquefaction can lead to large displacements of foundations, flow failure of slopes and ground surface settlement, sand boils, and post-earthquake stability failures.

In determining the liquefaction potential at the site, the main factors to be considered are:

- Which layers will liquefy?
- What is the likelihood of liquefaction?
- How potential liquefaction could affect development of the site?

Each of these are considered below.

4.4.2 Potential for Liquefaction

Three primary factors to contribute to liquefaction potential:

- Soil grading and density.
- Groundwater
- Earthquake intensity and level of ground shaking.

Each of these is discussed below.

Soil Grading and Density

The CPT logs over the site are interpreted as showing lenses and layers of loose to medium dense sand, silty-sand within the upper soil profile. These layers are considered to be potentially liquefiable from a soil character and density perspective.

Some layers of the upper soils were classified, by the Soil Character Index, I_c, as clayey silt. These have been assumed to be non-liquefiable where the I_c from the CPT logs is greater than 2.6.

Groundwater

Based on reading after the CPTs at the site we have adopted a groundwater level at 1.3m below ground level (bgl). Therefore soils are potentially liquefiable from a depth of 1.3m from a saturation criterion. It should be noted that groundwater levels are subject to seasonal changes.

Earthquake Intensity and Soil Resistance to Liquefaction

The level of ground shaking is one of the key factors in determining whether liquefaction will or will not occur. For this study we have reviewed three levels of ground shaking as follows:

1. Serviceability Limit State (SLS) design level earthquake.
2. Intermediate design level earthquake.
3. Ultimate Limit State (ULS) design level earthquake.

We have used the NZGS (2010) recommendation which uses NZS 1170.5:2004 to assess potential design level earthquake cases in terms of liquefaction hazards. As part of this assessment we have assumed an Importance Level 2 structure with a 50 year design life, a site hazard factor (z) of 0.33 for Blenheim and a Class D soil site. Each of the three earthquake cases is discussed in detail below.

1. Serviceability Limit State (SLS) Design Level Earthquake

From the NZGS method, we have derived a PGA of 0.09g with a Magnitude M7.5 earthquake based on a 1 in 25 year return period earthquake (based on NZS 1170.0:2004 Tables 3.2).

Buildings are expected to perform well for the SLS event and be returned to service after only nominal repair.

2. Intermediate Design Level Earthquake

From the NZGS method, we have derived a PGA of 0.22g with a Magnitude M7.5 earthquake based on a 1 in 150 year return period earthquake (based on NZS 1170.0:2004 Tables 3.2).

3. Ultimate Limit State (ULS) Design Level Earthquake

From the NZGS method, we have derived a PGA of 0.37g with a Magnitude M7.5 earthquake based on a 1 in 500 year return period earthquake (based on NZS 1170.0:2004 Tables 3.2).

Buildings/structures designed for the ULS event are expected to retain their structural integrity and form during an earthquake and not endanger life. Some plastic deformation of structural elements within the structure is expected to occur but ideally the damage can be repaired and the structure can be returned to service after the event, although repair may be uneconomical.

Details of the design level earthquakes used in our analysis are summarised in Table 8.

Table 8 – Liquefaction design earthquake parameters

Design Earthquake	PGA	Magnitude
SLS	0.09g	M7.5
Intermediate	0.22g	M7.5
ULS	0.37g	M7.5

Assessment Methodology

The ability for subsoil to resist the effect of ground shaking associated with the design level earthquakes has been assessed from the subsoil information obtained by the CPTs. Two liquefaction assessment methods, Idriss and Boulanger, and National Centre for Earthquakes Engineering Research (NCEER) have been used in this assessment to provide an understanding of the soils performance underlying the site. The method of Robertson and Wride (1998) with the modified fine content was used to assess the liquefaction potential from the CPT results.

Idriss and Boulanger Method

Liquefaction assessment was carried out using the method developed by Idriss and Boulanger (2008) and the method of Zhang et. al. (2002) was used for estimating the liquefaction induced settlements in accordance with the Ministry of Business, Innovation and Employment (MBIE) Guidelines (2012) for residential properties.

We note that the MBIE assessment method has been mandated for residential development in the Canterbury area and were not necessarily for other parts of New Zealand. However given that the results from the assessment method determine the MBIE defined foundation options we consider that it is appropriate to use this method.

NCEER Method

Liquefaction assessment was carried out using the NCEER method as described by Youd et al (2001) and the method of Ishihara and Yoshimine (1992) was used for estimating the liquefaction induced settlements as recommended by the NZGS (2010).

Liquefaction Effects

Liquefaction can have a number of effects on buildings and land. In this assessment we consider the following liquefaction effects:

- Liquefaction induced settlement.
- Liquefiable layers.
- Liquefaction induced ground damage.

These are discussed below and the results are summarised in Tables 9 to 11.

Liquefaction Induced Settlement

Liquefaction induced settlements have been calculated over the entire CPT profiles. The MBIE Guidelines recommend for a residential house in Christchurch the top 10m of the soil profile should be considered. As it is assumed the site could be developed as residential lots we have assessed the top 10m of the soil profile.

However the maximum depth any CPT reached was 6.8m.Other geotechnical information indicates that the underlying gravel extends to 8m and is underlain by sand that could potentially liquefy, therefore there is the possibility that there may be additional liquefiable layers at depth which could result in higher liquefaction induced settlements than those presented below.

Therefore it is recommended that if the site is to be developed geotechnical boreholes would be required and taken to a depth of at least 10m, to allow quantification of the liquefaction potential at depth.

The liquefaction induced settlement results are shown in Table 9.

Table 9 – Liquefaction Induced Settlement Summary

Test	Depth [m]	SLS (0.13g, M7.5)		Intermediate (0.20g, M7.5)		ULS (0.35g, M7.5)	
		Idriss and Boulanger [mm]	NCEER [mm]	Idriss and Boulanger [mm]	NCEER [mm]	Idriss and Boulanger [mm]	NCEER [mm]
CPT1	3.3	<5	<5	25	5	30	10
CPT2	3.3	<5	<5	30	15	35	25
CPT3	6.8	<5	5	40	25	45	35
CPT4	2.6	<5	<5	<5	<5	<5	5
CPT5	3.0	<5	<5	5	<5	5	5
CPT6	3.2	<5	<5	15	5	20	5

Notes:

(1) The settlements are to the nearest 5mm. Due to the inherent uncertainty in calculating liquefaction induced settlement, the calculated settlements are indicative only and actual settlement will vary from those above.

Liquefaction Induced Ground Damage

The layers which may liquefy in a design level event is critical in regards to the ground damage and foundation performance. We have used two methods to assess the potential for liquefaction induced ground damage which are discussed below:

1. Published information (after Ishihara, 1985) can be used to assess the potential for surface expression of liquefaction and hence the likelihood of inducing damage. Ishihara's method is for a single non-liquefied layer overlying a single liquefiable layer only. The liquefaction analysis indicates multiple liquefiable layers within the CPT profiles and to account for this we have adopted taken the thickness of the non-liquefied crust as the thickness from the ground surface to the top of the uppermost liquefiable layer, and the thickness of the liquefied layer as the sum of the thicknesses of all liquefiable layers.

   Ishihara's plots do not explicitly indicate ground damage curves for specific PGAs such as 0.09g which is the SLS level PGA. To simplify the analysis we have slightly overstated the damage levels and used the lowest available curve, (0.20g curve) when assessing damage under SLS level ground shaking.

2. Tonkin & Taylor developed the Liquefaction Severity Number (LSN) based on investigation data and observations made following major earthquake events in Christchurch. The LSN uses the settlements calculated using the Idriss and Boulanger method with the Zhang et al settlement method to assess the expected ground damage that could be caused by liquefaction in future earthquakes in Christchurch. The level of ground damage associated with LSN numbers is summarised in Table 9 below. Although this method has been developed on Christchurch data we consider that it can be applied to the Blenheim area.

Table 10 – LSN Ranges and Observed Effects (Tonkin and Taylor, 2013)

LSN Range	Predominant Performance
0-10	Little to no expression of liquefaction, minor effects
10-20	Minor expression of liquefaction, some effects
20-30	Moderate expression of liquefaction, with sand boils and some structural damage
30-40	Moderate to severe expression of liquefaction, settlement can cause structural damage
40-50	Major expression of liquefaction, undulations and damage to ground surface, severe total and differential settlement of structures
>50	Severe damage, extensive evidence of liquefaction at surface, severe total and differential settlements affecting structures, damage to services

The results of the liquefiable layers and liquefaction induced ground damage are shown in Table 11.

Table 11 – Liquefiable Layers and Liquefaction Induced Ground Damage Summary

Test	Depth [m]	SLS (0.09g, M7.5)			Intermediate (0.22g, M7.5)			ULS (0.37g, M7.5)		
		Liquefiable Layers[(1)] [m bgl]	Ishihara	LSN	Liquefiable Layers[(1)] [m bgl]	Ishihara	LSN	Liquefiable Layers[(1)] [m bgl]	Ishihara	LSN
CPT1	3.3	-	No	0	1.3 to 2.7	Yes	12	1.3 to 2.8	Yes	15
CPT2	3.3	-	No	0	1.3 to 3.0	Yes	15	1.3 to 3.0	Yes	18
CPT3	6.8	-	No	1	1.7 to 3.4 6.2 to 6.6	Yes	14	1.7 to 3.4 6.2 to 6.6	Yes	15
CPT4	2.6	-	No	0	-	No	0	2.0 to 2.1	No	1
CPT5	3.0	-	No	0	2.1 to 2.3	No	2	2.1 to 2.3	No	2
CPT6	3.2	-	No	0	1.6 to 2.7	No	8	1.6 to 2.8	Yes	9

Notes:

(1) The presence of liquefiable layers is indicative only due to the inherent uncertainty in calculating the liquefaction potential of the soil. Actual liquefiable layers may vary in depth and thickness from those above.

It should be noted that it is likely that there could be additional layers of liquefied soil below the depths investigated. If the additional liquefiable layers are present at depth the effect on ground damage could be muted due to the presence of the gravel layer and hence the ground damage assessment above may not vary significantly, although the liquefaction induced settlements may be higher than those presented above.

Liquefaction Induced Lateral Spreading

Flow failures caused by seismically induced liquefaction can occur when the shear stress required for static equilibrium of a soil mass is greater than shear strength of the soil in its liquefied state (Kramer

1996). The site is located approximately 600m from the Opawa River and there is a shallow stormwater drainage channel approximately 100m to the south.

As the Opawa River is located a significant distance away we consider that liquefaction induced lateral spreading associated with the river is likely to have limited effect on the site. Lateral spreading associated with the stormwater channel could affect the site but as the channel is relatively shallow the potential effect of lateral spreading on the site is considered to be low to moderate (in the order of 100mm or less in a ULS event), and may be mitigated with enhanced building foundations. It is recommended a detailed lateral spreading assessment should be undertaken when the future development of the site is known.

4.4.3 Summary of Liquefaction Assessment

The liquefaction analysis indicates the following:

- The MBIE guidelines recommend for residential houses in Christchurch the top 10m of the soil profile should be considered. In this investigation the maximum depth any CPT reached was 6.8m so it is possible that there could be liquefaction below the depth investigated. Therefore it is recommended that if the site is to be developed geotechnical boreholes would need to be drilled to at least 10m depth, to allow better quantification of the liquefaction potential at depth.

- Liquefaction could occur in limited layers in a SLS design level event and could occur from 1.3m (the assumed groundwater level) to the start of the gravel layer (Unit 3 as described in the ground model) and in the interbedded sand layers within Unit 3.

- Liquefaction induced total settlement of the full CPT profiles has been calculated to in the order of 5mm or less in a SLS design earthquake, 40mm or less in an intermediate design earthquake, and 45mm or less in a ULS design earthquake.

- Ishihara and LSN ground damage assessments indicates that limited liquefaction induced ground damage may occur in a SLS level event and minor to moderate liquefaction induced ground damage may occur in Intermediate and ULS design levels events.

- Lateral spreading associated with the Opawa River is likely to have limited effect on the site while the potential effect of lateral spreading on the site associated with the stormwater drain to the south is considered to be low to moderate.

In summary the liquefaction analysis indicates the site has a liquefaction potential. Liquefaction induced settlements and potential ground damage are likely to be limited in a serviceability limit state (SLS) event but in larger earthquake events liquefaction induced settlements in the order of 20mm to 50mm could occur and the induced ground damage is likely to be minor to moderate. The level of ground damage is likely to be dictated by the dense gravel layer present underlying the site.

4.5 Foundation Considerations

Foundation options will need to take into account the liquefaction potential at the site and the available bearing capacity.

Our preliminary assessment above indicates that the site has liquefaction potential and therefore buildings will require enhanced foundations. For residential buildings such foundation systems that could be used are detailed in the MBIE Guidelines (2012). Based on our assessment an enhance raft foundations may be suitable provided the building is a typical light weight residential structure but this

would need to be confirmed with additional geotechnical testing if the site is developed. We note that although these guidelines have been developed for the Canterbury rebuild they provide a good framework for building on liquefiable ground and hence have been considered.

If the site is to be used for industrial purposes then any buildings will require specific foundation design, which accounts for the liquefaction potential and associated settlements.

In assessing the available bearing capacity we have considered the DCP results against the MBIE Guidelines (2012) and NZS 3604:2011. We interpret that in order for the site to have "good ground" (Geotechnical Ultimate Bearing Capacity (UBC) >300kPa), the DCP readings per 100mm penetration must exceed five between 300mm and 900mm below ground level, and three blows below 900mm depth. In order to achieve Geotechnical UBC >200kPa, the requirements are for two blows per 100mm penetration. These depths are based on a typical NZS 3604 shallow footing no more than 300mm wide and founded 300mm below ground level.

Based on the DCP results Geotechnical UBC of 200kPa is available from a depth of 0.2m below existing ground level.

4.6 Further Investigations

If the site is to be developed for residential or industrial purposes further geotechnical investigation will be required. Given the presence of dense sand and gravel at shallow depth the geotechnical investigations should include geotechnical boreholes to confirm the ground conditions at depth as well as better quantify the liquefaction potential.

5. References

Benson, A., Hill, N., Little, T.A. & Van Dissen, R.J. 2001. Paleoseismicity, Rates of Active Deformation, and Structure of the Lake Jasper Pull-Apart Basin, Awatere Fault, New Zealand. *Victoria University of Wellington, School of Earth Sciences Consulting Report 2001/1, EQC Research Report 97/262.*

CGD, 2013 https://canterburygeotechnicaldatabase.projectorbit.com/ Canterbury Geotechnical Database (20/11/13)

Idriss, I.M. and Boulanger R.W., 2008. *Soil Liquefaction during Earthquakes.* EERI Monograph Series MNO-12

Kramer, 1996. *Earthquake Geotechnical Engineering*. Prentice Hall, Upper Saddle River, New Jersey, USA.

Marlborough District Council. 2013. GIS System. http://gis.marlborough.govt.nz/DekhoPublic/

Ministry of Business, Innovation and Employment (MBIE) 2012. Repairing and rebuilding houses affected by the Canterbury earthquakes.

NZGS, 2010. *Geotechnical earthquake engineering practice, Module 1 – Guideline for the identification, assessment and mitigation of liquefaction hazards*. NZ Geotechnical Society Inc, Wellington, New Zealand.

NZS1170.0:2004. *Australia/New Zealand Standard, Structural Design Actions, Part 0: General Principles.* Standards New Zealand, Wellington, New Zealand. Wellington, New Zealand.

NZS1170.5:2002. *Australia/New Zealand Standard, Structural Design Actions, Part 5: Earthquake Actions – New Zealand*. Standards New Zealand, Wellington, New Zealand.

Roberston, E.J. and Smith, E.G.C. 2004. A seismic site response and ground-shaking hazard assessment for Blenheim, New Zealand. *New Zealand Society for Earthquake Engineering Inc. 2004 Conference.*

Robertson and Wride, 1998. Evaluating cyclic liquefaction potential using the cone penetration test. Canadian Geotechnical Journal, Vol. 35, pp. 442 – 459.

Stirling, M.W., Wesnousky, S.G. & Berryman, K.R. 1998. Probabilistic seismic hazard analysis of New Zealand. *New Zealand Journal of Geology and Geophysics, 41: 355-375*.

Smith, W.D. & Berryman, K.R. 1983. Revised Estimates of Earthquake Hazard in New Zealand. *Bulletin of the New Zealand National Society for Earthquake Engineering, 16: 259-272.*

Tonkin and Taylor (2013) Liquefaction vulnerability study, Tonkin and Taylor Report 52020.0200/v1.0. February 2013. 52 pages and 14 appendices.

Youd et. al., 2001. *Liquefaction resistance of soils: Summary report from the 1996 NCEER and 1998 NCEER/NSF workshop on evaluation of liquefaction resistance of soils.* Journal of geotechnical and geoenviromental engineering. Volume 127, Issue 10, pp. 817-833.

Zhang, G., Robertson. P.K., Brachman, R., 2004, *Estimating Liquefaction Induced Lateral Displacements using the SPT and CPT*, ASCE, Journal of Geotechnical & Geoenvironmental Engineering, Vol. 130, No. 8, 861-871

6. Limitations

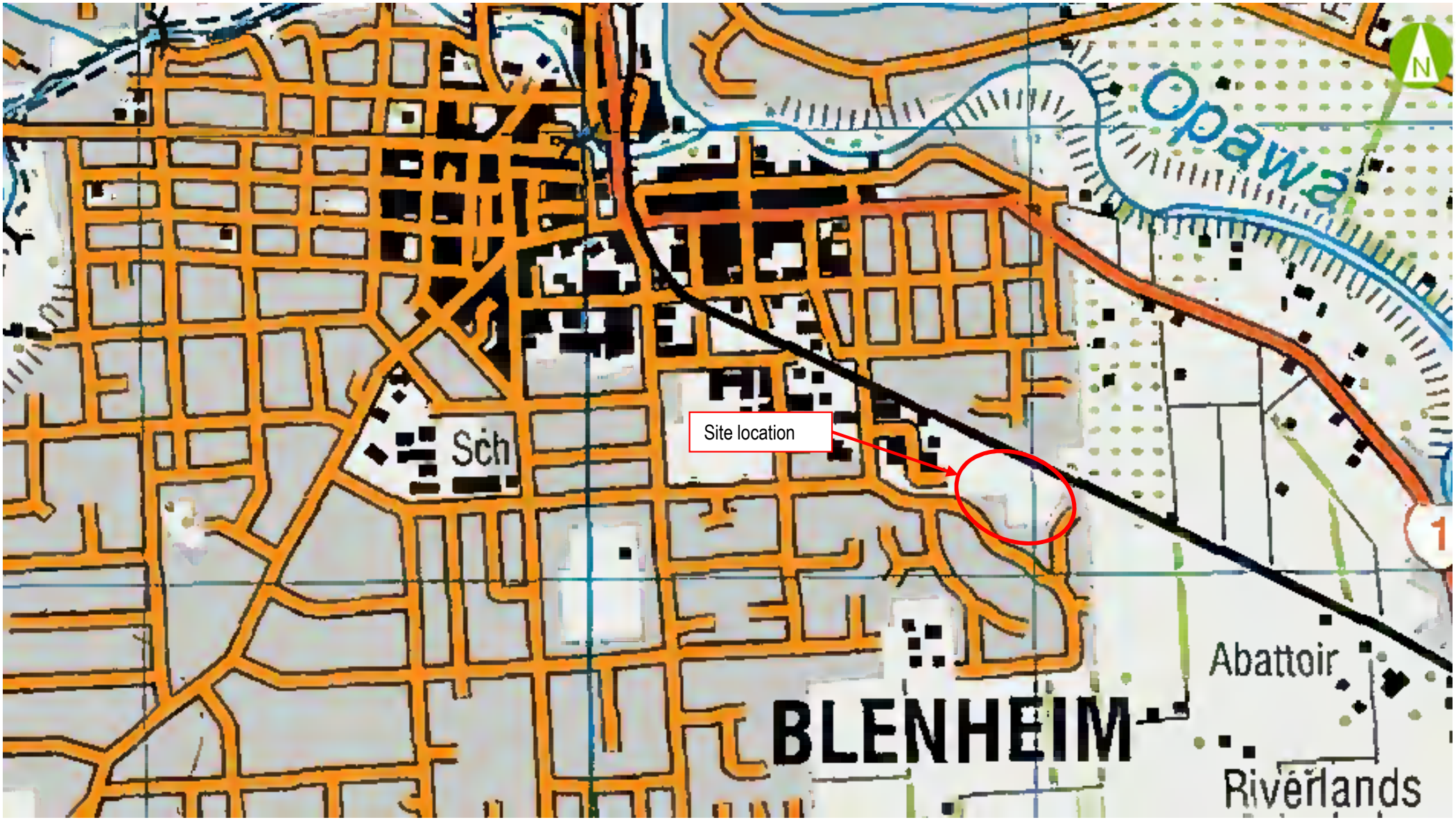
We have prepared this report in accordance with the brief as provided. The contents of the report are for the sole use of the Client and no responsibility or liability will be accepted to any third party. Data or opinions contained within the report may not be used in other contexts or for any other purposes without our prior review and agreement.

The recommendations in this report are based on data collected at specific locations and by using appropriate investigation methods with limited site coverage. Only a finite amount of information has been collected to meet the specific financial and technical requirements of the Client's brief and this report does not purport to completely describe all the site characteristics and properties. The nature and continuity of the ground between test locations has been inferred using experience and judgment and it must be appreciated that actual conditions could vary from the assumed model.

Subsurface conditions relevant to construction works should be assessed by contractors who can make their own interpretation of the factual data provided. They should perform any additional tests as necessary for their own purposes.

Subsurface conditions, such as groundwater levels, can change over time. This should be borne in mind, particularly if the report is used after a protracted delay.

Appendix A
Figures



Note: Not to scale; boundaries and locations are approximate only

aurecon
www.aurecongroup.com

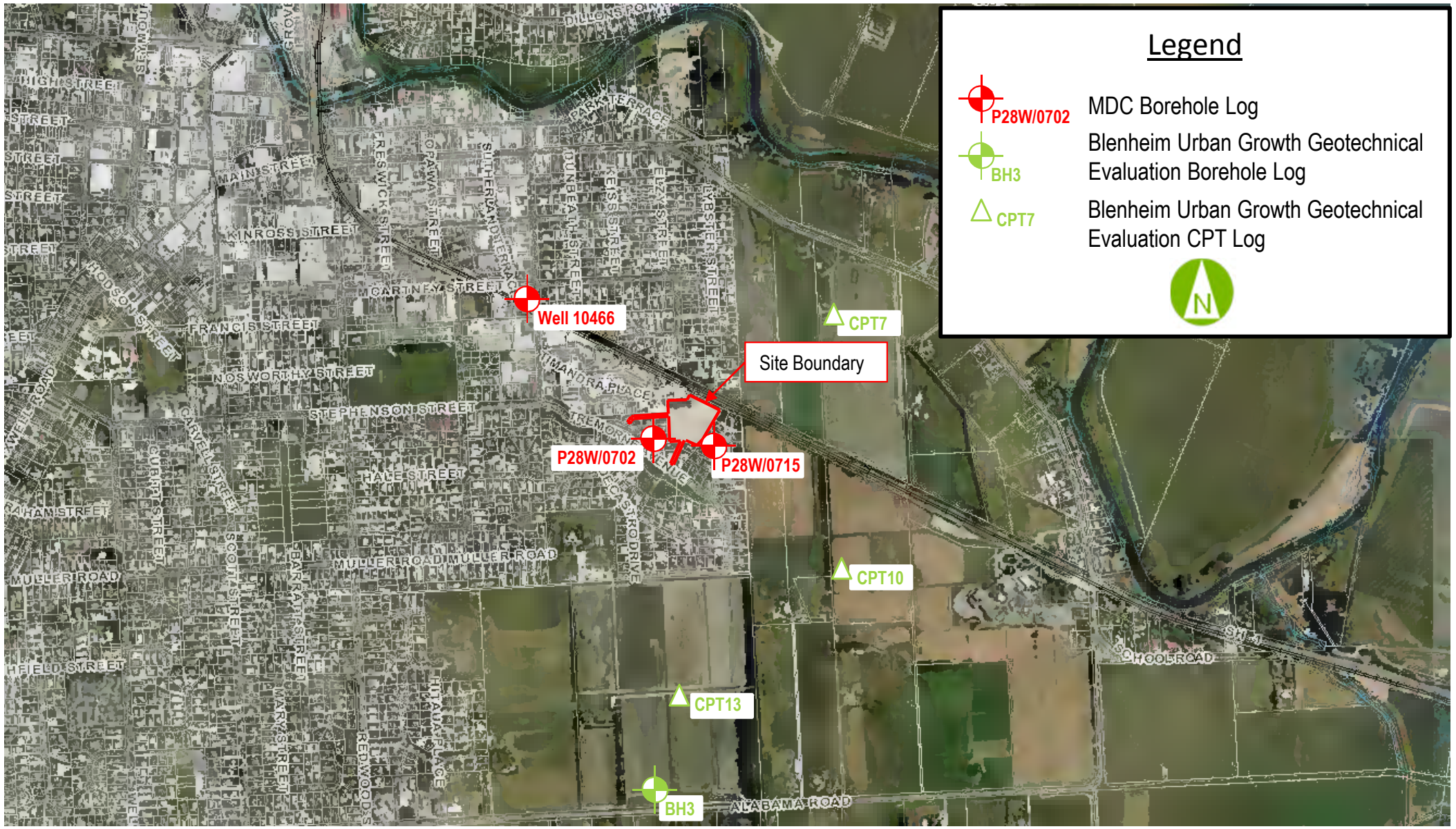
Figure 1 **Site Location**

(Sourced from LINZ Crown Copyright Reserved)

PROJECT	3 Tremorne Avenue, Blenheim
BY	T. Plunket
JOB NUMBER	239195
DATE	05 December 2013
DOCUMENT STATUS	Revision 1

CLIENT

J & RK de Castro Ltd (In Receivership)



Note: Not to scale; boundaries and locations are approximate only

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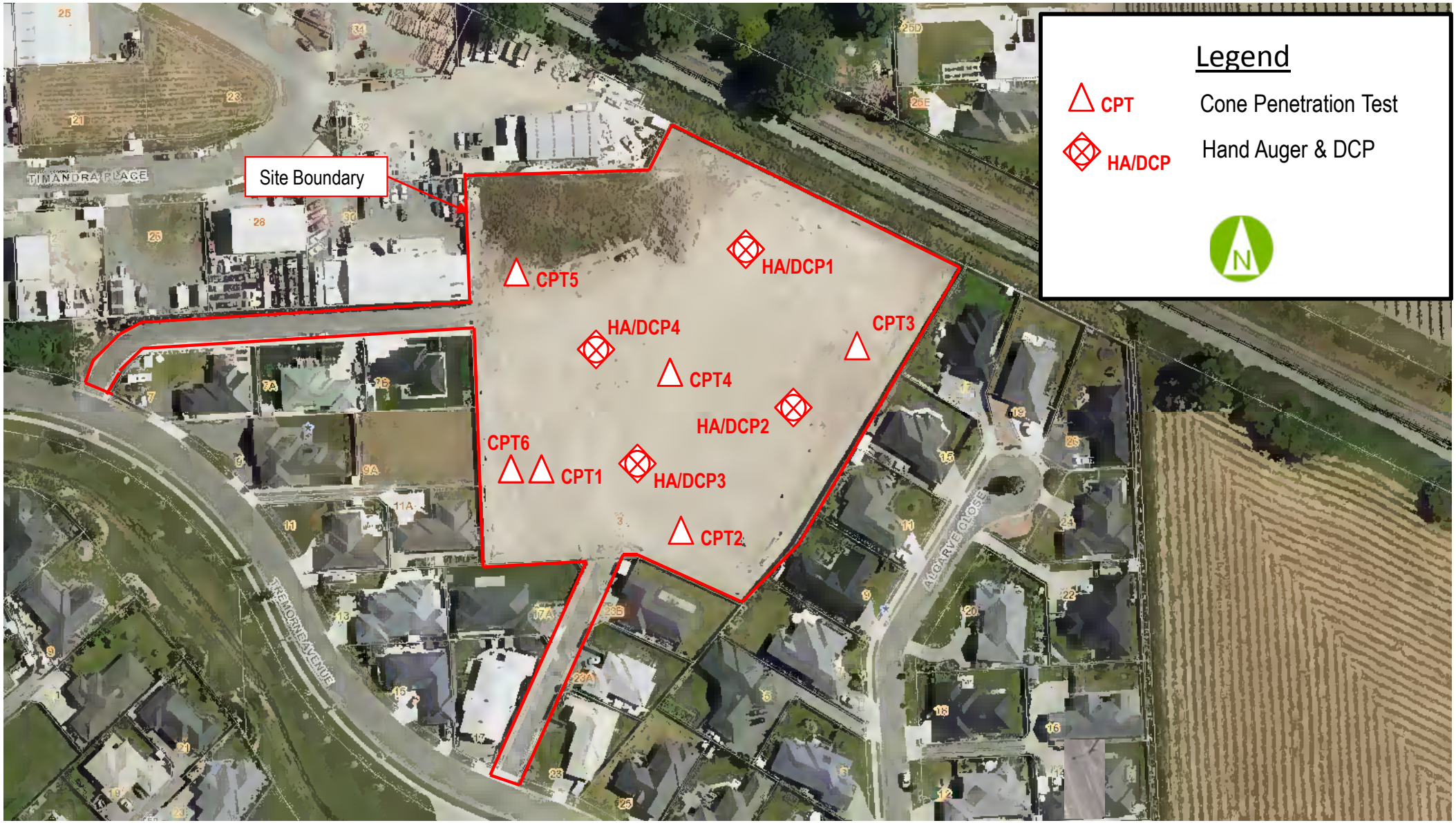
Figure 2 **Historical Boreholes**

(Sourced from Marlborough District Council Copyright Reserved)

PROJECT	3 Tremorne Avenue, Blenheim
BY	T. Plunket
JOB NUMBER	239195
DATE	05 December 2013
DOCUMENT STATUS	Revision 1

CLIENT

J & RK de Castro Ltd (In Receivership)



Note: Not to scale; boundaries and locations are approximate only

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Figure 3 **Canterbury Geotechnical Database and Previous Investigation Locations**

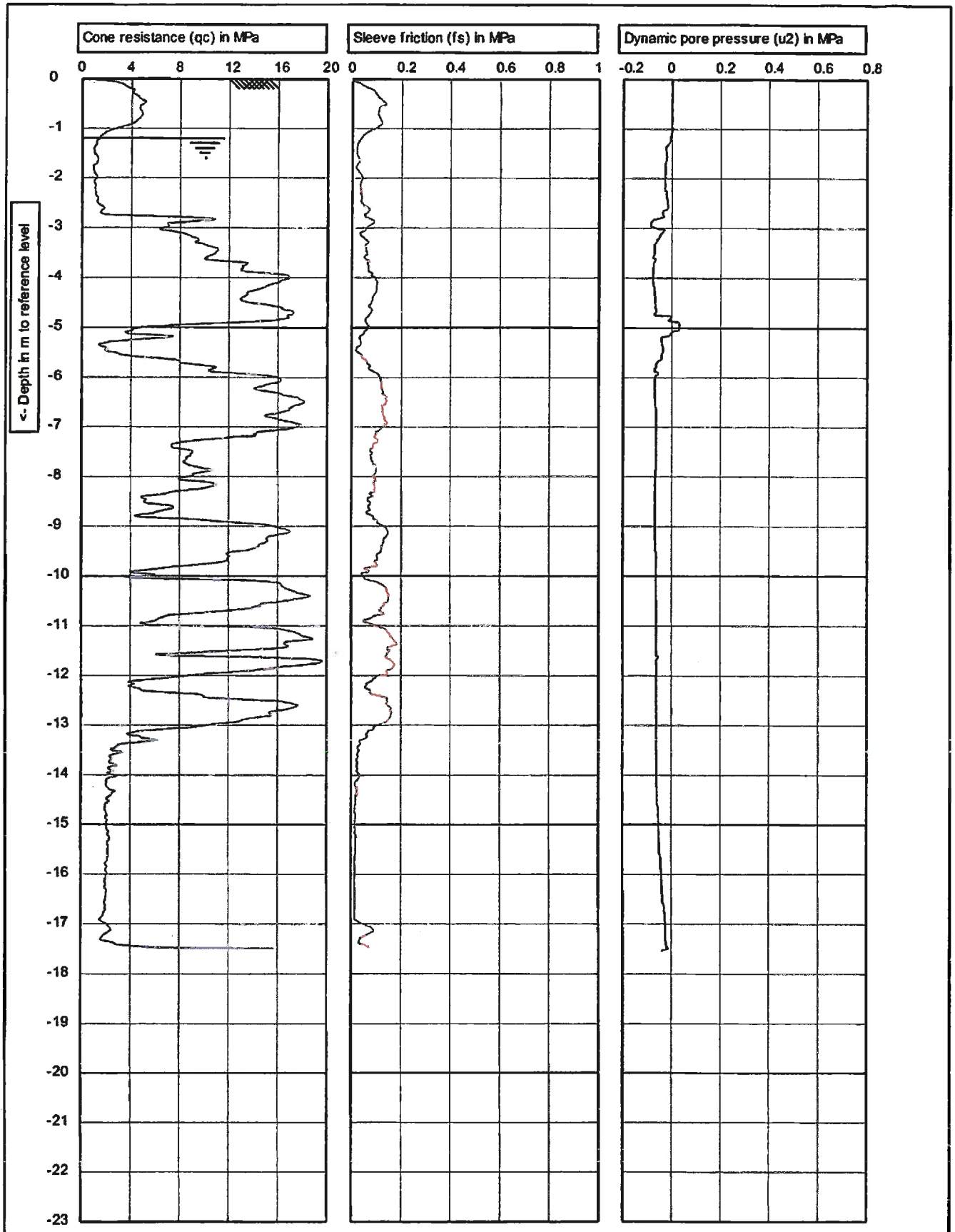
(Sourced from Marlborough District Council Copyright Reserved)

PROJECT	3 Tremorne Avenue, Blenheim
BY	T. Plunket
JOB NUMBER	239195
DATE	05 December 2013
DOCUMENT STATUS	Revision 1

CLIENT

J & RK de Castro Ltd (In Receivership)

Appendix B
Historical Subsurface and Blenheim Urban Growth Geotechnical Evaluation Logs



OPUS
HAMILTON LABORATORY

CPTask V1.20

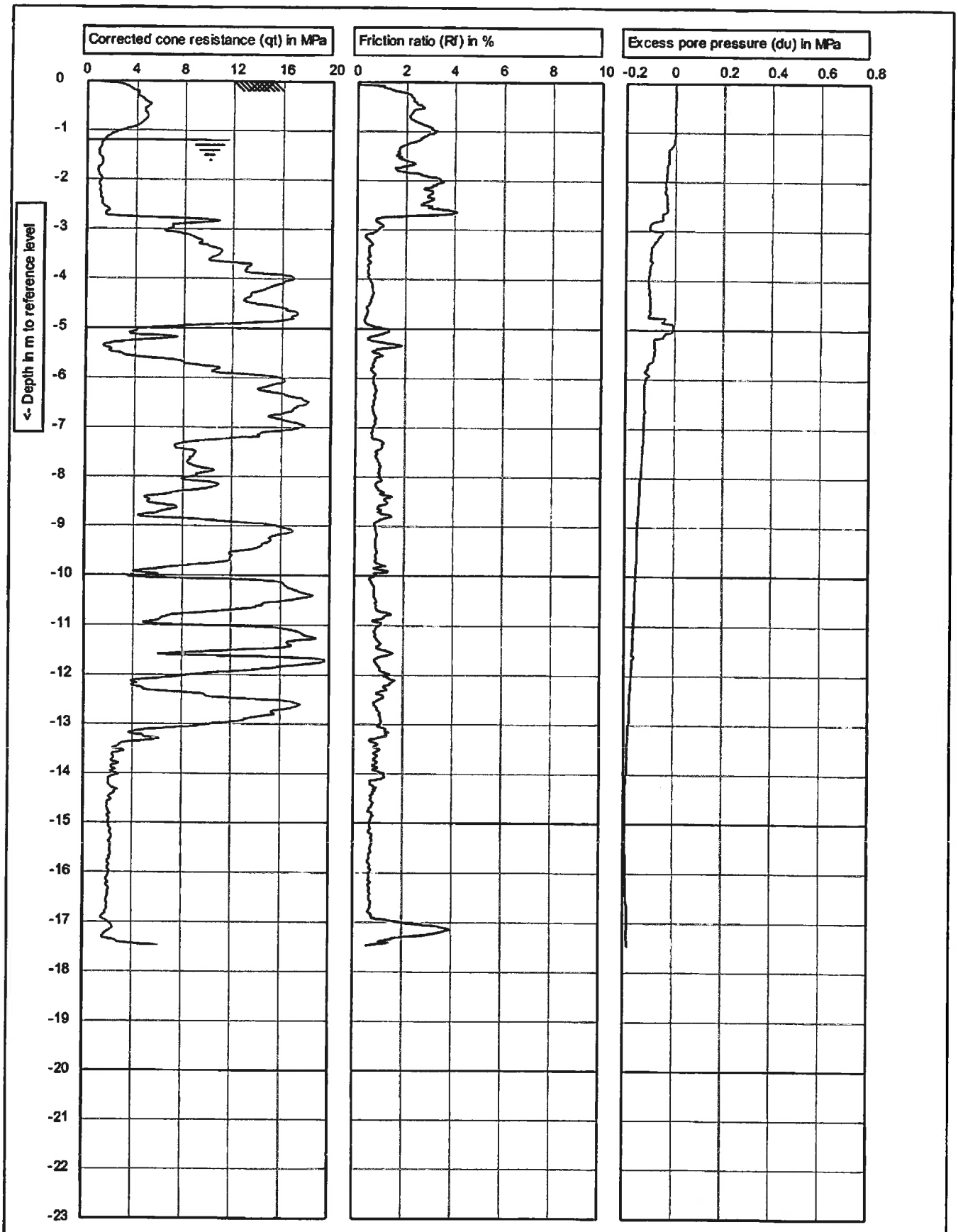
u2
150 cm²
10 cm²

Test according to A.S.T.M standard D-5778-07

G.L. 0 | W.L.: -1.2

Project: Geotechncial Investigation
Location: 2998 St Andrews SH1
Position:

Predrill :	0
Date:	1/02/2012
Cone no.:	C10CFIP.E09
Project no.:	Blenheim001
CPT no.:	CPT07



OPUS
HAMILTON LABORATORY

qu2
150 cm²
10 cm²

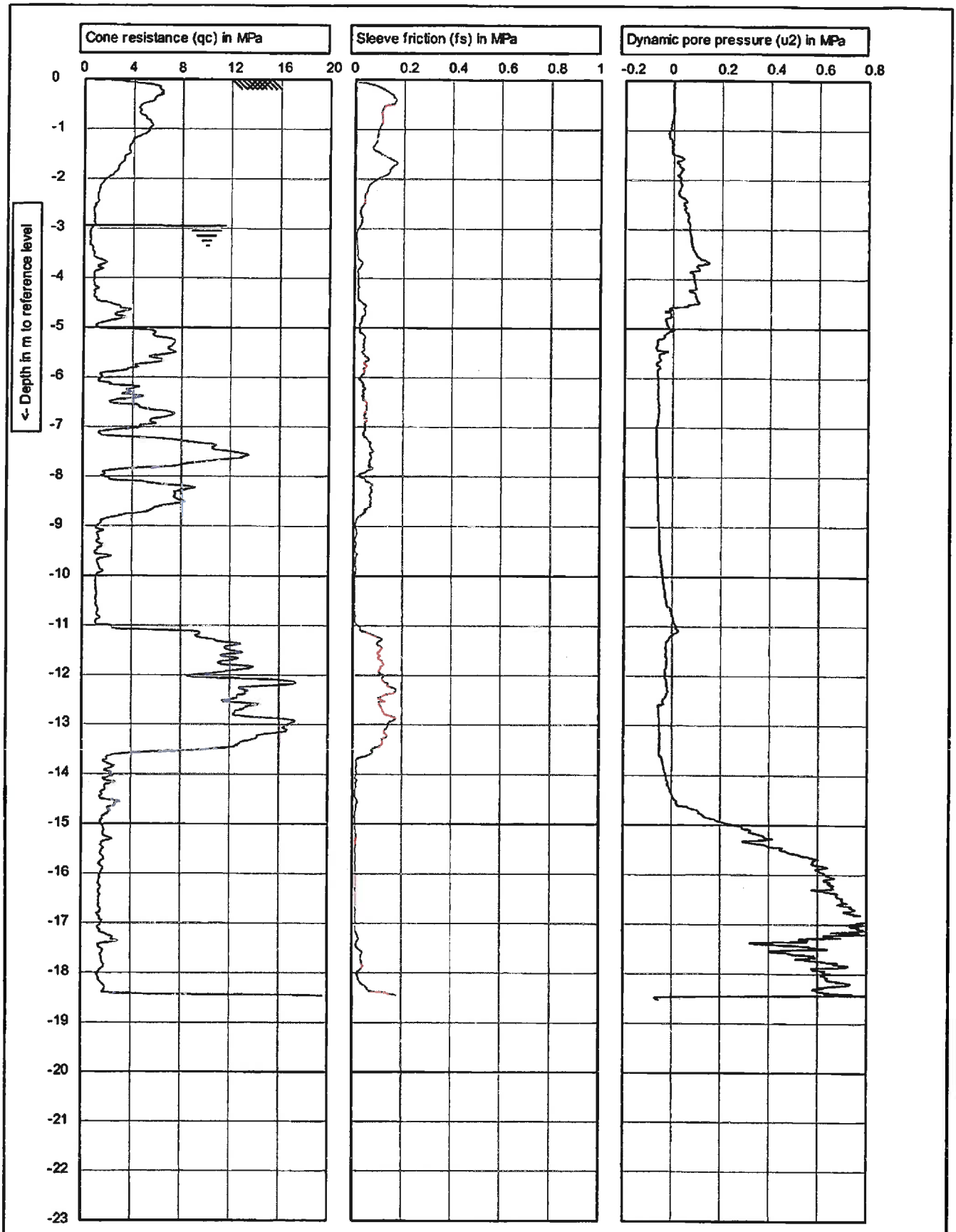
Test according to A.S.T.M standard D-5778-07

G.L. 0 | W.L.: -1.2

Project: Geotechncial Investigation
Location: 2998 St Andrews SH1
Position:

Predrill :	0
Date:	1/02/2012
Cone no.:	C10CFIIP.E09
Project no.:	Blenheim001
CPT no.:	CPT07

CPTwin V1.20



OPUS
HAMILTON LABORATORY

u2
150 cm²
10 cm²

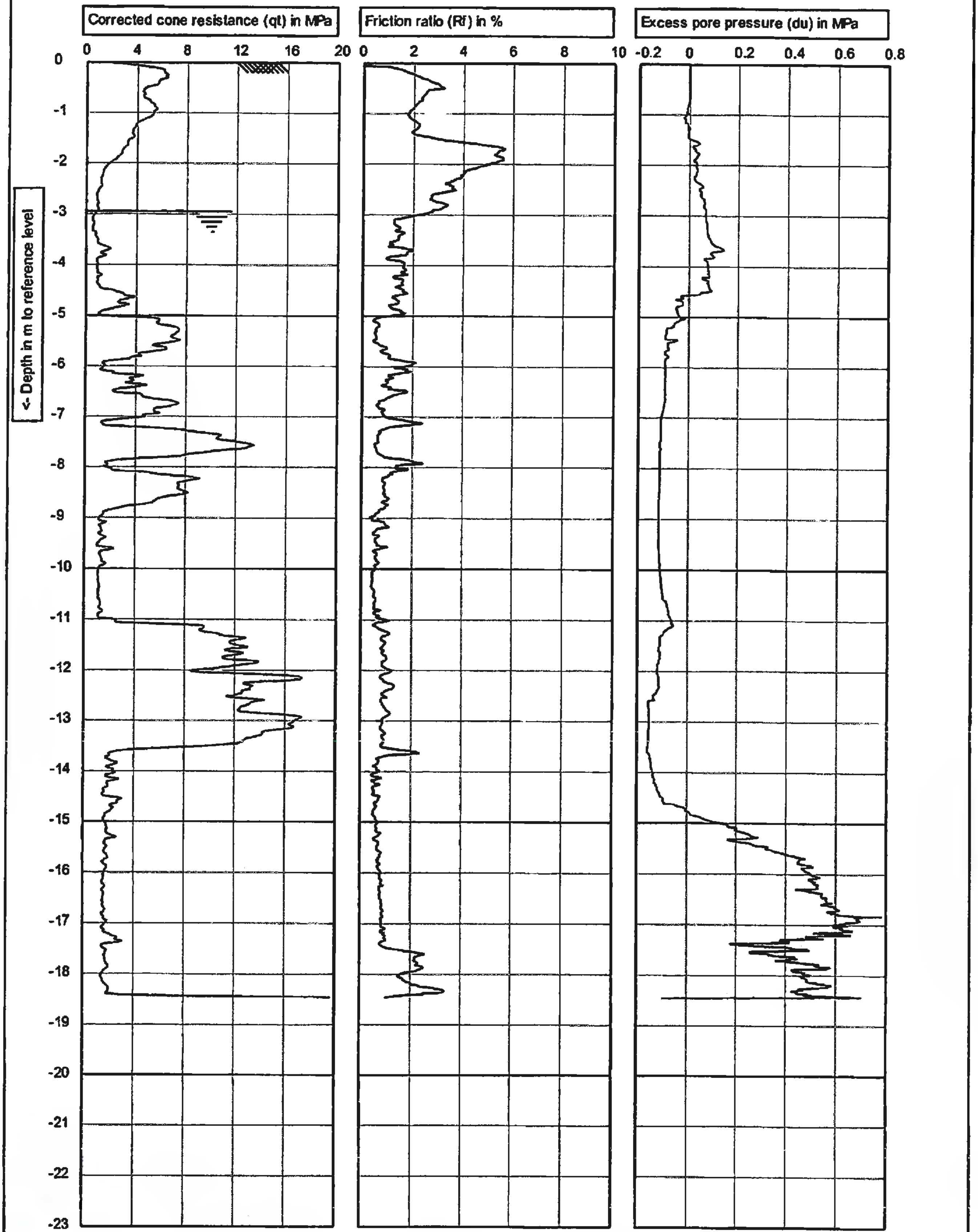
Test according to A.S.T.M standard D-5778-07

G.L. 0 | W.L.: -2.95

Project: Geotechncial Investigation
Location: 279 Alabama Rd- RD4
Position:

Predrill :	0
Date:	1/02/2012
Cone no.:	C10CFIIP.E09
Project no.:	Blenheim001
CPT no.:	CPT10

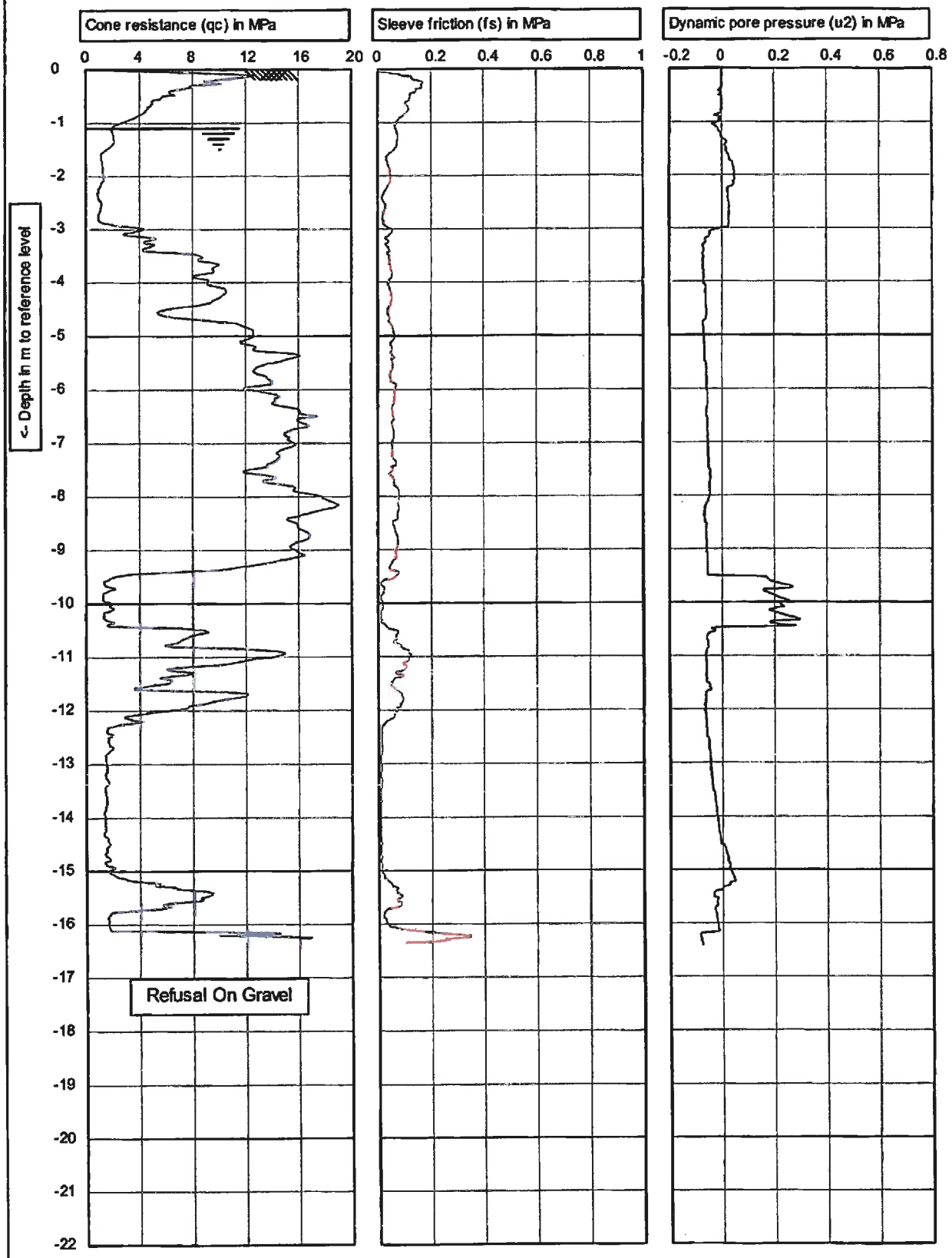
CPTsoft V1.20



OPUS
HAMILTON LABORATORY

150 cm² / 10 cm²	Test according to A.S.T.M standard D-5778-07	Predrill :	0
G.L. 0	W.L.: -2.95	Date:	1/02/2012
Project:	Geotechncial Investigation	Cone no.:	C10CFIIP.E09
Location:	279 Alabama Rd- RD4	Project no.:	Blenheim001
Position:		CPT no.:	CPT10 2/6

CPTask V1.29



OPUS
HAMILTON LABORATORY

r u2
150 cm²
10 cm²

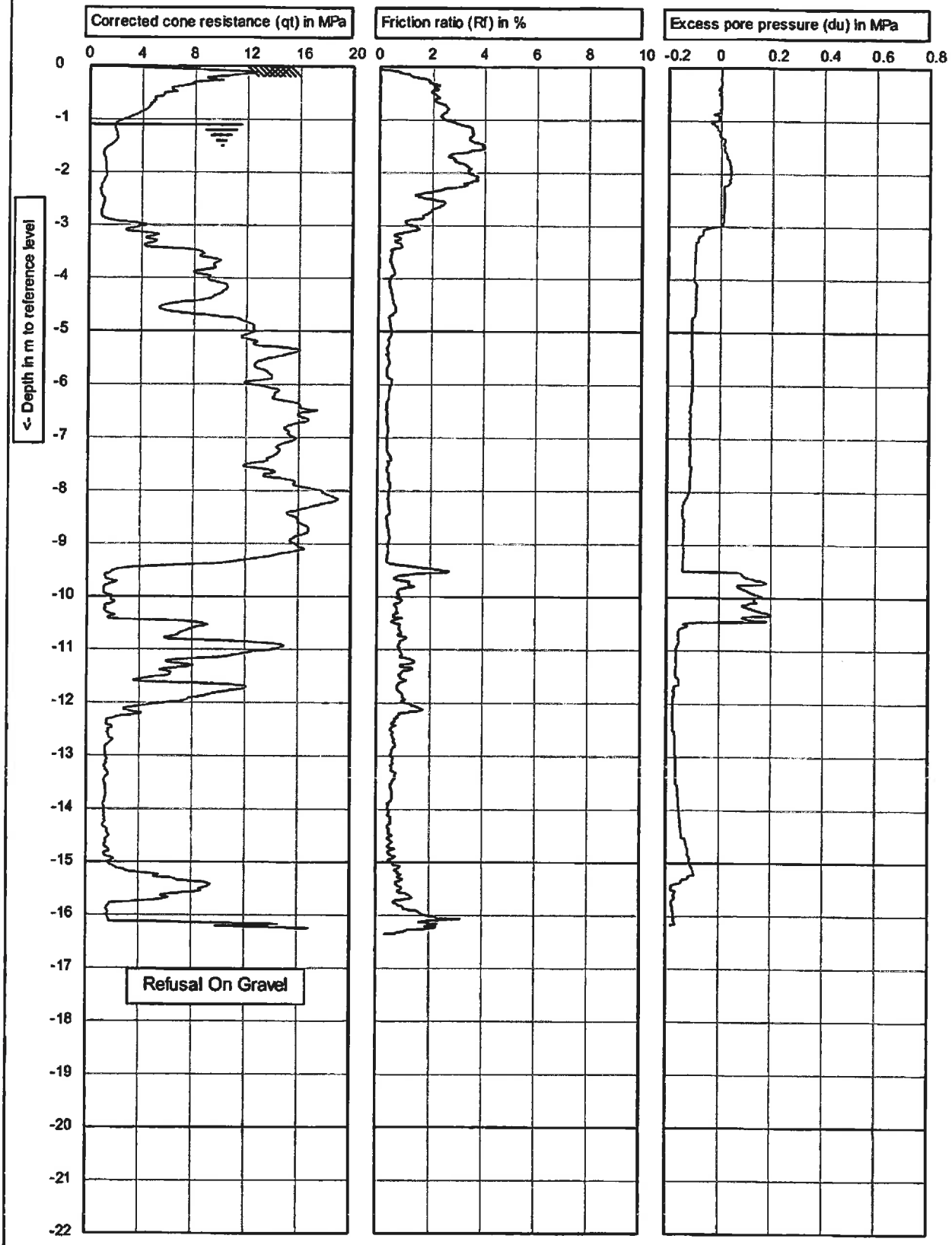
Test according to A.S.T.M standard D-5778-07

G.L. 0 | W.L.: -1.1

Project: Geotechncial Investigation
Location: 225 Alabama Rd
Position:

Predrill :	0
Date:	1/02/2012
Cone no.:	C10CFIIP.E09
Project no.:	Blenheim001
CPT no.:	CPT13

CPTask V1.20



OPUS
HAMILTON LABORATORY

CPTwin V1.20

Test according to A.S.T.M standard D-5778-07		Predrill :	0
G.L. 0	W.L.: -1.1	Date:	1/02/2012
Project: Geotechncial Investigation		Cone no.:	C10CFIP.E09
Location: 225 Alabama Rd		Project no.:	Blenheim001
Position:		CPT no.:	CPT13 2/6

DRILLING & INVESTIGATION LTD

CW Drilling

BORING NUMBER Liq 3

CLIENT Opus International Ltd

PROJECT NAME Blenheim Liquifaction Study

PROJECT NUMBER Liq3

PROJECT LOCATION In Paddock adjacent to Alabama Road

DATE STARTED 2/2/12 COMPLETED 3/2/12

GROUND ELEVATION ___ HOLE SIZE 125

DRILLING CONTRACTOR CW Drilling

GROUND WATER LEVELS:

DRILLING METHOD Concentrix

AT TIME OF DRILLING ---

LOGGED BY Barclay Moir CHECKED BY James Chapman

AT END OF DRILLING 1.00 m

NOTES Geotechnical Investigation Borehole

AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	REMARKS	GRAPHIC LOG	MATERIAL DESCRIPTION
0		Borehole backfilled upon completion		Dark Brown Silt
1.90				Light brown silt
2.80				Light grey silt, saturated at 2.5m
5.00				Blue/grey sandy sill, some shells
7.20				Grey well graded sandy Gravels
9.20				Grey well graded Gravels silty matrix
14.00				Grey Silt
14.30				Grey well graded sandy Gravels
15.00				Bottom of hole at 15.00 m.

GENERAL BH / TP / WELL OPUS BELNHEIM LIQUIFACTION 3.GPJ CW DRILLING.GDT 4/2/12

RK De Castro 27.11.96.

S29-1/0042

P28-1/0702

2591000 2590906

5964900 5964850

GROUND-WATER INVESTIGATIONS

WELL SCHEDULE

One Mile Sheet No.: S29 Field No: _____ File No: 42

Location - General Riverlands Grid Ref: 25529798

Ower or User: De Castro, R.K. Address: Greenfields

Driller: Stewart, R. Nelson Date: _____

Recorded by: G.A.E. Date: ~~6-2-70~~ * Source of Information Visit & L.J.B.

Type: Drilled Total Depth 16'8" ~~Rept'd~~ Meas'd Diameter: 4" ~~Rept'd~~ Meas'd

LOG

0 - 2	Soil
2 - 9	Sandy yellow clay and blue pug
9 - 12	Water-bearing gravel

* Drilldate Dec. 1958/Jan. 1959 according to R.K. De Castro 27.11.96.

well withdrawn.

Time 1545

Water Level on 6-2-70 (Date) ~~Rept'd~~ Meas'd 9 ft. ___ ins. ~~above~~ below ref point

Mean Approx. Water Level _____ Reference point End of Pipe

which is 1 ft 8 ins. ~~above~~ below ground surface Altitude of Ref. point _____

Yield-flow 15,000 gals/~~min~~ hr ~~Rept'd~~ Meas'd Est'd: Pump _____ gals/hr min

Drawdown _____ after _____ hours pumping at _____ gals/hr Min

Specific Capacity _____ gals per min. per ft. d.d) Test Pump Data: Yes No

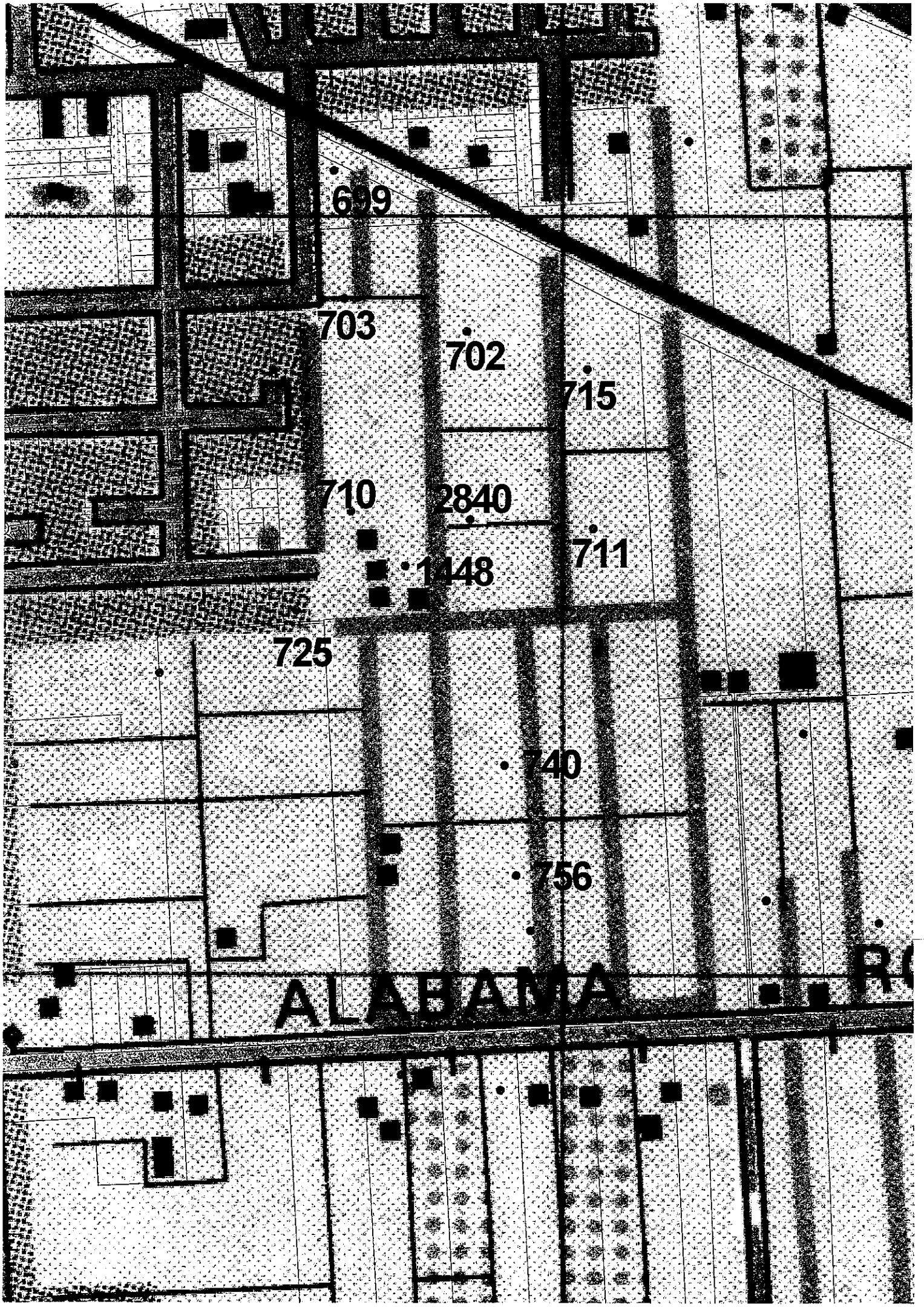
Use of Water Irrigation Quality _____ Analysis on File Yes No

Temperature of Water on _____ (Date) at ___ ft ___ ins. _____ °F

Casing - Length _____ Screen _____ Slots _____ Length _____ Depth _____

Pump - Type _____ Capacity _____

Power - Kind _____ Horsepower


703
702
715
710
2840
711
1148
725
740
756
ALABAMA

with R.K. DeCastro 27.11.96 ✱✓

S29w/044
P28w/0715

2590700 + 2591066
5964700 5964800

GROUND-WATER INVESTIGATIONS

WELL SCHEDULE

One Mile Sheet No: S29 Field No: _____ File No: 44

Location - General _____ Grid Ref: 252978

Owner or User: R. K. de Castro Address: _____

Driller: R. Stewart, Nelson Date: _____

Recorded by: LJB Date: 19/8/66 * Dec. 1958/JAN. 1959 Source of Information Visit

Type Drilled Total Depth 55ft Meas'd Rept'd: Diameter: 4 ins Meas'd Rept'd

LOG

0-1½	Soil
1½-8	Sandy yellow clay grading into blue pgu
8-48	Black sand and gravel
48-53	Tight clay bound gravel
53-55	Water-bearing gravel

Well encountered 3 layers of beach deposits with shells and sand

* Following discussions with R.K. DeCastro 27.11.96 apparently a relatively high yielding water well compared to others on property.

Water Level on _____ (Date) Meas'd Rept'd _____ ft. _____ ins. above below ref point

Mean Approx. Water Level _____ Reference point _____

which is _____ ft. _____ ins. above below ground surface Altitude of ~~Yield~~ Flow 4,000 gals/~~min.~~ hr. Yield 12-15,000 of ref. point _____

Meas'd Rept'd; Pump _____ gals/hr. min. Est'd

Drawdown _____ after _____ hours pumping at _____ gals/hr. min.

Specific Capacity _____ gals.per min. per foot d.d.) Test Pump data: Yes No.

Use of Water _____ Quality _____ Analysis on File Yes No.

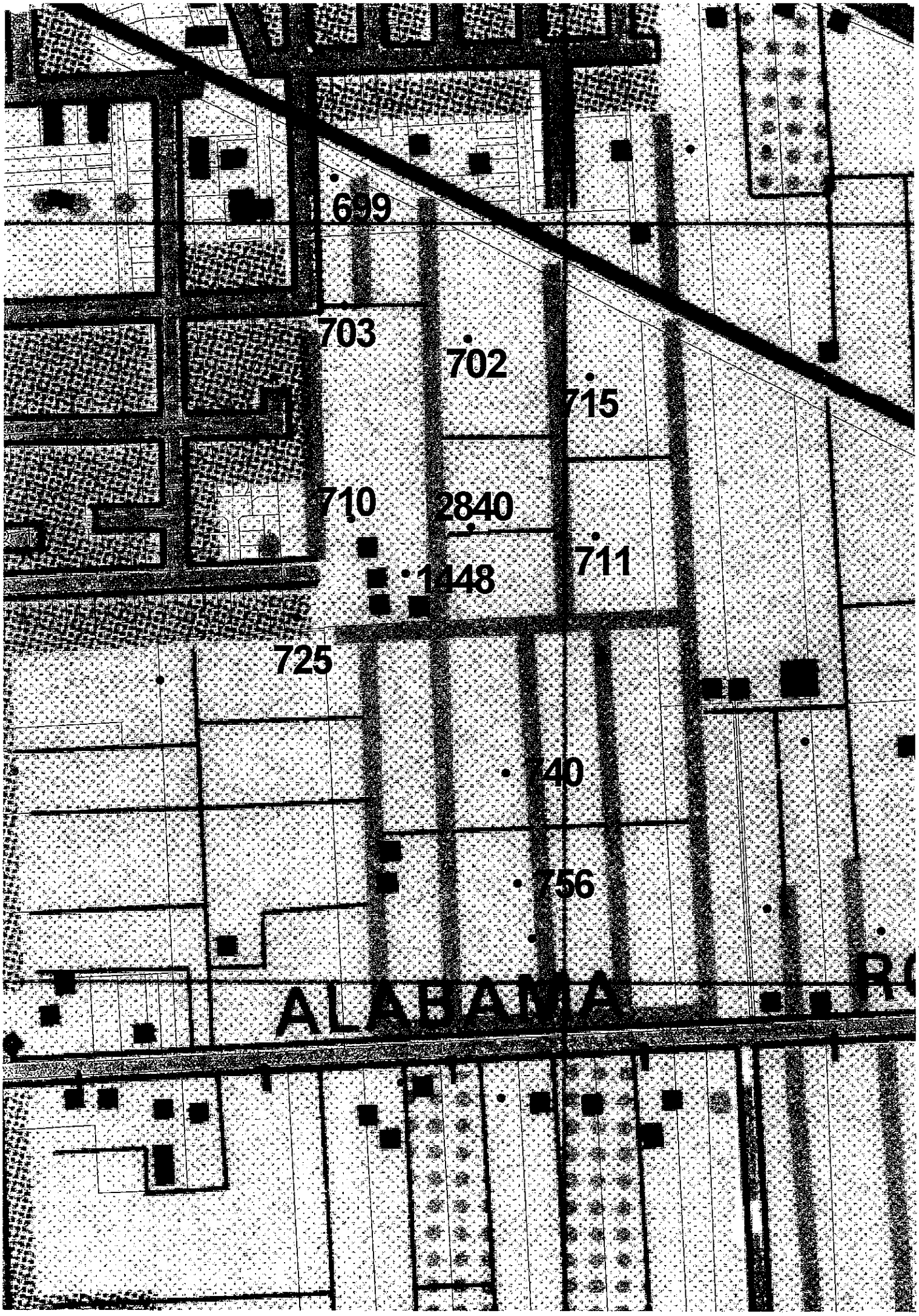
Temperature of Water on _____ (Date) at ___ ft ___ ins. _____ °F.

Casing - Length _____ Screen _____ Slots ___ Length ___ Depth _____

Pump - Type _____ Capacity _____

Power - Kind _____ Horsepower _____

Additional Notes: Drawdown varies with season. This best yielding well on property.


699
703
702
715
710
2840
711
1148
725
740
756
ALABAMA

Well 104466

CH2M Beca

BOREHOLE No: BH7

MACHINE BOREHOLE LOG

SHEET 1 of 2

PROJECT: Blenheim Sewage Pump Station Assessment — JOB NUMBER: 6517838

SITE LOCATION: Blenheim — CLIENT: Marlborough District Council

CIRCUIT: NZTM

COORDINATES: N 5,403,466 m, E 1,680,616 m

BOREHOLE LOCATION: South St

R.L: 15.37 m

DATUM: Blenheim Borough Datum U120744.17

DRILLING: FLUID LOSS	WATER LEVEL	CORE RECOVERY	METHOD	ROD	CASING	IN-SITU TESTS: Sv	τ (kPa)	SPT N'	SAMPLES	DEPTH (m)	GRAPHIC LOG	USCS	MOISTURE	SOIL / ROCK DESCRIPTION	GEOLOGICAL UNIT	R.L (m)
		85 %	Sonic							0		MH	M	'Soft', SILT, some clay, trace rootlets, trace fine to mefium sand; dark brown; moist, high plasticity. [Topsoil] Minor fine to medium gravel.		15
		100 %	SPT					1 0 1 2 2 3 N=8		1		MH	M	Firm, SILT, some clay, minor organics, trace fine to coarse gravel; grey mottled orange and dark brown; moist, high plasticity. 30mm thick dark brown organic SILT layer. Grey mottled orange. FeO staining. No organics or gravel.		14
	28/3/13 0740	100 %	Sonic							2						13
												SM	W	Minor fine to coarse sand.		
		11 %	SPT					7 7 8 6 5 4 N=23		3		SP SW	W W	Loose, silty, fine to coarse SAND, minor clay, minor medium to coarse gravel, trace organics; grey; wet, high plasticity. Loose, fine to medium SAND, some silt, minor to some fine to coarse gravel; grey; wet.		12
		100 %	Sonic									GW/SW	W	Medium dense, fine to coarse gravelly, fine to coarse SAND, minor silt; grey; wet. Gravel: SW, subrounded, greywacke, chert, quartz. Dark brown.		
		44 %	SPT					8 7 6 5 5 6 N=22		4		GP	W	Medium dense, fine to coarse SAND - fine to coarse GRAVEL, minor silt, trace cobble; grey; wet. Gravel: SW, subrounded, greywacke, quartz.		11
		100 %	Sonic											Medium dense, medium to coarse GRAVEL, some fine gravel, some fine to coarse sand, minor cobble; grey; wet. Gravel: SW, subrounded, greywacke.		
		78 %	SPT					1 2 2 3 3 4 N=12		5						10
		100 %	Sonic							6		SP	W	Medium dense, medium to coarse SAND, minor fine sand, minor wood fragments, trace coarse gravel, trace silt; grey; wet. Sulphurous odour.		9
		44 %	SPT					7 7 7 5 4 4 N=20		7		GW	W	Medium dense, fine to coarse sandy, fine to coarse GRAVEL, trace fibrous organics (wood fragments); grey; wet. Gravel: SW, subrounded, greywacke.		8
		100 %	Sonic							8		SP	W	Medium dense, medium to coarse SAND, minor fine sand, minor fibrous organics (wood fragments), trace medium to coarse gravel; grey; wet.		7
		89 %	SPT					2 3 3 5 5 5 N=18		9				No organics or wood fragments.		
		100 %	Sonic									MH	W	Very stiff, SILT, some clay; grey; wet, high plasticity.		6

DATE STARTED: 27/3/13 — DRILLED BY: Pro-Drill Ltd

DATE FINISHED: 27/3/13 — EQUIPMENT: Fraste XL2

LOGGED BY: GJG — DRILL METHOD: Sonic

SHEAR VANE No: — DRILL FLUID: Water and mud

DIAMETER/INCLINATION: 100 mm / 90°

COMMENTS:
Co-ordinates from hand held GPS with error +/-3m. Rods 1.52m long. Efficiency of SPT hammer is approximately 80%.

FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS SEE KEY SHEET

Revision A

A4 Scale 1:50

MACHINE_BOREHOLE P:\65\16517838\TGE\07 GROUND INVESTIGATION\BOREHOLE INVESTIGATION RESULTS\BOREHOLES.GPJ BECA.GDT 24/4/13

CH2M BECA

MACHINE BOREHOLE LOG

BOREHOLE No: **BH7**

SHEET 2 of 2

PROJECT: Blenheim Sewage Pump Station Assessment — JOB NUMBER: 6517838

SITE LOCATION: Blenheim — CLIENT: Marlborough District Council

CIRCUIT: NZTM

COORDINATES: N 5,403,466 m, E 1,680,616 m

BOREHOLE LOCATION: South St

R.L: 15.37 m

DATUM: Blenheim Borough Datum U120744.17

DRILLING: FLUID LOSS	WATER LEVEL	CORE RECOVERY	METHOD	RQD	CASING	IN-SITU TESTS: SV	τ (kPa)	SPT 'N'	SAMPLES	DEPTH (m)	GRAPHIC LOG	USCS	MOISTURE	SOIL / ROCK DESCRIPTION	GEOLOGICAL UNIT	R.L (m)
		100 %	Sonic					4				MH	W	Very stiff, SILT, some clay; grey; wet, high plasticity.		
		67 %	SPT					5 5 6								
		95 %	Sonic					6 6 N=23		11		SM	W	Medium dense, silty, fine to medium SAND, trace shell fragments; grey; wet.		
												SP	W	Medium dense, fine to medium SAND, some silt, trace shell fragments; grey; wet. Gradational upper boundary.		
		100 %	SPT					3 3 3 2 3				SM	W	Medium dense, silty SAND, trace shell fragments; grey; wet. Gradational upper boundary.		
		86 %	Sonic					4 N=12		12				Interbedded with clayey SILT laminations.		
		100 %	SPT					2 1 0 1 0		13		SW	S	Minor coarse sand, some silt. Loose, fine to coarse SAND, minor shell fragments, minor silt; grey; saturated.		
		95 %	Sonic					1 N=2				MH	M	Soft, clayey SILT; grey; moist, high plasticity.	Quaternary Deposits (Contd.)	
		100 %	SPT					1 1 3 3		14				Trace fine to medium gravel.		
		100 %	Sonic					3 3 N=12						Minor fine gravel, trace medium to coarse sand.		
		0 %	SPT					4 13 23 27 N=50+		15				Minor medium to coarse gravel.		
		100 %	Sonic		18.0m @ 27/3/13									Trace organics, no gravel.		
										16		GM	W	Medium dense, silty, medium to coarse sandy, fine to coarse GRAVEL, trace clay; grey; wet, low plasticity matrix. Gravel: SW, subrounded, greywacke.		
														Brown; non plastic.		
														Very dense. Solid cone SPT. No recovery.		
										17		GM	W	Very dense, silty, medium to coarse sandy, fine to coarse GRAVEL, trace clay; grey; wet, low plasticity matrix. Gravel: SW, subrounded, greywacke.		
		0 %	SPT					7 8 8 15 13 14 for 70mm N=50+		18				No recovery. Solid cone SPT.		
										19				END OF LOG @ 18.47 m		

DATE STARTED: 27/3/13 — DRILLED BY: Pro-Drill Ltd

DATE FINISHED: 27/3/13 — EQUIPMENT: Fraste XL2

LOGGED BY: GJG — DRILL METHOD: Sonic

SHEAR VANE No: — DRILL FLUID: Water and mud

DIAMETER/INCLINATION: 100 mm / 90°

COMMENTS:
Co-ordinates from hand held GPS with error +/-3m. Rods 1.52m long. Efficiency of SPT hammer is approximately 80%.

FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS SEE KEY SHEET

Revision A

A4 Scale 1:50

MACHINE_BOREHOLE P:\6517\6517838\TGE\07 GROUND INVESTIGATION\BOREHOLE INVESTIGATION RESULTS\BOREHOLES.GPJ BECA.GDT 24/4/13

Appendix C
CPT Logs

CONE PENETRATION TEST (CPT) REPORT

Client: Aurecon NZ Ltd
Location: 3 Tremorne Avenue, Blenheim

Printed: 13/11/2013

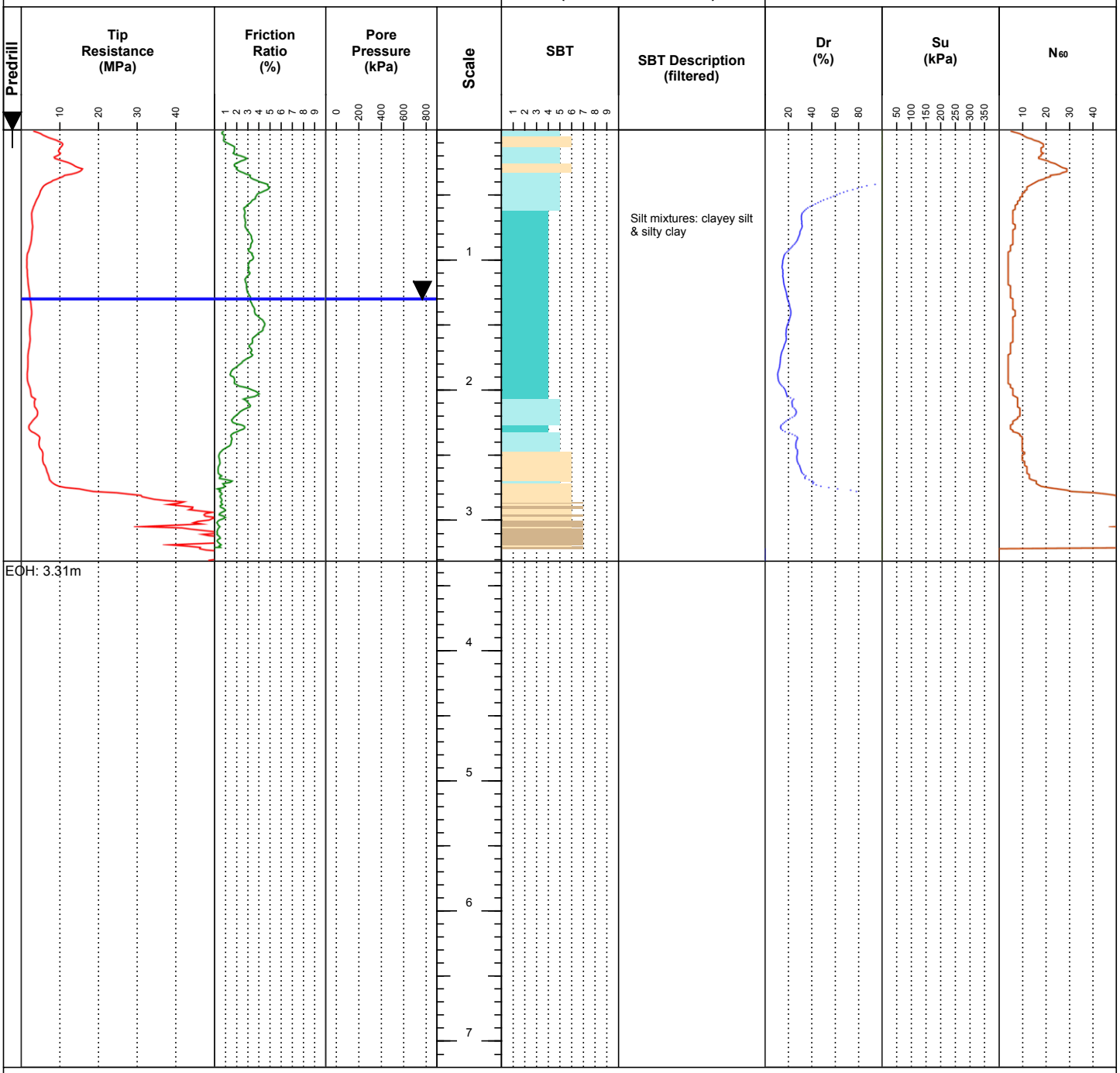
CONE PENETRATION TEST

Job:	12902
CPT No.:	CPT001

Name: 3 Tremorne Avenue, Blenheim
Client: Aurecon NZ Ltd
Location: 3 Tremorne Avenue, Blenheim

Grid: NZTM
Datum:
Termination: -

North (m): 5403138.09
East (m): 1680956.18
Elevation (m): -
Hole Depth (m): 3.31



Operator: S. Cardona
Cone Reference: 080238T
Cone Area Ratio: 0.75
Cone Type: -

Date: 11/11/2013
Predrill: 0.00
Water Level: 1.30
Collapse:

Tip Resistance Initial: -2.5116
Local Friction Initial: -0.0434
Pore Pressure Initial: -

Tip Resistance Final: -2.4664
Local Friction Final: -0.0443
Pore Pressure Final: -

Effective Refusal
Tip: ✓
Gauge:
Inclinometer:
Other:

Target Depth:

Soil Behaviour Type (SBT) - Robertson et al. 1986

0	Undefined	5	Sand mixtures: silty sand to sandy silt
1	Sensitive fine -grained	6	Sands: clean sands to silty sands
2	Clay - organic soil	7	Dense sand to gravelly sand
3	Clays: clay to silty clay	8	Stiff sand to clayey sand
4	Silt mixtures: clayey silt & silty clay	9	Stiff fine-grained

Notes & Limitations

Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P. K. Robertson and K.L. Cabal (2010), Guide to Cone Penetration Testing for Geotechnical Engineering, 4th Edition. The interpretations are presented only as a guide for geotechnical use, and should be carefully reviewed by the user. Both McMillan Drilling Ltd & Geroc Solutions Ltd do not warranty the correctness or the applicability of any of the geotechnical soil and design parameters shown and does not assume any liability for any use of the results in any design or review. The user should be fully aware of the techniques and limitations of any method used to derive data shown in this report.

Remarks
Effective Refusal

Hole Depth (m): 3.31

CONE PENETRATION TEST

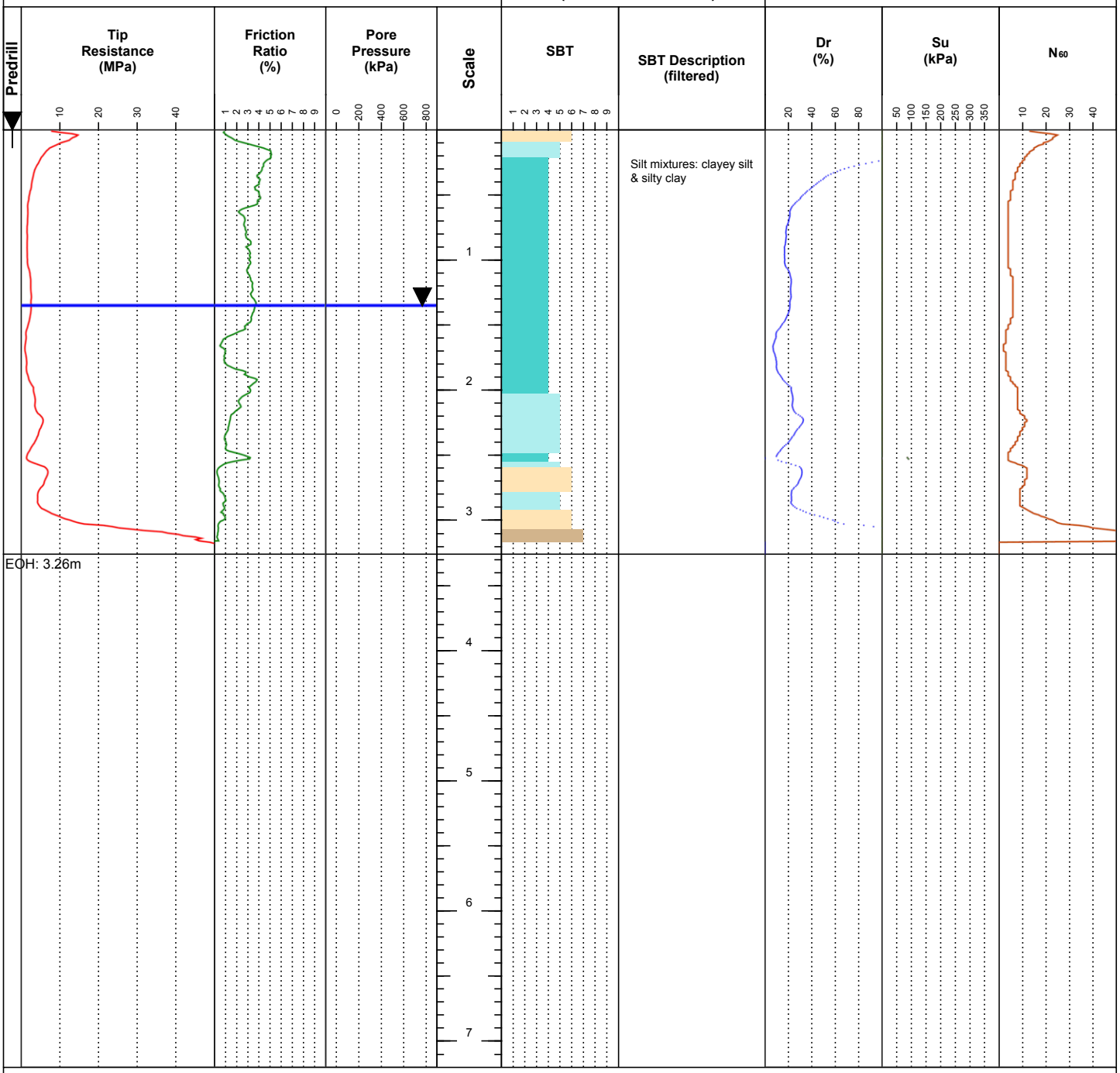
Job:	12902
CPT No.:	CPT002

Name: 3 Tremorne Avenue, Blenheim
Client: Aurecon NZ Ltd
Location: 3 Tremorne Avenue, Blenheim

Grid: NZTM
Datum:
Termination: -

North (m): 5403122.23
East (m): 1680995.40
Elevation (m): -
Hole Depth (m): 3.26

RAW DATA | **SOIL BEHAVIOUR TYPE (NON-NORMALISED)** | **ESTIMATED PARAMETERS**



Operator: S. Cardona
Cone Reference: 080238T
Cone Area Ratio: 0.75
Cone Type: -

Date: 11/11/2013
Predrill: 0.00
Water Level: 1.35
Collapse:

Tip Resistance Initial: -2.3564
Local Friction Initial: -0.0424
Pore Pressure Initial: -

Tip Resistance Final: -2.4989
Local Friction Final: -0.0447
Pore Pressure Final: -

Effective Refusal
Tip: ✓
Gauge:
Inclinometer:
Other:
Target Depth:

Soil Behaviour Type (SBT) - Robertson et al. 1986

0	Undefined	5	Sand mixtures: silty sand to sandy silt
1	Sensitive fine -grained	6	Sands: clean sands to silty sands
2	Clay - organic soil	7	Dense sand to gravelly sand
3	Clays: clay to silty clay	8	Stiff sand to clayey sand
4	Silt mixtures: clayey silt & silty clay	9	Stiff fine-grained

Notes & Limitations

Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P. K. Robertson and K.L. Cabal (2010), Guide to Cone Penetration Testing for Geotechnical Engineering, 4th Edition. The interpretations are presented only as a guide for geotechnical use, and should be carefully reviewed by the user. Both McMillan Drilling Ltd & Geroc Solutions Ltd do not warranty the correctness or the applicability of any of the geotechnical soil and design parameters shown and does not assume any liability for any use of the results in any design or review. The user should be fully aware of the techniques and limitations of any method used to derive data shown in this report.

Remarks
Effective Refusal

Hole Depth (m): 3.26

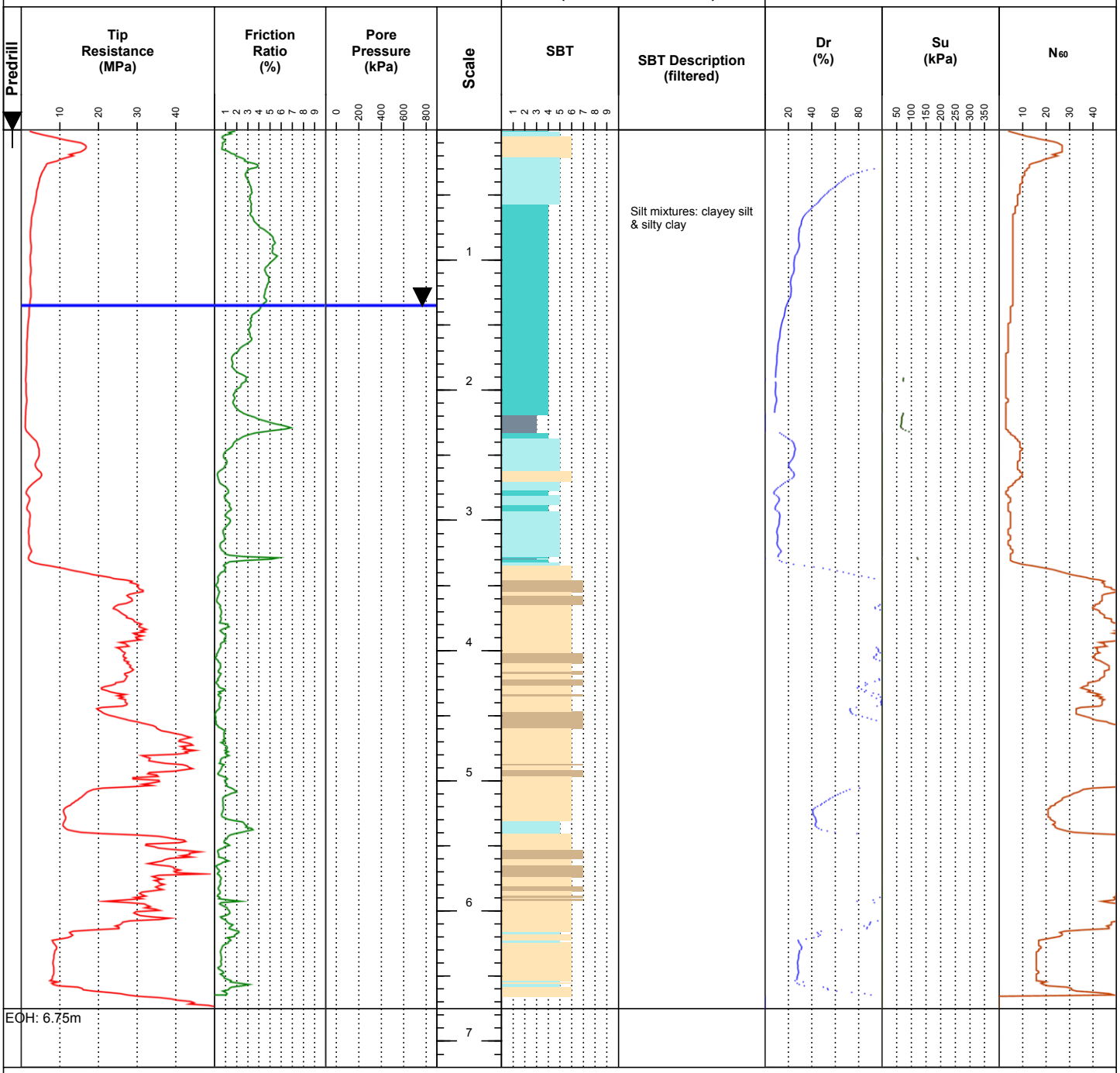
CONE PENETRATION TEST

Job:	12902
CPT No.:	CPT003

Name: 3 Tremorne Avenue, Blenheim
Client: Aurecon NZ Ltd
Location: 3 Tremorne Avenue, Blenheim

Grid: NZTM
Datum:
Termination: -

North (m): 5403171.05
East (m): 1681042.31
Elevation (m): -
Hole Depth (m): 6.75



Operator: S. Cardona
Cone Reference: 080238T
Cone Area Ratio: 0.75
Cone Type: -

Date: 11/11/2013
Predrill: 0.00
Water Level: 1.35
Collapse:

Tip Resistance Initial: -2.4846
Local Friction Initial: -0.0456
Pore Pressure Initial: -

Tip Resistance Final: -2.3508
Local Friction Final: -0.0441
Pore Pressure Final: -

Effective Refusal
Tip: ✓
Gauge:
Inclinometer:
Other:

Target Depth:

Soil Behaviour Type (SBT) - Robertson et al. 1986

0	Undefined	5	Sand mixtures: silty sand to sandy silt
1	Sensitive fine -grained	6	Sands: clean sands to silty sands
2	Clay - organic soil	7	Dense sand to gravelly sand
3	Clays: clay to silty clay	8	Stiff sand to clayey sand
4	Silt mixtures: clayey silt & silty clay	9	Stiff fine-grained

Notes & Limitations

Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P. K. Robertson and K.L. Cabal (2010), Guide to Cone Penetration Testing for Geotechnical Engineering, 4th Edition. The interpretations are presented only as a guide for geotechnical use, and should be carefully reviewed by the user. Both McMillan Drilling Ltd & Geroc Solutions Ltd do not warranty the correctness or the applicability of any of the geotechnical soil and design parameters shown and does not assume any liability for any use of the results in any design or review. The user should be fully aware of the techniques and limitations of any method used to derive data shown in this report.

Remarks
Effective Refusal

Hole Depth (m): 6.75

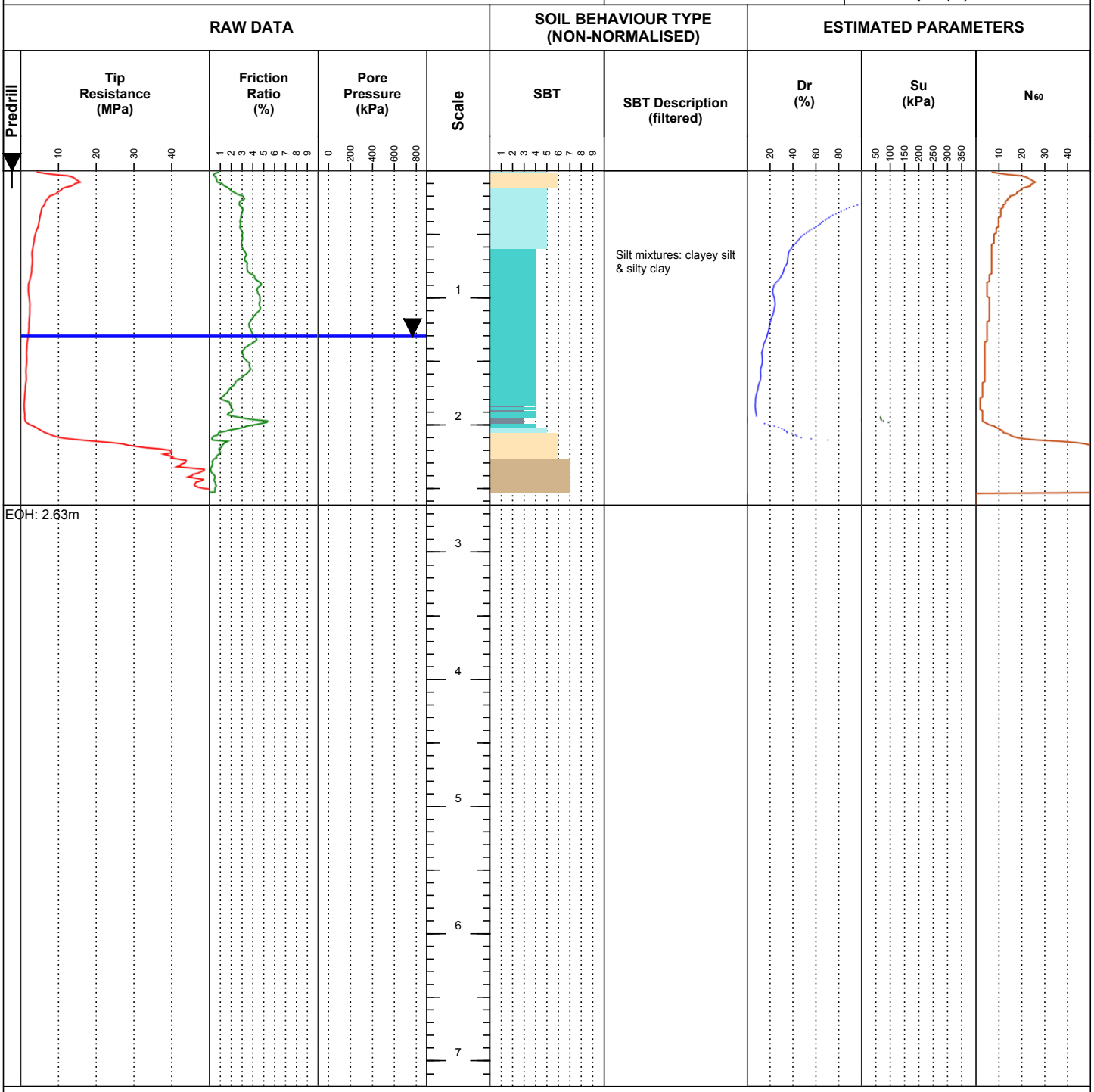
CONE PENETRATION TEST

Job:	12902
CPT No.:	CPT004

Name: 3 Tremorne Avenue, Blenheim
Client: Aurecon NZ Ltd
Location: 3 Tremorne Avenue, Blenheim

Grid: NZTM
Datum:
Termination: -

North (m): 5403162.37
East (m): 1680991.22
Elevation (m): -
Hole Depth (m): 2.63



Operator: S. Cardona
Cone Reference: 080238T
Cone Area Ratio: 0.75
Cone Type: -

Date: 11/11/2013
Predrill: 0.00
Water Level: 1.30
Collapse:

Tip Resistance Initial: -2.4609
Local Friction Initial: -0.0447
Pore Pressure Initial: -

Tip Resistance Final: -2.4053
Local Friction Final: -0.0445
Pore Pressure Final: -

Effective Refusal
Tip: ✓
Gauge:
Inclinometer:
Other:

Target Depth:

Soil Behaviour Type (SBT) - Robertson et al. 1986

0	Undefined	5	Sand mixtures: silty sand to sandy silt
1	Sensitive fine -grained	6	Sands: clean sands to silty sands
2	Clay - organic soil	7	Dense sand to gravelly sand
3	Clays: clay to silty clay	8	Stiff sand to clayey sand
4	Silt mixtures: clayey silt & silty clay	9	Stiff fine-grained

Notes & Limitations

Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P. K. Robertson and K.L. Cabal (2010), Guide to Cone Penetration Testing for Geotechnical Engineering, 4th Edition. The interpretations are presented only as a guide for geotechnical use, and should be carefully reviewed by the user. Both McMillan Drilling Ltd & Geroc Solutions Ltd do not warranty the correctness or the applicability of any of the geotechnical soil and design parameters shown and does not assume any liability for any use of the results in any design or review. The user should be fully aware of the techniques and limitations of any method used to derive data shown in this report.

Remarks
Effective Refusal

Hole Depth (m): 2.63

CONE PENETRATION TEST

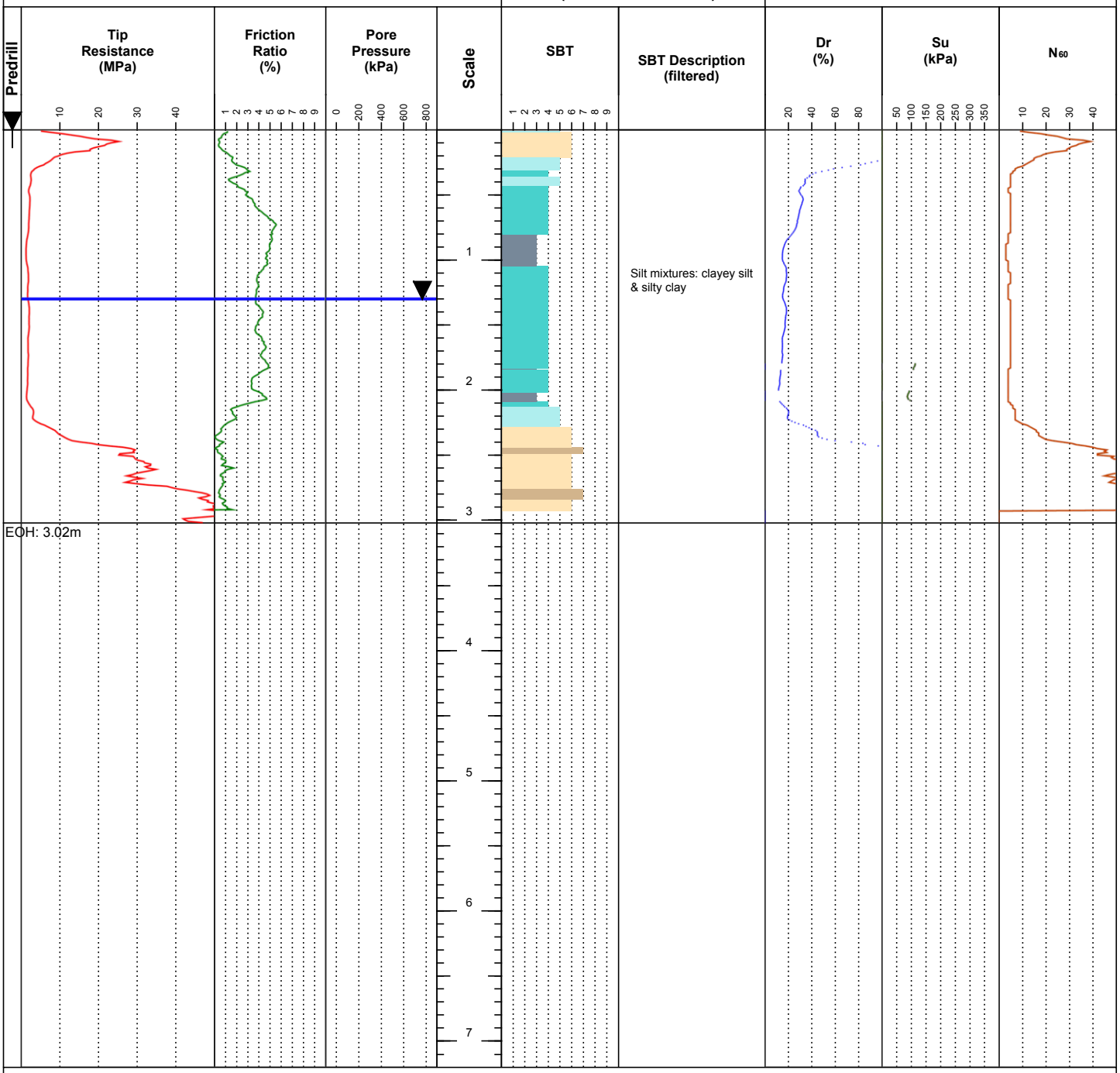
Job:	12902
CPT No.:	CPT005

Name: 3 Tremorne Avenue, Blenheim
Client: Aurecon NZ Ltd
Location: 3 Tremorne Avenue, Blenheim

Grid: NZTM
Datum:
Termination: -

North (m): 5403193.60
East (m): 1680956.80
Elevation (m): -
Hole Depth (m): 3.02

RAW DATA | **SOIL BEHAVIOUR TYPE (NON-NORMALISED)** | **ESTIMATED PARAMETERS**



Operator: S. Cardona
Cone Reference: 080238T
Cone Area Ratio: 0.75
Cone Type: -

Date: 11/11/2013
Predrill: 0.00
Water Level: 1.30
Collapse:

Tip Resistance Initial: -2.4305
Local Friction Initial: -0.0442
Pore Pressure Initial: -

Tip Resistance Final: -2.4681
Local Friction Final: -0.0462
Pore Pressure Final: -

Effective Refusal
Tip: ✓
Gauge:
Inclinometer:
Other:
Target Depth:

Soil Behaviour Type (SBT) - Robertson et al. 1986

0	Undefined	5	Sand mixtures: silty sand to sandy silt
1	Sensitive fine -grained	6	Sands: clean sands to silty sands
2	Clay - organic soil	7	Dense sand to gravelly sand
3	Clays: clay to silty clay	8	Stiff sand to clayey sand
4	Silt mixtures: clayey silt & silty clay	9	Stiff fine-grained

Notes & Limitations

Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P. K. Robertson and K.L. Cabal (2010), Guide to Cone Penetration Testing for Geotechnical Engineering, 4th Edition. The interpretations are presented only as a guide for geotechnical use, and should be carefully reviewed by the user. Both McMillan Drilling Ltd & Geroc Solutions Ltd do not warranty the correctness or the applicability of any of the geotechnical soil and design parameters shown and does not assume any liability for any use of the results in any design or review. The user should be fully aware of the techniques and limitations of any method used to derive data shown in this report.

Remarks
Effective Refusal

Hole Depth (m): 3.02

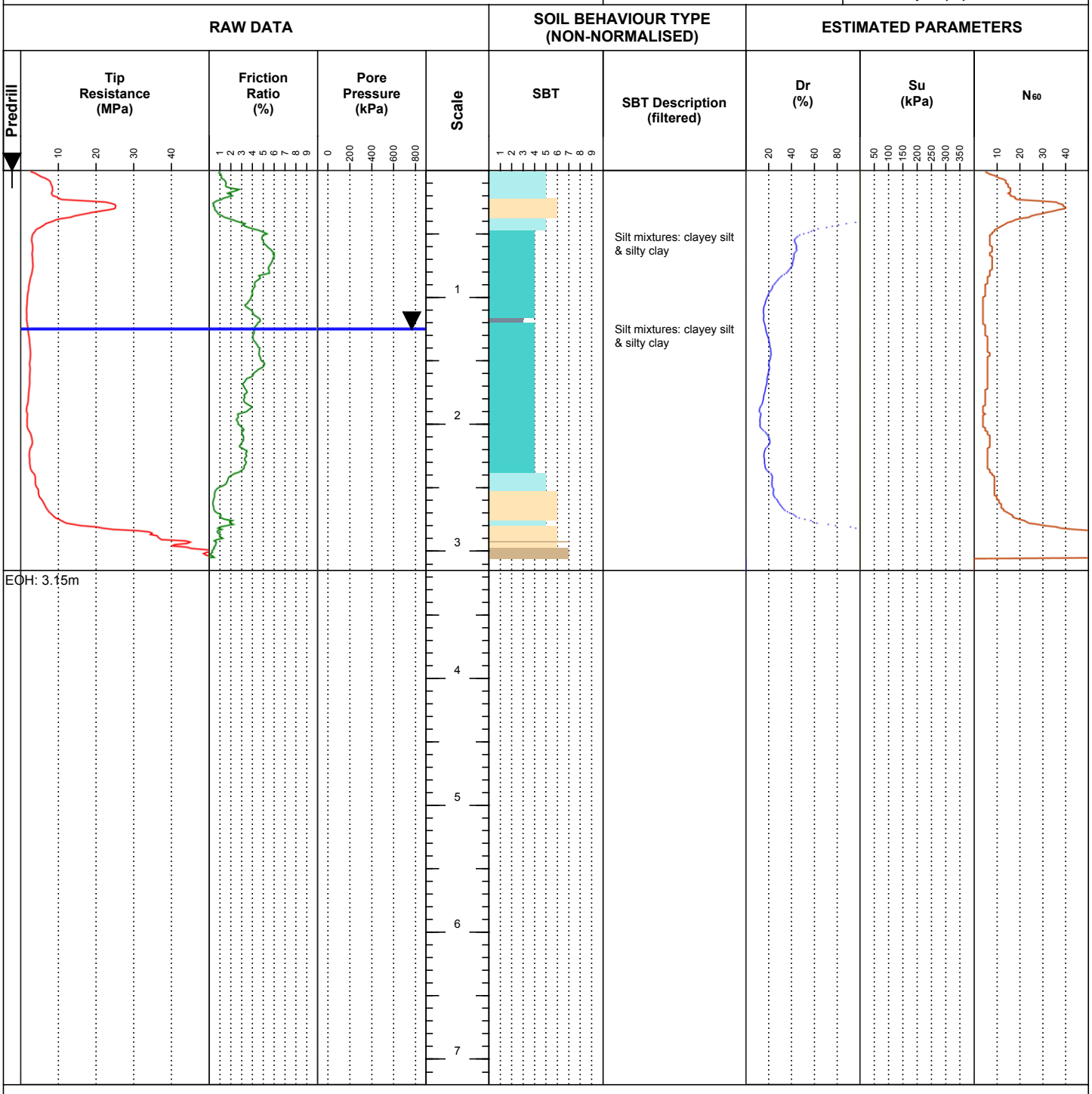
CONE PENETRATION TEST

Job:	12902
CPT No.:	CPT006

Name: 3 Tremorne Avenue, Blenheim
Client: Aurecon NZ Ltd
Location: 3 Tremorne Avenue, Blenheim

Grid: NZTM
Datum:
Termination: -

North (m): 5403138.15
East (m): 1680951.54
Elevation (m): -
Hole Depth (m): 3.15



Operator: S. Cardona
Cone Reference: 080238T
Cone Area Ratio: 0.75
Cone Type: -

Date: 12/11/2013
Predrill: 0.00
Water Level: 1.25
Collapse:

Tip Resistance Initial: -2.421
Local Friction Initial: -0.0408
Pore Pressure Initial: -

Tip Resistance Final: -2.3304
Local Friction Final: -0.0434
Pore Pressure Final: -

Effective Refusal
Tip: ✓
Gauge:
Inclinometer:
Other:

Target Depth:

Soil Behaviour Type (SBT) - Robertson et al. 1986

0	Undefined	5	Sand mixtures: silty sand to sandy silt
1	Sensitive fine -grained	6	Sands: clean sands to silty sands
2	Clay - organic soil	7	Dense sand to gravelly sand
3	Clays: clay to silty clay	8	Stiff sand to clayey sand
4	Silt mixtures: clayey silt & silty clay	9	Stiff fine-grained

Notes & Limitations

Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P. K. Robertson and K.L. Cabal (2010), Guide to Cone Penetration Testing for Geotechnical Engineering, 4th Edition. The interpretations are presented only as a guide for geotechnical use, and should be carefully reviewed by the user. Both McMillan Drilling Ltd & Geroc Solutions Ltd do not warranty the correctness or the applicability of any of the geotechnical soil and design parameters shown and does not assume any liability for any use of the results in any design or review. The user should be fully aware of the techniques and limitations of any method used to derive data shown in this report.

Remarks
Effective Refusal

Hole Depth (m): 3.15

TEST DETAIL

PointID: CPT001

Sounding: 1

Operator: S. Cardona | **Date:** 11/11/2013 | **Effective Refusal**
Cone Reference: 080238T | **Predrill:** 0.00 | **Tip:** ✓
Cone Area Ratio: 0.75 | **Water Level:** 1.30 | **Gauge:**
Cone Type: - | **Collapse:** | **Inclinometer:**
Other:

Tip Resistance Initial: -2.5116 | **Tip Resistance Final:** -2.4664
Local Friction Initial: -0.0434 | **Local Friction Final:** -0.0443
Pore Pressure Initial: - | **Pore Pressure Final:** - | **Target Depth:**

PointID: CPT002

Sounding: 2

Operator: S. Cardona | **Date:** 11/11/2013 | **Effective Refusal**
Cone Reference: 080238T | **Predrill:** 0.00 | **Tip:** ✓
Cone Area Ratio: 0.75 | **Water Level:** 1.35 | **Gauge:**
Cone Type: - | **Collapse:** | **Inclinometer:**
Other:

Tip Resistance Initial: -2.3564 | **Tip Resistance Final:** -2.4989
Local Friction Initial: -0.0424 | **Local Friction Final:** -0.0447
Pore Pressure Initial: - | **Pore Pressure Final:** - | **Target Depth:**

PointID: CPT003

Sounding: 3

Operator: S. Cardona | **Date:** 11/11/2013 | **Effective Refusal**
Cone Reference: 080238T | **Predrill:** 0.00 | **Tip:** ✓
Cone Area Ratio: 0.75 | **Water Level:** 1.35 | **Gauge:**
Cone Type: - | **Collapse:** | **Inclinometer:**
Other:

Tip Resistance Initial: -2.4846 | **Tip Resistance Final:** -2.3508
Local Friction Initial: -0.0456 | **Local Friction Final:** -0.0441
Pore Pressure Initial: - | **Pore Pressure Final:** - | **Target Depth:**

PointID: CPT004

Sounding: 4

Operator: S. Cardona | **Date:** 11/11/2013 | **Effective Refusal**
Cone Reference: 080238T | **Predrill:** 0.00 | **Tip:** ✓
Cone Area Ratio: 0.75 | **Water Level:** 1.30 | **Gauge:**
Cone Type: - | **Collapse:** | **Inclinometer:**
Other:

Tip Resistance Initial: -2.4609 | **Tip Resistance Final:** -2.4053
Local Friction Initial: -0.0447 | **Local Friction Final:** -0.0445
Pore Pressure Initial: - | **Pore Pressure Final:** - | **Target Depth:**

PointID: CPT005

Sounding: 5

Operator: S. Cardona | **Date:** 11/11/2013 | **Effective Refusal**
Cone Reference: 080238T | **Predrill:** 0.00 | **Tip:** ✓
Cone Area Ratio: 0.75 | **Water Level:** 1.30 | **Gauge:**
Cone Type: - | **Collapse:** | **Inclinometer:**
Other:

Tip Resistance Initial: -2.4305 | **Tip Resistance Final:** -2.4681
Local Friction Initial: -0.0442 | **Local Friction Final:** -0.0462
Pore Pressure Initial: - | **Pore Pressure Final:** - | **Target Depth:**

TEST DETAIL

PointID: CPT006

Sounding: 6

Operator: S. Cardona
Cone Reference: 080238T
Cone Area Ratio: 0.75
Cone Type: -

Date: 12/11/2013
Predrill: 0.00
Water Level: 1.25
Collapse:

Effective Refusal Tip: ✔
Gauge:
Inclinometer:
Other:

Tip Resistance Initial: -2.421
Local Friction Initial: -0.0408
Pore Pressure Initial: -

Tip Resistance Final: -2.3304
Local Friction Final: -0.0434
Pore Pressure Final: -

Target Depth:

CPT CALIBRATION AND TECHNICAL NOTES

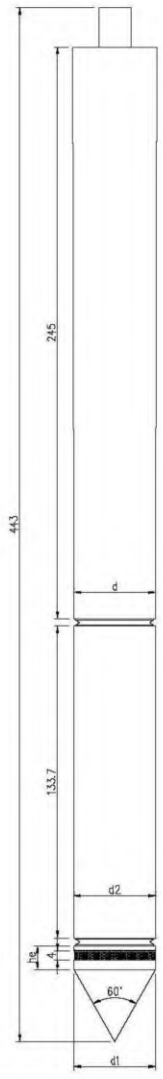
These notes describe the technical specifications and associated calibration references pertaining to the following cone types:

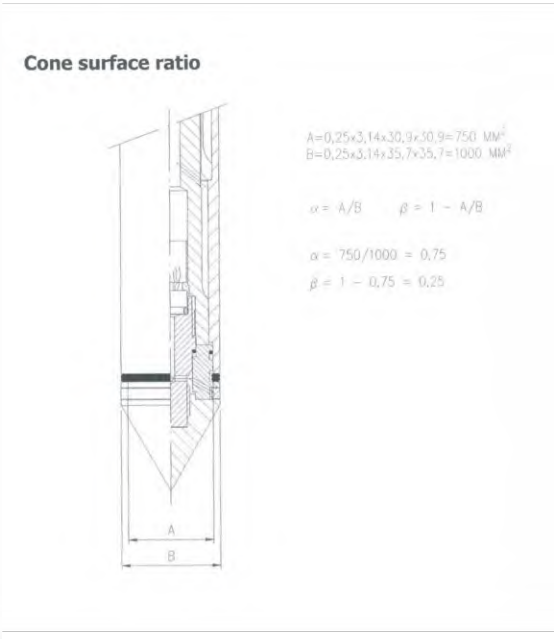
- ELCI-10CFXY measuring cone resistance, sleeve friction and inclination (standard cone);
- ELCI-CFXYP20-10 measuring cone resistance, sleeve friction, inclination and pore pressure (piezocone).

Dimensions

Dimensional specifications for both cone types are detailed below. All tolerances are routinely checked prior to testing and measurements taken are manually recorded on CPT field sheets. All field sheets are kept on file and available on request.

A.P. van den Berg Machinefabriek tel.: +31 (0)513-631355 info@apvandenberg.com	**DEVIATION of Straightness + MINIMUM Dimensions tip, friction jacket, cone adapter**	Standards: EN ISO 22476-1 APB-standard
Type of cone:	Icone 10 cm^2	
ALLOWABLE SIZE VARIATION		
Diameter of tip:	$35,3 \leq d1 \leq 36,0$	
Diameter of centering ring CFP	$35,3 \leq d1 \leq 36,0$	
Diameter of friction jacket:	$d_1 \leq d_2 < d_1 + 0,35$	
Height dimension of tip edge:	$7 \leq h_e \leq 10$	
PRODUCTION DIMENSIONS		
Tip:	$d_1 = 35,7\ ^{+0,2}_{0}$	
Jacket (C-cone):	$d_2 = 35,7\ ^{+0,2}_{0}$	
Friction jacket (CF-cone):	$d_2 = 35,9\ ^{+0,1}_{0}$	
Tip for used cone:	$d_1 = 35,5\ ^{+0,1}_{0}$	
MINIMUM DIMENSIONS		
Minimum diameter jacket (C-cone):	$d_2 = 35,2$ (APB standard)	
Minimum diameter friction jacket (CF-cone):	$d_2 = 35,3$	
Use "used cone"-tip when friction jacket diameter:	$d_2 \leq 35,65$	
Minimum diameter of cone adaptor:	$d = 35,3$	
Maximum deviation of straightness:	1 mm on a length of 1000 mm (max. oscillation 1,0 mm.)	





CPT CALIBRATION AND TECHNICAL NOTES (cont.)

Calibration

Each cone has a unique identification number that is electronically recorded and reported for each CPT test. The identification number enables the operator to compare 'zero-load offsets' to manufacturer calibrated zero-load offsets.

The recommended maximum zero-load offset for each sensor is determined as ± 10% of the maximum measuring range although the more conservative trigger point adopted by McMillan Drilling Services is ± 10% of the nominal range.

In addition to maximum zero-load offsets, McMillan Drilling Services also limits the difference in zero load offset before and after the test as ± 1% of the maximum measuring range. See table below:

	Tip (MPa)	Friction (MPa)	Pore Pressure (MPa)
Maximum Measuring Range:	150	1.50	3.00
Nominal Measuring Range:	100	1.00	2.00
Max. 'zero-load offset':	10	0.10	0.20
Max 'before and after test':	1.5	0.015	0.03

Note: The zero offsets are electronically recorded and reported for each test in the same units as that of each sensor.

TEST CERTIFICATE
Icone (all versions)

Supplier:	A.P. v.d. Berg Machinefabriek, Heerenveen The Netherlands
Production-order:	61053.001
Client:	Mc Millan
Cone-type:	ELCI 10 CFXY
Cone-number:	080238

To test / To check item	**Required value**	**Checked value**
Isolation-resistance	>0.5 G-Ohm	O.K. Gohm
Straightness total Icone (10 cm2). (Base part Icone: S <= 0,2 mm) **For dimensions 15cm Icones: see standard/table.**	S<= 2,2 mm	O.K. mm
All Measurements: Test with both GOnsite! v2.xx and v3.12.		O.K.
Zero-Value Tip	Good	-2,75 MPa
Zero-Value Local Friction	Good	-0,03 MPa
Zero-Value Pore Pressure	Good	n.v.t. kPa
Zero-Value Inclination X Zero-Value Inclination Y	-2°< X <+2° -2° < Y <+2°	0,3 ° 0,2 °
Measurements Tip resistance OK?	Yes	0-50MPa
Influence of Tip on Local Friction and Pore Pressure? Tip: **Max Load**; Mantle free? 10cm2:**150 kN.** // 15 cm2:**225 kN.**	No influence	O.K.
Measurements Local Friction OK?	Yes	0-0,75MPa
Local Friction: **Max Load**	O.K.	O.K.
Measurements Pore Pressure OK?	Yes	n.v.t.
Measurements Inclination OK?	Yes	-24-0-24
Cone recognition on disconnecting and connecting Icone again?	Yes	O.K.
Software version? Check at opening screen. **NOTE DOWN versionnbr.:**	Version:	1.8
Check alarm-settings Icone. Alarm values are set. (Kill Shutdown)	O.K.	O.K.

Remarks:

Calibrated by:	C.J. Ouwejan	Date: 3-6-13	Sign.:
Final check:	J.E. Tenhage	Date: 3-6-13	Sign.:

R:\E&D\Beproevingsprotocollen\Beproevingsprotocol Icone English.doc

Appendix D
Hand Auger Borehole and DCP Logs

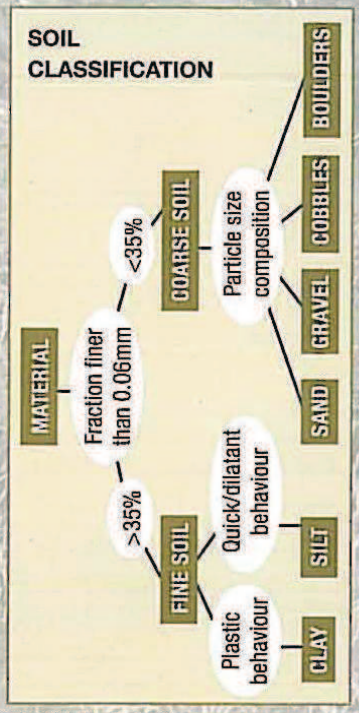
SOIL > field guide sheet

FIELD DESCRIPTION OF SOIL

SEQUENCE OF TERMS – fraction – colour – structure – strength – moisture – bedding – plasticity – sensitivity – additional

GRAIN SIZE CRITERIA

TYPE	COARSE								FINE		ORGANIC
	Boulders	Cobbles	Gravel			Sand			Silt	Clay	Organic Soil
			coarse	medium	fine	coarse	medium	fine			
Size Range (mm)	200		60	20	6	2	0.6	0.2	0.06	0.002	
Graphic Symbol											



PROPORTIONAL TERMS DEFINITION (COARSE SOILS)

Fraction	Term	% of Soil Mass	Example
Major	(....) [UPPER CASE]	≥ 50 [major constituent]	GRAVEL
Subordinate	(....) y [lower case]	20 – 50	Sandy
Minor	with some ... with minor ...	12 – 20 5 – 12	with some sand with minor sand
	with trace of (or slightly)...	< 5	with trace of sand (slightly sandy)

DENSITY INDEX (RELATIVE DENSITY) TERMS

Descriptive Term	Density Index (I_D)	SPT "N" value (blows / 300 mm)	Dynamic Cone (blows / 100 mm)
Very dense	> 85	> 50	> 17
Dense	65 – 85	30 – 50	7 – 17
Medium dense	35 – 65	10 – 30	3 – 7
Loose	15 – 35	4 – 10	1 – 3
Very loose	< 15	< 4	0 – 2

Note: • No correlation is implied between Standard Penetration Test (SPT) and Dynamic Cone Test values.
• SPT "N" values are uncorrected. • Dynamic Cone Penetrometer (Scala)

CONSISTENCY TERMS FOR COHESIVE SOILS

Descriptive Term	Undrained Shear Strength (kPa)	Diagnostic Features
Very soft	< 12	Easily exudes between fingers when squeezed
Soft	12 – 25	Easily indented by fingers
Firm	25 – 50	Indented by strong finger pressure and can be indented by thumb pressure
Stiff	50 – 100	Cannot be indented by thumb pressure
Very stiff	100 – 200	Can be indented by thumb nail
Hard	200 – 500	Difficult to indent by thumb nail

ORGANIC SOILS/ DESCRIPTORS

Term	Description
Topsoil	Surficial organic soil layer that may contain living matter. However topsoil may occur at greater depth, having been buried by geological processes or man-made fill, and should then be termed a buried topsoil.
Organic clay, silt or sand	Contains finely divided organic matter; may have distinctive smell; may stain; may oxidise rapidly. Describe as for inorganic soils.
Peat	Consists predominantly of plant remains. ***Firm***: Fibres already compressed together ***Spongy***: Very compressible and open stucture ***Plastic***: Can be moulded in hand and smears in fingers ***Fibrous***: Plant remains recognisable and retain some strength ***Amorphous***: No recognisable plant remains
Roolets	Fine, partly decomposed roots, normally found in the upper part of a soil profile or in a redeposited soil (e.g. colluvium or fill)
Carbonaceous	Discrete particles of hardened (carbonised) plant material.

MOISTURE CONDITION

Condition	Description	Granular Soils	Cohesive Soils
Dry	Looks and feels dry	Run freely through hands	Hard, powdery or friable
Moist	Feels cool, darkened in colour	Tend to cohere	Weakened by moisture, but no free water on hands when remoulding
Wet			Weakened by moisture, free water forms on hands when handling
Saturated	Feels cool, darkened in colour and free water is present on the sample		

PLASTICITY (CLAYS & SILTS)

Term	Description
High plasticity	Can be moulded or deformed over a wide range of moisture contents without cracking or showing any tendency to volume change
Low plasticity	When moulded can be crumbled in the fingers; may show quick or dilatant behaviour

GRADING (GRAVELS & SANDS)

Term	Description	
Well graded	Good representation of all particle sizes from largest to smallest	
Poorly graded	Limited representation of grain sizes - further divided into:	
	Uniformly graded	Most particles about the same size
	Gap graded	Absence of one or more intermediate sizes

compiled by KATE WILLIAMS design KARRYN MUSCHAMP

NZ GEOTECHNICAL SOCIETY INC

This field sheet has been taken from and should be used and read with reference to the document FIELD DESCRIPTION OF SOIL AND ROCK. Guideline For the Field Classification and Description of Soil and Rock for Engineering Purposes. NZ Geotechnical Society Inc, December 2005. **www.nzgeotechsoc.org.nz**

DYNAMIC CONE (SCALA) PENETROMETER TEST RECORD

SCALA PENETROMETER NO. **DCP 1**

PROJECT **3 Tremorne Ave**
Blenheim

PROJECT NO. **239195**

CO-ORDINATES (NZTM)
E 1681013
N 5403197

GROUND LEVEL m RL

TESTED / SUPERVISED BY **B. SUCKLING**

DATE **11/11/2013**

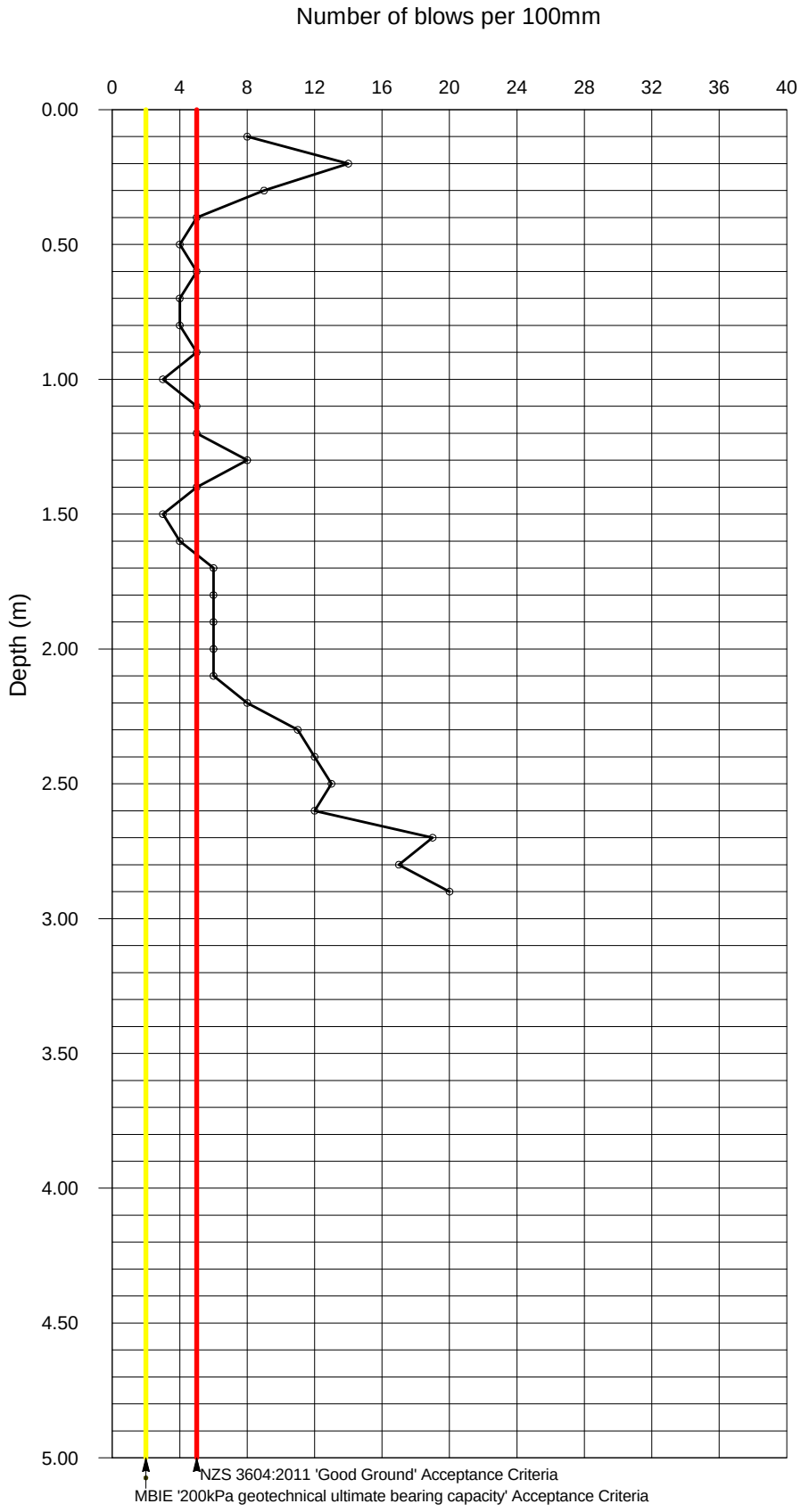
CHECKED BY **T. PLUNKET**

DATE **18/11/2013**

Results

Depth (m)	Blows per 100 mm
0.0	8
	14
	9
	5
0.5	4
	5
	4
	4
	5
1.0	3
	5
	5
	8
	5
1.5	3
	4
	6
	6
	6
2.0	6
	6
	8
	11
	12
2.5	13
	12
	19
	17
	20
3.0	
3.5	

Depth (m)	Blows per 100 mm
3.5	
4.0	
4.5	
5.0	



Remarks:

20 blows for 100mm in the last increment.

Coordinates approximate only. Ground level not measured.

Effective refusal, 20+ blows per 100mm penetration.

DYNAMIC CONE (SCALA) PENETROMETER TEST RECORD

SCALA PENETROMETER NO. **DCP 2**

PROJECT **3 Tremorne Ave**
Blenheim

PROJECT NO. **239195**

CO-ORDINATES (NZTM)
E 1681024
N 5403149

GROUND LEVEL m RL

TESTED / SUPERVISED BY **B. SUCKLING**

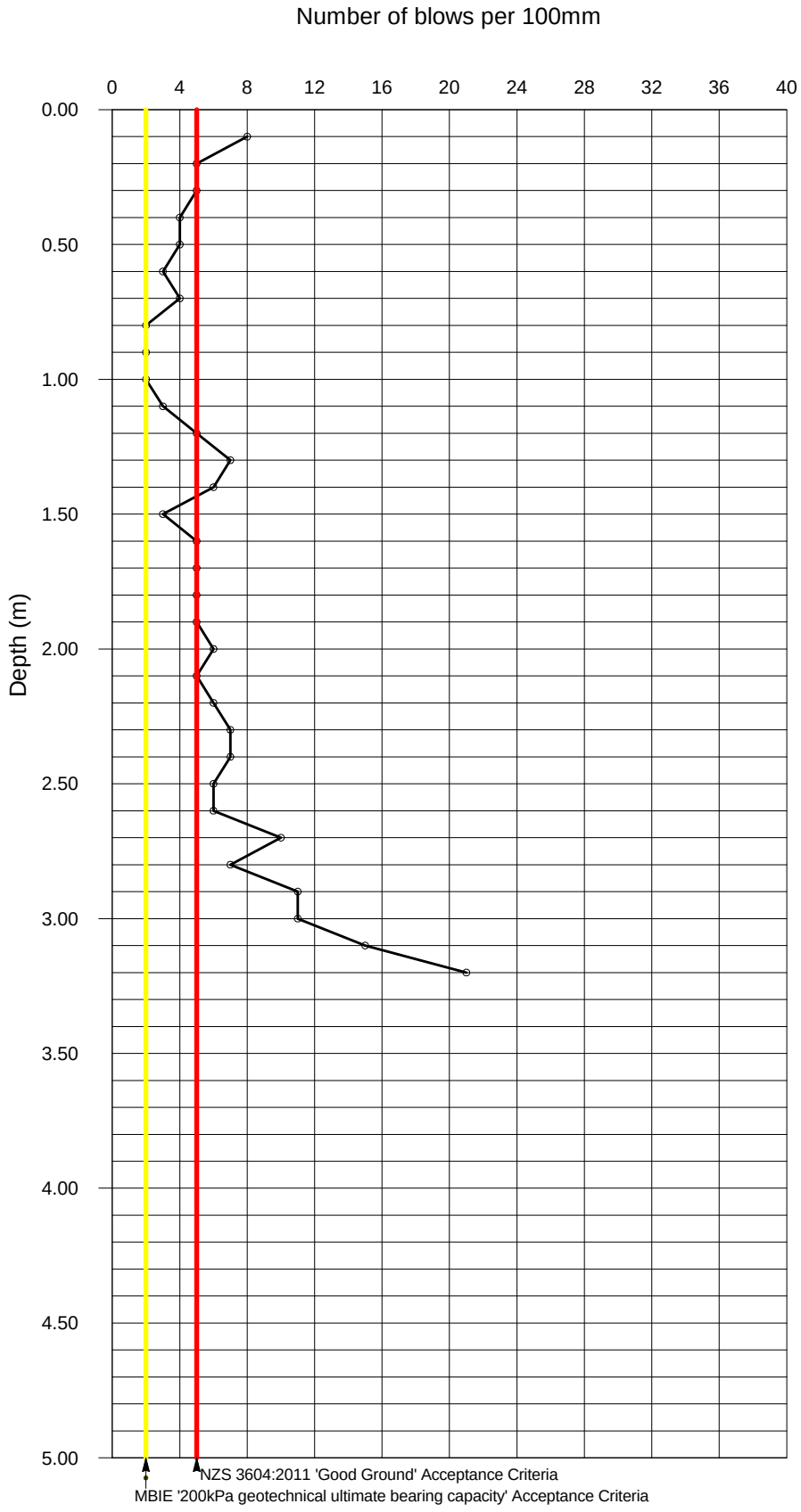
DATE **11/11/2013**

CHECKED BY **T. PLUNKET**

DATE **18/11/2013**

Results

Depth (m)	Blows per 100 mm	Depth (m)	Blows per 100 mm
0.0	8	3.5	
	5		
	5		
	4		
0.5	4	4.0	
	3		
	4		
	2		
	2		
1.0	2	4.5	
	3		
	5		
	7		
	6		
1.5	3	5.0	
	5		
	5		
	5		
	5		
2.0	6		
	5		
	6		
	7		
	7		
2.5	6		
	6		
	10		
	7		
	11		
3.0	11		
	15		
	21		
3.5			



Remarks:

21 blows for 100mm in the last increment.

Coordinates approximate only. Ground level not measured.

Effective refusal, 20+ blows per 100mm penetration.

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DYNAMIC CONE (SCALA) PENETROMETER TEST RECORD

SCALA PENETROMETER NO. **DCP 3**

PROJECT **3 Tremorne Ave**
Blenheim

PROJECT NO. **239195**

CO-ORDINATES (NZTM)
E 1680987
N 5403136

GROUND LEVEL m RL

TESTED / SUPERVISED BY **B. SUCKLING**

DATE **11/11/2013**

CHECKED BY **T. PLUNKET**

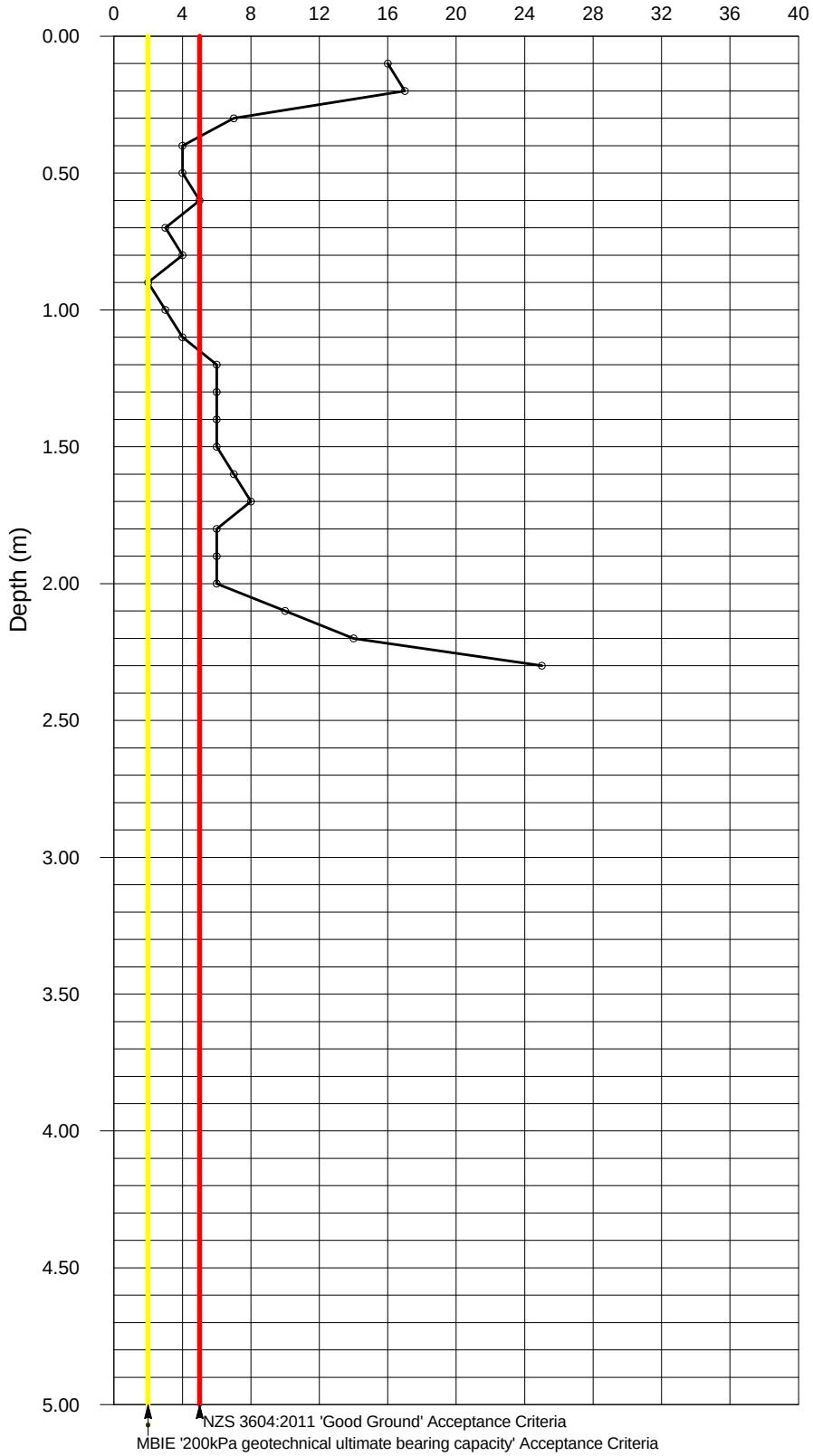
DATE **18/11/2013**

Results

Depth (m)	Blows per 100 mm
0.0	16
	17
	7
	4
0.5	4
	5
	3
	4
	2
1.0	3
	4
	6
	6
	6
1.5	6
	7
	8
	6
	6
2.0	6
	10
	14
	25
2.5	
3.0	
3.5	

Depth (m)	Blows per 100 mm
3.5	
4.0	
4.5	
5.0	

Number of blows per 100mm



Remarks:

20 blows for 80mm in the last increment.

Coordinates approximate only. Ground level not measured.

Effective refusal, 20+ blows per 100mm penetration.

DYNAMIC CONE (SCALA) PENETROMETER TEST RECORD

SCALA PENETROMETER NO. **DCP 4**

PROJECT **3 Tremorne Ave**
Blenheim

PROJECT NO. **239195**

CO-ORDINATES (NZTM)
E 1680973
N 5403171

GROUND LEVEL m RL

TESTED / SUPERVISED BY **B. SUCKLING**

DATE **11/11/2013**

CHECKED BY **T. PLUNKET**

DATE **18/11/2013**

Results

Depth (m)	Blows per 100 mm
0.0	19
	13
	8
	5
0.5	5
	3
	3
	2
	2
1.0	3
	3
	8
	8
	7
1.5	8
	7
	5
	5
	5
2.0	5
	6
	6
	15
	13
2.5	17
	18
	16
	25
3.0	
3.5	

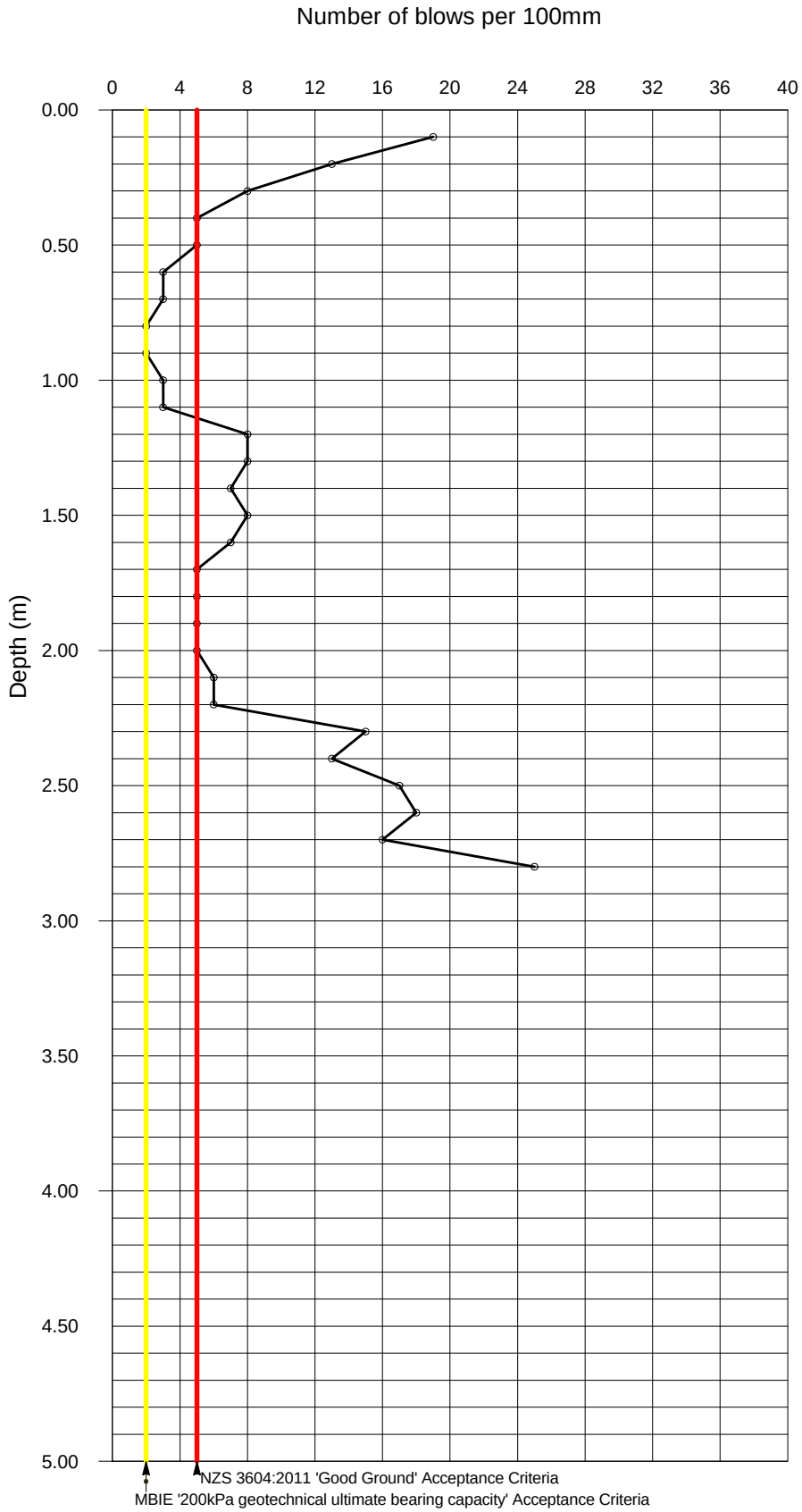
Depth (m)	Blows per 100 mm
3.5	
4.0	
4.5	
5.0	

Remarks:

20 blows for 80mm in the last increment.

Coordinates approximate only. Ground level not measured.

Effective refusal, 20+ blows per 100mm penetration.



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HAND AUGER RECORD

HOLE NO. **HA 1**

PROJECT NO. **239195**

PROJECT **3 Tremorne Ave Blenheim**

CLIENT **J & RK de Castro Ltd (In Receivership)**

CO-ORDINATES (NZTM) **E 1681013** **N 5403197**

SHEET **1** of **1**

METHOD **HA**

DATE from **11/11/2013** to **11/11/2013**

MACHINE & NO. **N/A**

ORIENTATION **VERTICAL**

GROUND-LEVEL m RL

Water level	Tests	Samples (Type Ref Depth)	Reduced Level	Depth (m)	Legend	STRATA DESCRIPTION
		HA 0.00		0.00		Sandy SILT with minor gravel; light greyish brown. *Stiff*, dry, low plasticitiy; sand, fine; gravel, fine to medium, subangular to subrounded. (TOPSOIL/FILL).
				0.15		SILT with minor sand; brownish grey mottled orange. *Stiff*, dry, low plasticity; sand, fine.
						1.10m Becomes brown mottled orange, moist.
				1.45		End of Hand Auger at 1.45m, on 11/11/2013 *Termination Reason:* Too difficult to auger, very stiff silts encountered.

STRATA DESCRIPTION
SUBORDINATE FRACTION, MAJOR FRACTION, MINOR FRACTION, COLOUR, STRUCTURE, STRENGTH, MOISTURE CONDITION GRADING, BEDDING, PLASTICITY, ETC....
(NZ GEOTECHNICAL SOCIETY - FIELD DESCRIPTION OF SOIL AND ROCK)

- Small Disturbed Sample
- Large Disturbed Sample
- SPT Liner Sample
- Thin Wall Undisturbed Sample
- U100 Undisturbed Sample
- Pocket Penetrometer Test
- Piston Sample
- Water Level
- Impression Packer Test
- Standard Penetration Test
- Permeability Test
- Piezometer / Standpipe Tip
- Packer Test
- In-situ Vane Shear Test

LOGGED **B. SUCKLING**

DATE **11/11/2013**

CHECKED **T. PLUNKET**

DATE **18/11/2013**

REMARKS

Groundwater not encountered.

Coordinates approximate only. Ground level not measured.

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HAND AUGER RECORD

HOLE NO. **HA 2**

PROJECT NO. **239195**

PROJECT	**3 Tremorne Ave Blenheim**		
CLIENT	**J & RK de Castro Ltd (In Receivership)**	CO-ORDINATES (NZTM) **E 1681024 N 5403149**	SHEET **1** of **1**
METHOD	**HA**		DATE from **11/11/2013** to **11/11/2013**
MACHINE & NO.	**N/A**	ORIENTATION **VERTICAL**	GROUND-LEVEL m RL

Water level	Tests	Samples (Type Ref Depth)	Reduced Level	Depth (m)	Legend	STRATA DESCRIPTION
		0.00		0.00		
		HA		0.10		Sandy SILT with some gravel; light greyish brown. *Stiff*, dry, low plasticity; sand, fine; gravel, fine to coarse, subangular to subrounded. (TOPSOIL/FILL).
						SILT with minor sand; greyish brown mottled orange. *Stiff*, dry, low plasticity; sand, fine.
						1.00m Becomes brown mottled orange, *very stiff*, moist.
				1.20		End of Hand Auger at 1.20m, on 11/11/2013 *Termination Reason:* Too difficult to auger, very stiff silts encountered.

STRATA DESCRIPTION
SUBORDINATE FRACTION, MAJOR FRACTION, MINOR FRACTION, COLOUR, STRUCTURE, STRENGTH, MOISTURE CONDITION GRADING, BEDDING, PLASTICITY, ETC....
(NZ GEOTECHNICAL SOCIETY - FIELD DESCRIPTION OF SOIL AND ROCK)

- Small Disturbed Sample
- Large Disturbed Sample
- SPT Liner Sample
- Thin Wall Undisturbed Sample
- U100 Undisturbed Sample
- Pocket Penetrometer Test
- Piston Sample
- Water Level
- Impression Packer Test
- Standard Penetration Test
- Permeability Test
- Piezometer / Standpipe Tip
- Packer Test
- In-situ Vane Shear Test

LOGGED **B. SUCKLING**

DATE **11/11/2013**

CHECKED **T. PLUNKET**

DATE **18/11/2013**

REMARKS

Groundwater not encountered.

Coordinates approximate only. Ground level not measured.

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HAND AUGER RECORD

HOLE NO. **HA 3**

PROJECT NO. **239195**

PROJECT	**3 Tremorne Ave Blenheim**		
CLIENT	**J & RK de Castro Ltd (In Receivership)**	CO-ORDINATES (NZTM) **E 1680987 N 5403136**	SHEET **1** of **1**
METHOD	**HA**		DATE from **11/11/2013** to **11/11/2013**
MACHINE & NO.	**N/A**	ORIENTATION **VERTICAL**	GROUND-LEVEL m RL

Water level	Tests	Samples (Type Ref Depth)	Reduced Level	Depth (m)	Legend	STRATA DESCRIPTION
		HA 0.00		0.00		
				0.10		Sandy SILT with some gravel; greyish brown. *Stiff*, dry, low plasticity; sand, fine to medium; gravel, fine to medium, subangular to subrounded. (TOPSOIL/FILL).
						SILT with minor sand; greyish brown mottled orange. *Stiff*, dry, low plasticity; sand is fine.
						0.90m Becomes moist. 0.95m Becomes brown mottled orange, *very stiff*.
				1.20		End of Hand Auger at 1.20m, on 11/11/2013 *Termination Reason:* Too difficult to auger, very stiff silts encountered.

STRATA DESCRIPTION
SUBORDINATE FRACTION, MAJOR FRACTION, MINOR FRACTION, COLOUR, STRUCTURE, STRENGTH, MOISTURE CONDITION GRADING, BEDDING, PLASTICITY, ETC....
(NZ GEOTECHNICAL SOCIETY - FIELD DESCRIPTION OF SOIL AND ROCK)

- Small Disturbed Sample
- Large Disturbed Sample
- SPT Liner Sample
- Thin Wall Undisturbed Sample
- U100 Undisturbed Sample
- Pocket Penetrometer Test
- Piston Sample
- Water Level
- Impression Packer Test
- Standard Penetration Test
- Permeability Test
- Piezometer / Standpipe Tip
- Packer Test
- In-situ Vane Shear Test

LOGGED **B. SUCKLING**

DATE **11/11/2013**

CHECKED **T. PLUNKET**

DATE **18/11/2013**

REMARKS

Groundwater not encountered.

Coordinates approximate only. Ground level not measured.

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HAND AUGER RECORD

HOLE NO. **HA 4**

PROJECT NO. **239195**

PROJECT	**3 Tremorne Ave Blenheim**		
CLIENT	**J & RK de Castro Ltd (In Receivership)**	CO-ORDINATES (NZTM) **E 1680973 N 5403171**	SHEET **1** of **1**
METHOD	**HA**		DATE from **11/11/2013** to **11/11/2013**
MACHINE & NO.	**N/A**	ORIENTATION **VERTICAL**	GROUND-LEVEL m RL

Water level	Tests	Samples (Type Ref Depth)	Reduced Level	Depth (m)	Legend	STRATA DESCRIPTION
		HA 0.00		0.00		Sandy SILT with some gravel; greyish brown. *Stiff*, dry, low plasticity; sand, fine to medium; gravel, fine to medium, subangular to subrounded. (TOPSOIL/FILL).
				0.15		SILT with minor sand; greyish brown mottled orange. *Stiff*, dry, low plasticity; sand is fine.
						0.85m Becomes moist.
						1.00m Becomes brown mottled orange, *very stiff*.
				1.25		End of Hand Auger at 1.25m, on 11/11/2013 *Termination Reason:* Too difficult to auger, very stiff silts encountered.

- Small Disturbed Sample
- Large Disturbed Sample
- SPT Liner Sample
- Thin Wall Undisturbed Sample
- U100 Undisturbed Sample
- Pocket Penetrometer Test
- Piston Sample
- Water Level
- Impression Packer Test
- Standard Penetration Test
- Permeability Test
- Piezometer / Standpipe Tip
- Packer Test
- In-situ Vane Shear Test

LOGGED **B. SUCKLING**

DATE **11/11/2013**

CHECKED **T. PLUNKET**

DATE **18/11/2013**

REMARKS

Groundwater not encountered.

Coordinates approximate only. Ground level not measured.

Aurecon New Zealand Ltd., Unit 1, 150 Cavendish Road, Casebrook, Christchurch 8051. Tel: +64 3 375 0761 Fax: +64 3 379 6955 christchurch@aurecongroup.com

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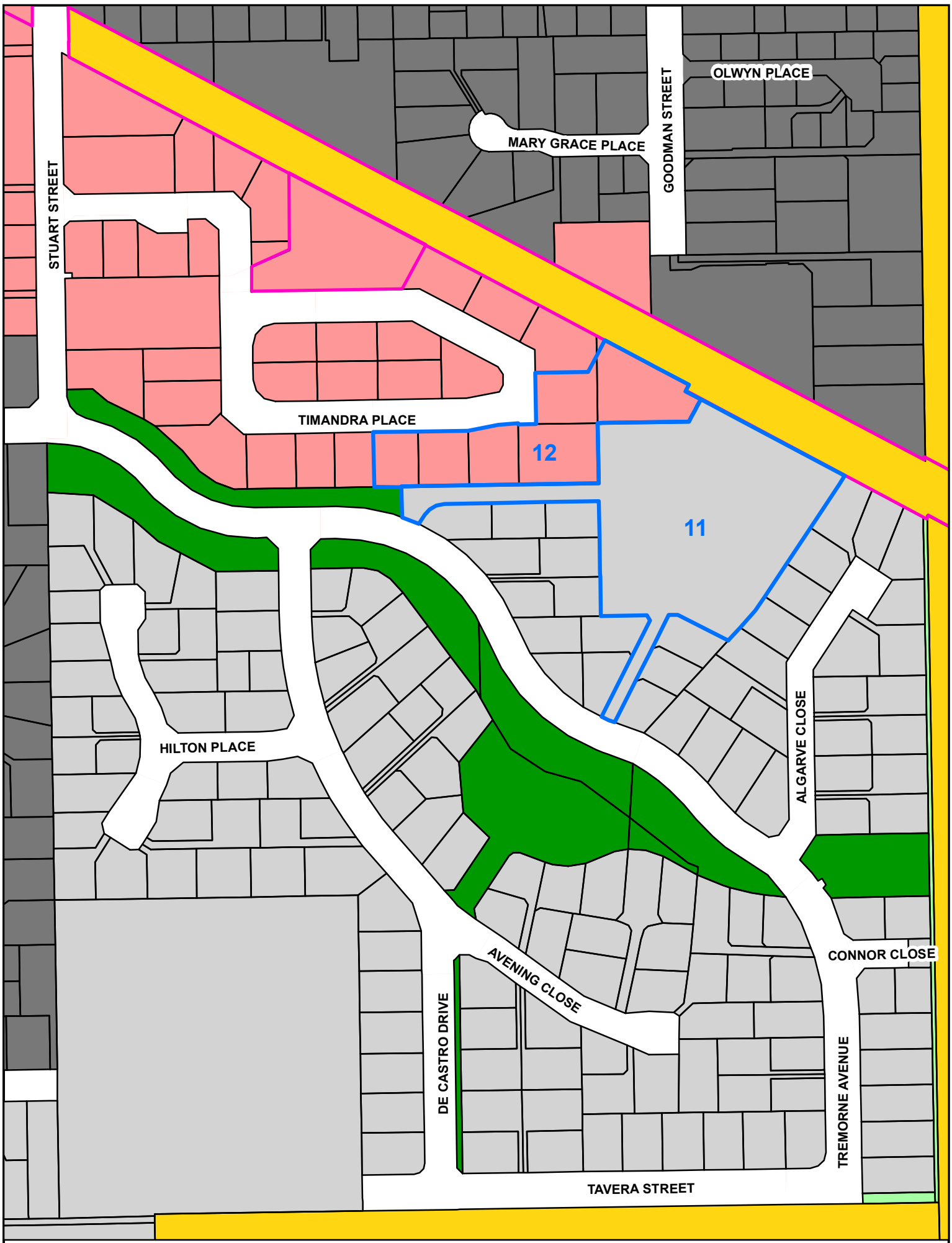
Appendix 3



Proposed Zoning Tremorne Avenue

Section 32 Report Map

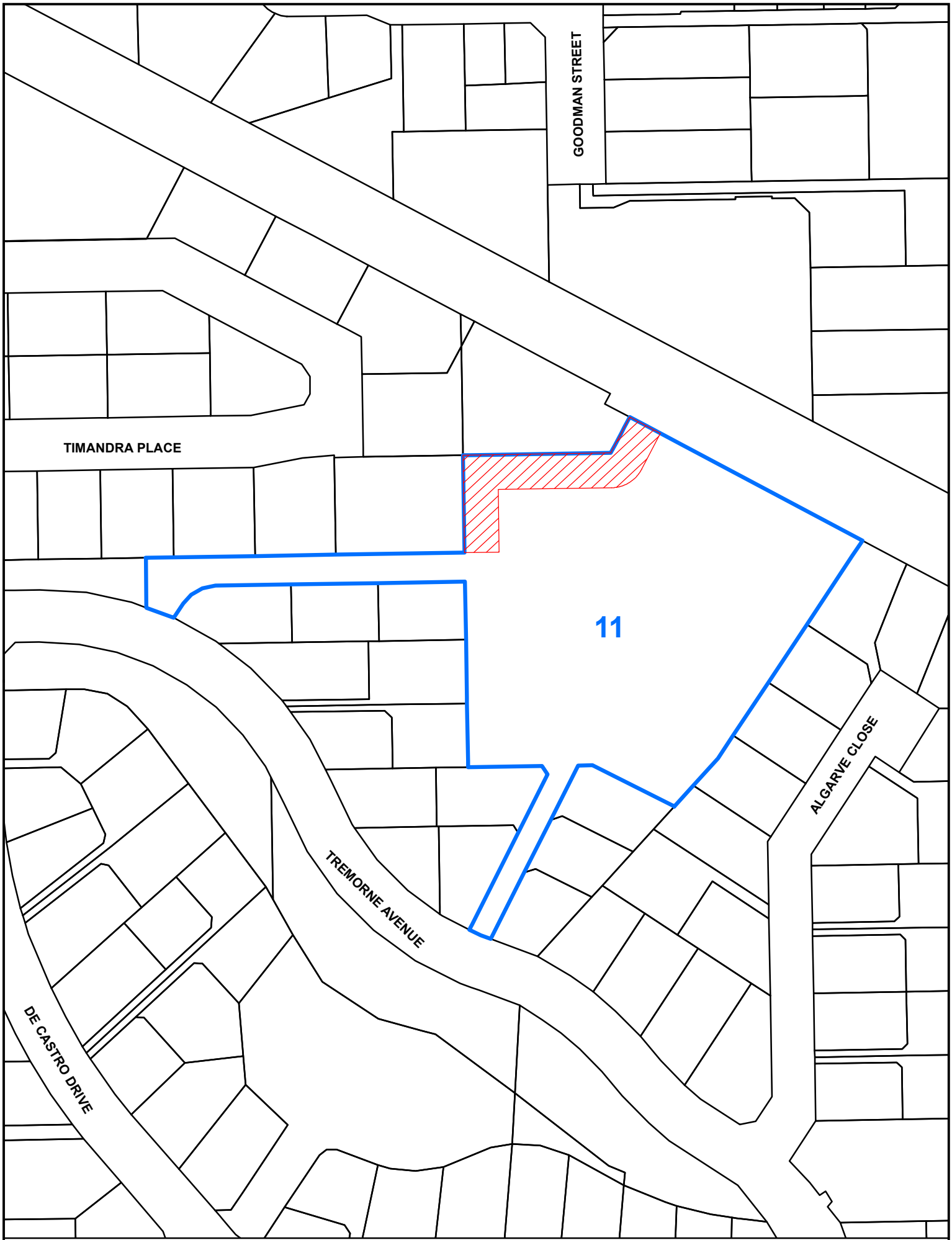
Wairau Awatere Resource Management Plan

Date: 5/06/2014

Legend

- Specific Activity Sites Appendix (G)
- Designation
- Land Parcel
- Local Recreation
- Conservation
- Industrial One
- Rural Three
- Road
- Urban Residential One
- Urban Residential Two

N



Proposed Diagram Tremorne Avenue
Appendix G Site: 11

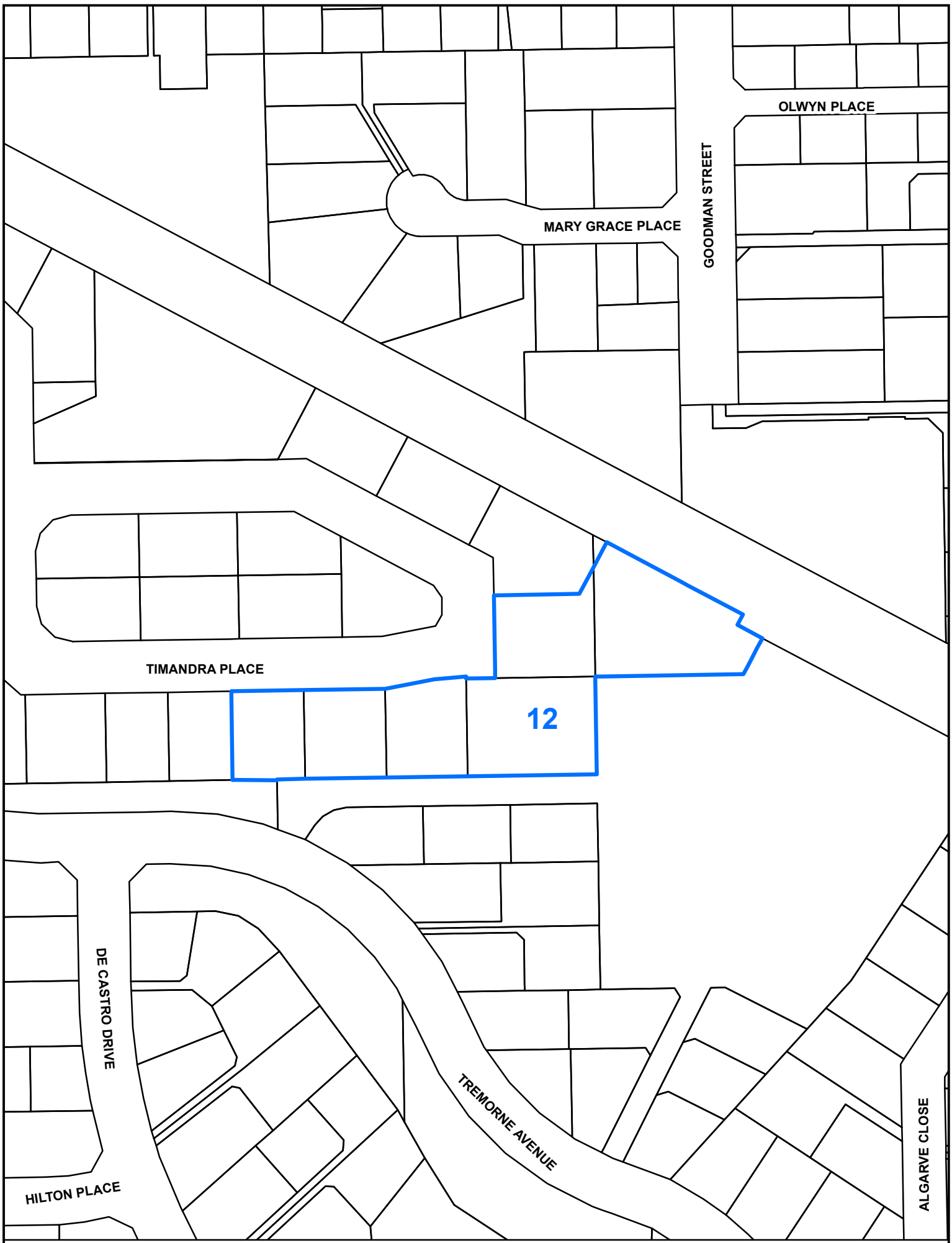
Section 32 Report Map
Wairau Awatere Resource Management Plan

Date: 5/06/2014

Legend

- Appendix G Site Inclusion
- 11 Specific Activity Sites Appendix (G)
- Land Parcel

N



Proposed Diagram Tremorne Avenue Appendix G Site: 12

Section 32 Report Map
Wairau Awatere Resource Management Plan

Date: 5/06/2014

Legend

12 Specific Activity Sites Appendix (G)

Land Parcel

N