CORE
ENGINEERING SOLUTIONS

GEOTECHNICAL COMPLETION REPORT
STAGE 3

Lot 14 DP 374000
51 TE MAIKA ROAD, NGUNGURU

Job Details:	Residential Subdivision – Stage Three
Job number:	20-0078
Client:	Traverse Ltd
Site Address:	51 Te Maika Road, Ngunguru
Legal Description:	Lot 14 DP 374000
Date:	22 December 2022
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Core Engineering Solutions Limited

Geotechnical Completion Report for Stage 3 - Residential Subdivision at Lot 14 DP 374000
51 Te Maika Road, Ngunguru

Job No	20-0078
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Street Address	51 Te Maika Road, Ngunguru
Legal Description	Lot 14 DP 374000
Applicable Consents	SL2100003
Client	Traverse Ltd
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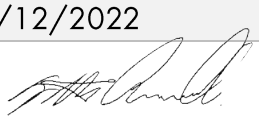
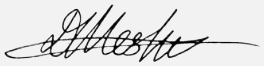
Author Signature	
Authoriser Signature	

Please note that NZS4431:1989 has been updated during the course of this project to NZS4431:2022.

This document references both NZS4431:1989 and NZS4431:2022. This is not an error and relates to the change in practices outlined in each of these documents and the timeframe during which earthworks took place.

1. INTRODUCTION

This Geotechnical Completion Report (GCR) has been prepared By Core Engineering Solutions Ltd (CES Ltd) for Traverse Ltd as part of the documentation to be submitted to Whangarei District Council (WDC) on completion of the Stage Three of the Te Maika Road subdivision in Ngunguru, located at 51 Te Maika Road, Ngunguru, hereinafter referred to as 'the site'. Stage Three comprises the development of 11 residential lots.

This report addresses the geotechnical engineering aspects of the subdivision development, identifies and discusses geotechnical engineering issues that must be taken into consideration during individual Lot development, and includes a Statement of Professional Opinion (SOPO) that covers the Suitability of the Land for its Intended Purpose. The SOPO includes a summary table, outlining the Geotechnical Design Recommendations from CES Ltd in regards to individual Residential Lots. The SOPO is located within Appendix One.

The subdivision design was prepared by Reyburn & Bryant Limited (R&B Ltd), and the main civil contractor was Clements Contractors Ltd (CC Ltd).

CES Ltd Drawings in this report are based on final contour levels provided by Reyburn and Bryant for the purposes of establishing building setbacks. Final 'AS Built' plans are to be provided by Reyburn and Bryant.

CES Ltd was commissioned to observe and undertake construction monitoring for earthworks and specific design engineering works (eg retaining wall, settlement monitoring, fill compaction).

Subdivision Earthworks were carried out in general accordance with NZS4404:2010 Land Development and Subdivision Infrastructure, together with NZS 4431:1989. Compliance with the recent NZS4431:2022 Code of practice for Earth Fill for Residential Development has been adopted where practically possible.

This document has been prepared in general accordance with the Whangarei District Council (WDC) Engineering Standards 2022, with special reference to Site Development Suitability (Geotechnical and Natural Hazards).

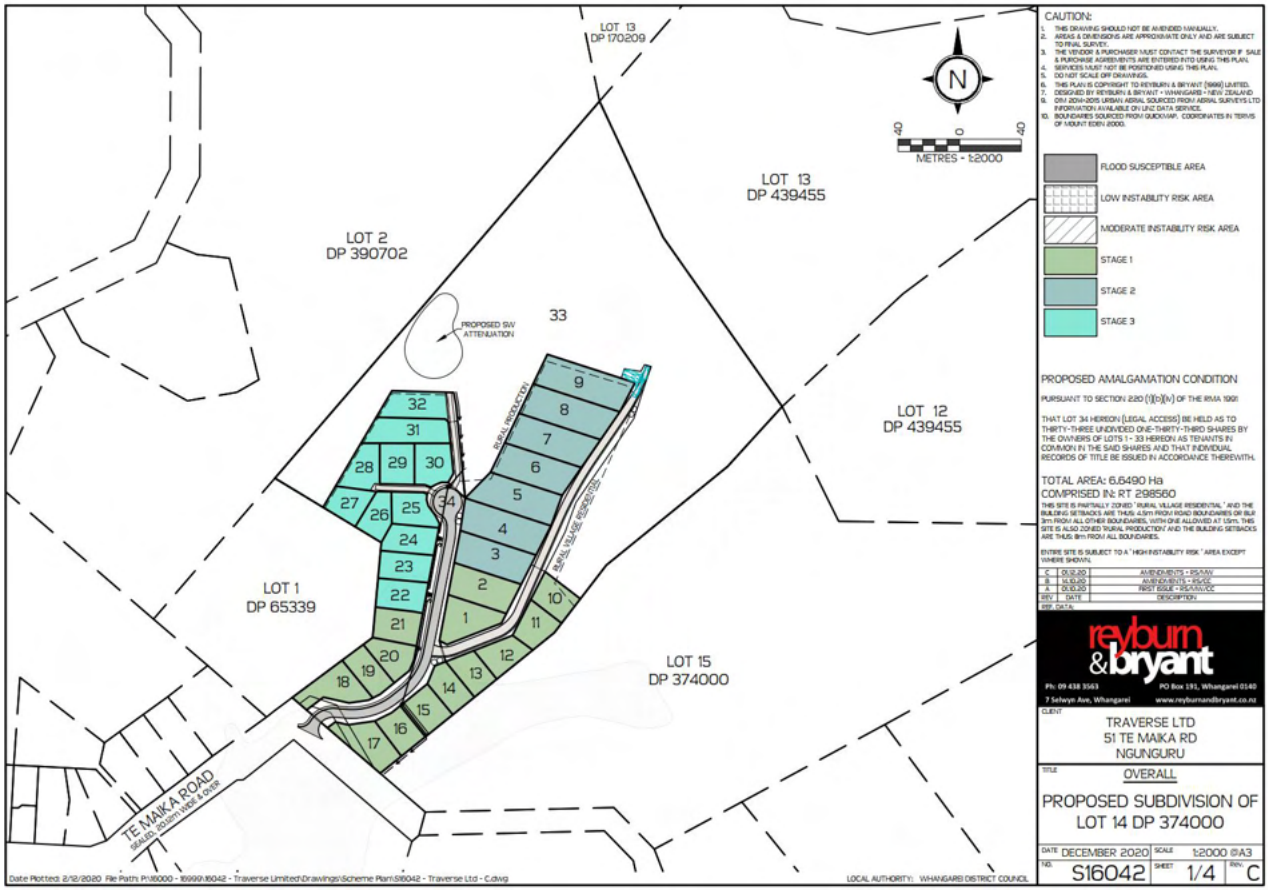


Figure 1 - Map of subdivision, showing various Stages. (Source R&B Ltd)

2. SITE DESCRIPTION

This 66490m² property is located on the northern side at the end of Te Maika Road. The property has a prominent broad crested spur ridgeline which runs down towards the south. The western and north-western boundaries back onto the flank of a ridgeline that runs through the neighbouring properties.

The majority of the lower areas of the subdivision have been raised using fill material harvested from Stage 2 of the development. Earthworks have been carried out in such a manner as to form level or near level sites throughout the majority of Stages One and Three of the subdivision. No in-fill drainage, such as a drainage blanket, has been placed during construction.

Stage Three of this development is mainly level following extensive earth filling over the allotments (Lots 22-32); however, specific items that may affect development within the subdivision are noted below.

2.1 Completed Subdivision

The completed Stage Three Subdivision has resulted in the formation of eleven new residential Lots (Lots 22-32 inclusive) that, on completion of the subdivision works and certification from the

Council, will be released for individual development. The majority of the sections within this development have been filled using engineered fill to create level building sites.

2.2 Topographical Description Post-Construction

The land within Stage Three has undergone significant transformation in order to obtain the finished site profile. The majority of Stage Three sections have a near-level topography, with lots 27 and 28 being situated partially on ridge flanks and Lots 26 and 29 stepping down from the hill flanks.

Topsoil and non-engineered fill has been removed from the site, however, issues with access and elevated ground levels within Lots 27 to 28 made undercutting all organic material in this area difficult. Substantial amounts of clay fill from the spur (within Stage Two) to the north east of the site, has been cut and transported down the hill to raise the site and form the new platforms, mitigating the flood hazard and liquefaction risk. Residential Lots have been raised above flood heights. The fill depths within this part of the development are generally less than 1.2m with the exception of lots 26-29 and lots 31-32.

Much of the site is now underlain by Cirtex Gridtex Geocomposite (Duragrid X 40/40). This has been laid and overlapped to the manufacturers specification. CC Ltd have confirmed to CES Ltd that no penetrations, other than those for the Fire Fighting Tanks, infiltrate through the Geocompsite material.

Roading and infrastructure have been constructed. Infrastructure includes stormwater, wastewater, power and internet (fibre) infrastructure.

Settlement monitoring has been undertaken at a number of locations where the height of fill has exceeded 1.0m which is covered under Section 5.5 of this report.

No retaining walls have been built within Stage Three of the subdivision.

3. PREVIOUS WORK

The following reports on this site have been previously issued:

- Engineering Report for Subdivision for the property by Richardson Stevens Consultants (1996) Ltd, Ref: 6886, dated: 5 November 2007 (Amended June 2008)
- Geotechnical Assessment Longview Estuary Estate Ngunguru (30 October 2007) Riley Consultants
- Subdivision Report 51 Te Maika Road Ngunguru (31 October 2018) Wilton Joubert Consulting Engineers Ref#81048, covering the original initial stage of this development (now known as Stage 2)

The following reports on this development have previously been issued by CES Ltd:

- Subdivision Report, Lot 14 DP 374000, 51 Te Maika Road Ngunguru (4/12/2020)
- Retaining Wall Design and Calculations (15/12/2020)
- Concrete Driveway reinforcing detail (20/05/2022)

4. SITE OPERATIONS

4.1 Construction Works and Programme

The primary works on-site were carried out between January 2021 and August 2022. Earthworks comprised:

- Cut and fill earthworks
- Installation of Geocomposite materials
- Retaining Wall structures construction
- Creation and relocation of main drain
- Fill old drain
- Construction of roads and services (power, telecommunications, stormwater and wastewater, sewers, firefighting tanks etc.)
- Topsoil spreading upon completion of the bulk formation and retaining wall construction works
- Planting of native seedlings to stabilise ridge flanks

Services such as stormwater, wastewater and firefighting tanks were constructed at the completion of earthworks. Refilling trenches and compaction of excavated areas was monitored by Clements Contractors Ltd.

Likewise, utility services (power, telecommunication etc,) were constructed following the completion of the bulk earthworks. Refilling trenches and compaction of excavated areas was monitored by Clements Contractors Ltd.

4.2 Extent of Formation Works

To form the sites with this stage, earthfill has been extracted from the ridgeline within Stage Two of this development. The works involved undercutting the entire low-lying area of any loose vegetation and organic material down to the water table and then overlaid with a geocomposite material and engineered fill. The extent of the earth fill and earthworks is illustrated within the approved engineering plans, and CES Ltd plans appended to this report. Maximum fill depths are indicated to be approximately 4.0m in depth on the ridge flanks and generally 2.0m and less within the lower-lying areas.

Stage Three land was affected by the site formation works, and final levels are to be supplied with the Reyburn and Bryant As-Built Plans.

4.3 Source of Fill Material

Works were designed to achieve a cut to fill balance with material cut from the sections in Stage Two and used as fill in Stage One and Stage Three. The nature of this material was weathered Waipapa Group, which consisted of mainly silty CLAY with pockets of less weathered material. The insitu strength of the fill material was generally in excess of 140kPa.

4.4 Geocomposite Material

CES Ltd specified the use of Cirtex Gridtex 40/40 Geocomposite throughout this subdivision. Designed specifically for soil stabilisation and reinforcement, Gridtex is a combination Biaxial Geogrid bonded to a non-woven polyester geotextile.

Gridtex underlays all of the eastern side of Stage Three of the subdivision. On the western side, Lots 26,27 and 28 are benched into the Waipapa Group of the hill bordering the subdivision, and no geocomposite underlies these sections. Lots 22-25 and Lots 29,31 and 32 are partially underlain by geocomposite on their eastern side. Lot 30 is completely underlain by Geocomposite. The extents of the geocomposite are contained within the R&B As-Built plans.

The only penetration through this material within the subdivision are for the two fire fighting tanks. CC Ltd have confirmed that no pipes penetrate the Geocomposite material and no repairs have been required across the material, apart from within the location of the four fire fighting tanks.

Installation methodology for the Geocomposite material was observed and checked by CES Ltd during site visits, to ensure that subsoil surfaces were correctly prepared and that manufacturers' specifications were followed in terms of both overlap and installation process.

The geocomposite material continues to act as a stabilising influence for clay fill and reduction of loading to the lightly consolidated Holocene soils at depth. For this reason, only minor and necessary penetration should be made through the geocomposite material, for example, driven piles for dwellings, although even these should be bored down to below the depth of the geocomposite material.

The depth to the geocomposite material is sufficient that it should not interfere with minor improvements on the majority of individual Lots. No avoidable excavations or penetrations such as swimming pools, should be allowed to penetrate the geocomposite material.

4.5 Field Control

Compaction acceptance testing was undertaken in line with the guidelines outlined in NZS 4431:1989. The filled portion of the development is generally 1.2m-2.0m on average in depth with the underlying soils being saturated. The fill material being used was weathered silty clay material from the Waipapa Group geology and was sourced from the ridgeline on-site. This material is well known to be a reliable source for bulk fill, especially when the moisture content is managed appropriately. Fill from the ridge was excavated and transferred immediately to the lower-lying land being raised. The main geotechnical risk for the filled area is related to consolidation/settlement of the underlying alluvial soils, and with the thickness of filling generally proposed over the site, CES Ltd assessed that provided that the moisture content is managed and a consistent methodology is undertaken that soil compaction of the clay soils would be evaluated through undrained shear strength.

Confirmation of the placement and compaction of fill material was undertaken by CES Ltd technicians at regular intervals during earthworks, using a hand held Pilcon Shear Vane. Pilcon Shear tests were undertaken in accordance with New Zealand Geotechnical Society Guidelines for Hand Held Shear Vane Test, 2001. The placement of the subgrade and installation of the geocomposite fabric was inspected throughout the earthworks stage of the development.

On completion of the subdivision earthworks, Hand Auger testing was carried out on each of the sections within Stage Three. 50mm diameter Hand Auger boreholes were drilled down until the Geocomposite Material was encountered.

Calibrated Pilcon Shear Vanes, used in accordance with New Zealand Geotechnical Society Guideline for Hand Held Shear Vane Test, 2001, was used generally at every 0.2m in the drilled holes, measuring both in situ and remoulded strengths. Corrected results and borelogs are presented in Appendix 5. Topsoil depths were also recorded in these locations.

Samples of the fill material were obtained from across the entire subdivision and the material was sent to Geocivil in Whangarei to undertake Linear Shrinkage testing and determination of the liquid limit, plastic limit, plasticity index and water content. This testing was used to assist with providing an estimation on the expected soil expansivity. Results for this testing are presented in Appendix 5.

Additional hand auger testing was undertaken in September 2022 to establish the depth to groundwater post-earthworks. Four Hand Auger tests were undertaken across the site, two tests within Stage Three in locations where previous subsoil investigations had occurred so that a comparison could be made.

Stage Three testing was undertaken on two Lots, Lot 25 and Lot 32 and both tests penetrated until groundwater was encountered. Despite the wet winter conditions present, groundwater was encountered at 2.3m BGL on Lot 32 and 3.2m BGL on Lot 25.

4.6 Compaction Control Requirements

The compaction control criteria adopted methods as described within NZS4431:2022 Earth Fill for Residential Development. The earthfill has been compacted using a sheepsfoot roller and assisted with further compaction from fully loaded Moxy trucks.

Calibrated Pilcon Shear Vanes, used in accordance with New Zealand Geotechnical Society Guideline for Hand Held Shear Vane Test, 2001, were utilised for random testing during earthworks. Construction montironing by CES Ltd encountered undrained shear strength (corrected) of 140kPa within the engineered fill as it was being placed within this stage.

The compaction control criteria adopted methods as described within NZS4431:1989 Earth Fill for Residential Development. Standards New Zealand had not updated NZS 4431when filling commenced, and therefore the old standard applies to this subdivision.

The earthfill has been compacted using a D4 bulldozer and sheepsfoot roller and assisted with further compaction from fully loaded Moxy trucks running across the surface.

The specified requirements by CES Ltd were as follows:

Minimum undrained Vane Shear Strength (measured in situ by hand held shear vane):

General fill:	Minimum single value (factored)	110kPa
	Minimum average value (factored)	140kPa

Maximum Air Voids Percentage (as defined in NZS 4402:1986 Part 1):

General fill:	Maximum single value	10%
	Maximum average value	8%

Adequate compaction was deemed to have been achieved when an undrained shear strength (corrected) of 140kPa has been achieved. From the post earthworks Nuclear Densometer testing by Geocivil, three holes returned an average shear value of less than 110kPa (Hole 8, 1.0m BGL, Hole 9, 0.5mBGL and 1.0mBGL).

A total of seven out of the fourteen NDM shear vanes tests failed to a minimum average value of 140kPa. Five shear vanes were below the minimum single value (110kPa). Based on the above results, CES Ltd believes piling to be the most effective solution for foundations within Stage Three of this subdivision.

Post earthworks laboratory testing of the Waipapa Group fill from the hill indicated a dry density of 1.33 t/m^3. CES Ltd would normally specify a minimum dry density of 95% of laboratory dry density, or 1.26 t/m^3. As per NZS 4431:1989, for highly plastic clays though, a slightly lower

number may be adopted to reduce post construction swelling of the bulk fill. For this reason, CES Ltd adopted a value of 1.23 t/m^3.

Further confirmation of the placement and compaction of fill was checked by Nuclear Densometer post construction by Geocivil Ltd.

Only one location within Stage Three, Lot 1, failed to achieve the required dry density. Hole 5 (Lot 24, 1.0m BGL) returned a dry density of 1.18 t/m^3 at 1.0mBGL. The shallower test returned a value of 1.27 t/m^3, meeting specification and throwing up questions of whether this may simply be an anomaly.

From our site monitoring and testing above, CES Ltd is satisfied that the engineered fill is suitably compacted to minimise any residual settlement in the engineered fill and is suitable for residential development, subject to Section 5.5 of this report.

4.7 Uncertified Fill

All areas of bulk filling that were constructed as part of the subdivision works meet the requirements for certified fill in accordance with NZS4431:1989.

Due to the initial shallow groundwater levels at the base of service trenches, specific testing of the backfill material placed to reinstate the service trench excavations was not thoroughly undertaken. As a result, the material locally associated with the back-fill of trenches, particularly for services such as power supply, telecoms, stormwater and wastewater, cannot be considered to meet the requirements for certified fill in accordance with NZS 4431:1989. It should be understood that services were designed to be installed as shallow as practically possible to minimise issues during construction and to limit backfill overlying these services.

All service trench back-fill material comprises either granular graded hard-fill, and/or cohesive trench excavated spoil. This was generally compacted back into the trenches on completion of the respective service installation. The supporting Producer Statements from the contractors involved are appended to this report. On the basis above, compliance with WDC Policy #0022 shall be strictly complied with on any future development within this stage.

4.8 Settlement Monitoring

Settlement Pads were placed across the entire subdivision in order to monitor the effect of additional soil load. The settlement pads have been placed over Stages 1 and 3 where most of earthfill has overlaid alluvial deposit. The aim of the settlement monitoring is ensure that settlement over the development is consistent and rates of movement are decreasing to within the secondary settlement phase. Further discussion and results from settlement monitoring are contained within Section 5.5.

5. EVALUATION OF SITE FOR RESIDENTIAL DEVELOPMENT

The majority of the lower areas of the subdivision have been raised using fill material harvested from Stage 2 of the Development. Earthworks have been carried out in such a manner as to form level or near level sites throughout the subdivision, mainly within Stages 1 and 3. Reyburn and Bryant Ltd are to supply the As-Built Plans finished heights over the entire development.

5.1 General Ground Conditions

All residential Lots within Stage Threee have been affected by cutting and filling, with cutting exposing the in situ, Waipapa Group soils that underlie the site, and bulk filling generally comprising engineered fill that has been constructed in accordance with NZS4431:2022. Engineered fill over this development can be considered present to a depth of 2.0m below finished ground level.

Lot 26-28 comprise a mixture of natural ground and bulk fill. The eastern portion has been earthfilled to create a level building platform and is located on the edge of Holocene Deposits and Waipapa Group geologies. During the undercutting stage of the base of the valley, it was noted that the soils were highly saturated, plastic and the presence of peat intermixed. These soils were encountered within Lots 29 – 32 and Lots 22-25, and should be expected beneath the geocomposite fabric.

5.2 Seismic Classification

CES Ltd undertook an assessment of the Seismic Subsoil Class, as per the criteria outlined in NZS 1170.5. Soils on-site varied from soft to stiff soils underlying the engineered fill, and CPT testing prescribed the majority of the soils in this area as cohesive, at depths of less than 20m which aligns with the criteria for a Class C soil (Ref: Table 3.2 of NZS 1170.5).

CES Ltd assesses the site subsoil class as being a Class C – Shallow Soils Site in accordance with Section 3.1.3, NZS1170.5.

5.3 Liquefaction

Reference has been made to the 2017 Geotechnical Modules released by MBIE, EQC and the Ministry for the Environment, Planning and Engineering Guidance for potentially liquefaction-prone land. Previous assessment in regard to liquefaction has been addressed by CES Ltd at the initial application stage for this development (Refer to CES Ltd Subdivision Report as referenced under Section 3 of this report).

Prior to development, the low lying areas of the subdivision at 51 Te Maika Road within Stage 3 encountered soils which had signs of sand CLAY from the CPT testing conducted. CPT results from

the development pre-earthworks provided indicative SBT reading of generally greater than 2.6, indicating a generally non-liquefiable layer within Stage Three. There was the presence of shallow layers of more silty and Sand material which has since been capped off with a geocomposite fabric and engineered clay fill. This subdivision lies within an area of the country with a low seismicity risk.

Mitigation steps for liquefaction have included;

- Lifting ground heights
- A dense Engineered clay fill overlying site, capping and stabilising any liquefiable soils beneath the fill
- Uncontrolled fill removed
- Geocomposite material underlying fill and pipes, reducing differential settlement risk
- Drain moved and geocomposite material and engineered fill laid instead

In our opinion, following the site earthworks and improvements, CES Ltd is satisfied that the risk of liquefaction within Stage 3 of this development is low.

5.4 Expansive Soils

Underlying soil and this site comprise Engineered Fill and in-situ Waipapa Group material (Lots26, 27 and 28). Experience with similar soils elsewhere suggests that the site soils are likely to be susceptible to seasonal shrink/swell movements as the ground dries out then wets up in a cyclic manner from summer to winter.

The New Zealand Building code defines 'good ground' in the following manner:

'Good ground means any soil or rock capable of permanently withstanding an ultimate bearing pressure of 300 kPa (i.e. an allowable bearing pressure of 100 kPa using a factor of safety of 3.0), but excludes:

a) Potentially compressible ground such as topsoil, soft soils such as clay which can be moulded easily in the fingers, and uncompacted loose gravel which contains obvious voids,
b) Expansive soils being those that have a liquid limit of more than 50% when tested in accordance with NZS 4402 Test 2.2, and a linear shrinkage of more than 15% when tested, from the liquid limit, in accordance with NZS 4402 Test 2.6, and
c) Any ground which could foreseeably experience movement of 25 mm or greater for any reason including one or a combination of: land instability, ground creep, subsidence, liquefaction, lateral spread, seasonal swelling and shrinking, frost heave, changing ground water level, erosion, dissolution of soil in water, and effects of tree roots.

CES Ltd identified the soils as expansive in our initial site investigations stage and proposed to defer classification until earthworks completion. Since soils are expansive in nature, and the foreseeable

movement is expected to be greater than 25mm, therefore soils on-site are not considered to meet the definition prescribed above for 'good ground'.

CES Ltd commissioned Geocivil Ltd to undertake Linear Shrinkage testing and determination of the liquid limit, plastic limit, plasticity index and water content from samples of the Waipapa Group parent material and of the material placed as fill. This form of testing was preferred due to the geology present.

In NZS 3604:2011 expansive soils are defined as those with:

- Liquid Limit, LL > 50% (as tested by NZS4402.2.2:1986)
- Linear Shrinkage, LS > 15% (as tested by NZS4402.2.6:1986)

Within this subdivision, the results of the Linear Shrinkage tests indicate a consistent linear shrinkage of between 13% and 19% from Liquid Limit to oven-dried result. This result is a reflection of the consistency of the parent material and is consistent with the samples taken on other parts of the development within Stage 2.

Samples returned a Plasticity Index (PI) of 23 and a Liquid Limit (LL) ranging from 55 to 58.

From the sample taken on the ridgeline and the above criteria for expansive soils, we are satisfied that the soils on-site are expansive in nature as the liquid limits exceed the definition above. From a further review of the results and use of the Casagrande Plasticity Chart, the soils on-site are assessed as generally an elastic SILT which exhibits low to medium levels of plasticity. The linear shrinkage results were marginally over the threshold for 'good ground' in accordance with NZS3604, therefore, soil expansivity of higher than a CLASS S as per NZBC – B1 should be expected. Due to the constant shallow groundwater level and ground level, the seasonal changes of moisture are anticipated to be less severe within this stage.

From the above and experience with the geology present at the site, CES Ltd assesses the soils on-site for this stage of the subdivision as Class M – Moderately Expansive in accordance with NZBC – B1 Structure.

5.5 Static Settlement

The majority of this stage is overlying Holocene Deposits, which are potentially susceptible to elastic and primary consolidation settlement under static gravity loads. The initial subdivision report by CES Ltd, which accompanied the application, stated that ongoing settlement monitoring would be conducted throughout the subdivision along with piezometers to monitor groundwater levels. Subsequent to this, damage to the settlement pads occurred during earthworks construction which altered the monitoring proposed for the development. In conjunction with the settlement pad monitoring, further analysis has been provided using Settle3D, and a secondary check on the predicted settlement magnitudes using CPT data directly in the CPT interpretation software CPeT-IT. Additional boreholes have also been performed to confirm the changes to groundwater levels.

Lots 27 and 28 are located on sites that have not been cut flat and have a mixture of Waipapa Group hillside flanks and softer Holocene deposits downhill. These allotments are not considered as part of this analysis as the building sites are a mixture of ridge flanks and engineered fill. These lots are on areas which transition between two geologies; it is recommended that these foundations be specifically designed by a suitably qualified and experienced engineer.

5.5.1 Settlement Monitoring

CES Ltd had a total of eight settlement monitoring pads installed in various locations across the subdivision to monitor both the change in height and the rate of change of settlement over time. Initially, four pads were installed in June 2021, and the initial heights were taken on 22 June 2021. During the course of construction, two settlement pads were lost or destroyed by heavy machinery. A further two pads suffered minor damage, causing a variation in results.

Four additional settlement pads were installed in February 2022.

Pads were generally located in areas expected to have the largest amounts of settlement:

- MP1 – Boundary between Lot 16 and Lot 17 beside road
- MP2 – Centre of Northern Boundary of Lot 16
- MP3 – Centre of Boundary between Lot 21 and Lot 22
- MP4 – Centre of Boundary between Lot 23 and 24
- MP5 – South-western end of Lot 30
- MP6 – North-eastern side of Lot 32
- MP7 – Centre of Lot 13
- MP8 – South-western side of Lot 1

Figure 2 - View of subdivision showing location of settlement pads (Source R&B Ltd)

One pad (MP6) had an initial fall in height over the first month of 85mm. Consultation with R&B Ltd about this result with a consensus this reading is unlikely and was potentially instead caused by damage to the pad. Subsequent monthly changes in height for this pad have all been in the area of 10-13mm, in line with similar rates observed on the remaining pads.

Settlement Pads were monitored for both total settlement and change in the rate of settlement. Initial settlement was highest after settlement pads were installed (~20-30mm per month), decreasing significantly over time (<7mm per month).

Despite the significant separation between settlement pads, settlement rates is highly consistent across the development. MP6 shows the largest settlement over the last four weeks (6.9mm), with MP8 showing the least amount of settlement at 4.1mm. The use of the geocomposite fabric will also assist with any anomalies over the site and ensure a uniform amalgamation of the engineering fill.

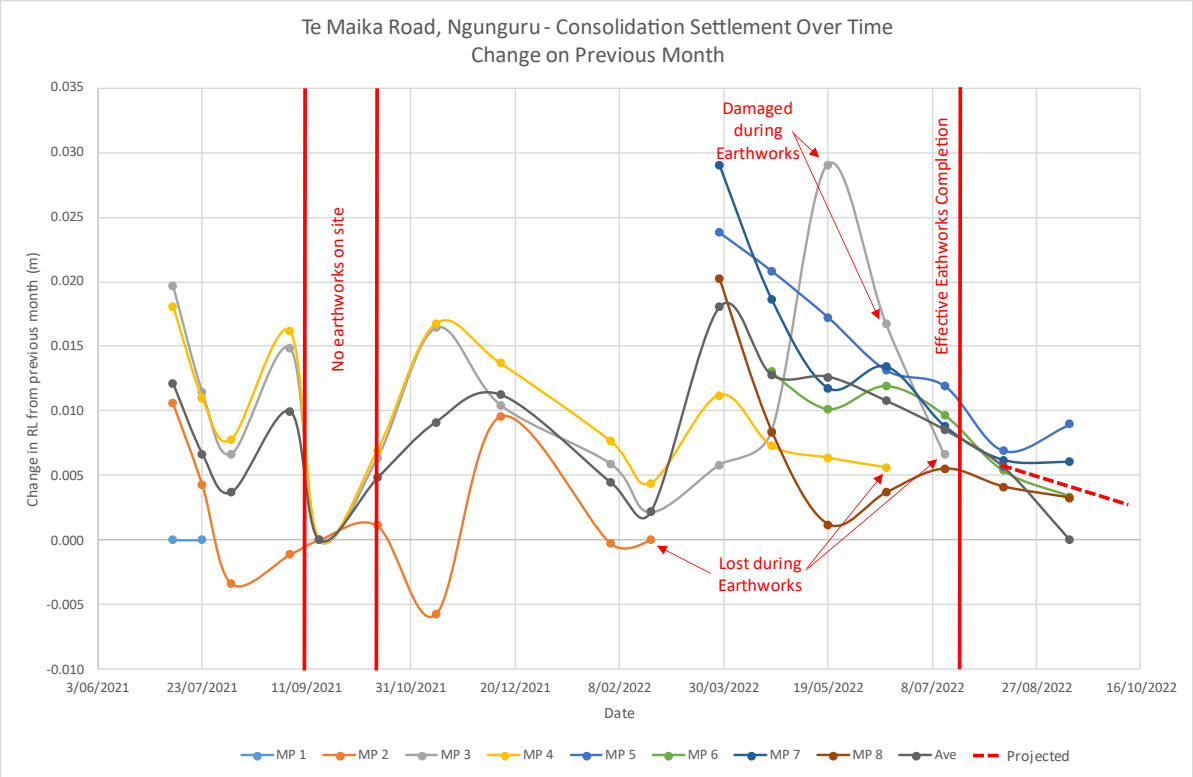


Figure 3 - Graph measuring the rate of change in movement (settlement) from the previous period.RL heights for each of the settlement pads is taken every four weeks and the change from the previous period graphed. (Source CES Ltd)

It is noted that when earthworks stopped during September 2021 and no heavy machinery was working on-site that no significant movement occurred on site. In most instances, settlement ceased, which is a similar observation with recent levels at the site towards the end of the development reducing on a downward trend as site works reduce and heavy machinery leaves the site.

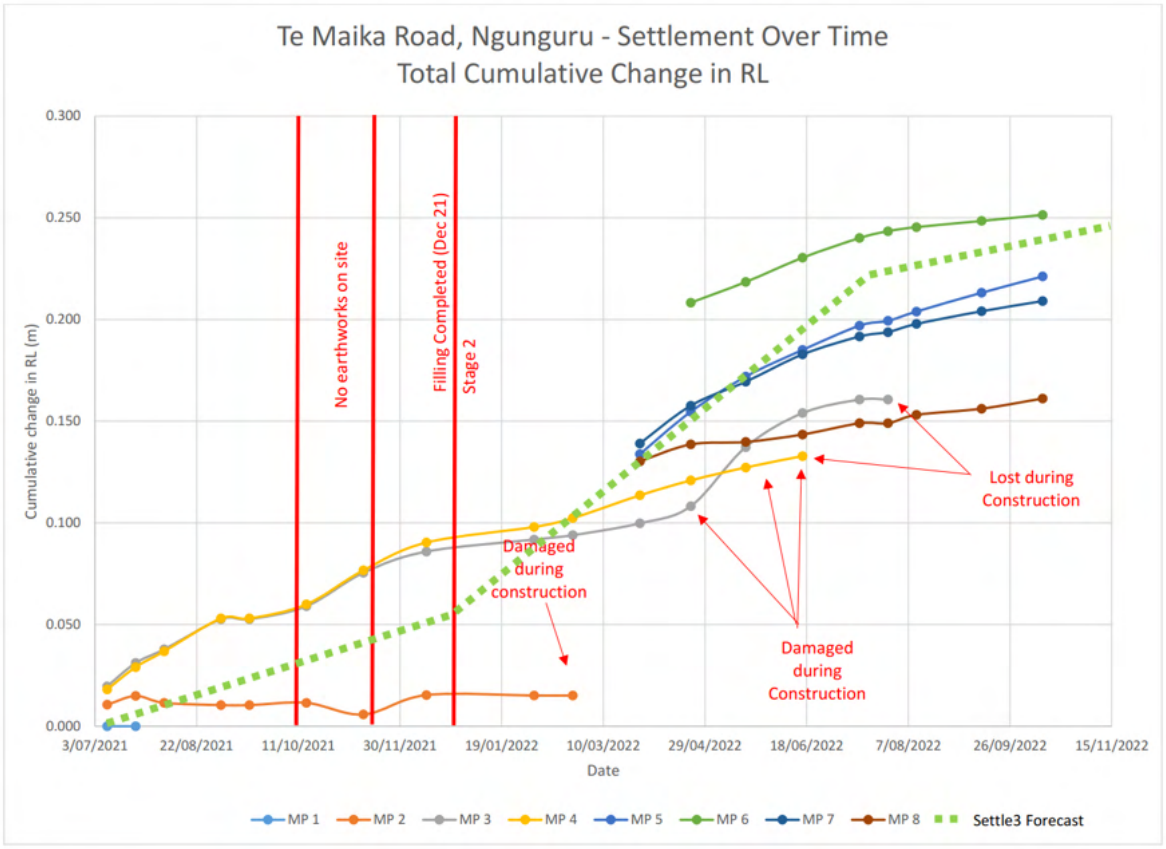


Figure 4 - Graph showing the total movement (settlement) from the installation of the settlement pads. (Source CES Ltd)

Total settlement-induced movement at any individually monitored pad on the subdivision has generally been less than 250mm, with the rate of change noticeably reducing from July 2022 onwards (1.5 years post earthworks).

In addition to the above, shallow boreholes were conducted within this stage on Lot 25 and Lot 32 to compare the change in groundwater depths. The groundwater depths at these lots ranged from 2.3m to 3.2m below existing ground, this is following an additional 2.0m of engineered fill. Previously in the same locations, groundwater was located at 0.5m below the existing ground pre-earthworks.

At the issue of this report, the latest settlement monitoring results encountered a cessation in movement at one settlement pad within the subdivision and further ongoing declines in average settlement for the subdivision.

5.5.1 Settlement Analysis

The initial loading stage from earthfill being laid is expected to have been 40-50mm, with the use of laden Moxy trucks carting and dumping loads over the development. Our comparison of the observed rates and the theoretical rate commences from a known point being at the completion of earth filling within Stage 1 and 3, which was towards the end of 2021.

Due to the difficulty with compliance from the contractor with installing piezometers and maintaining settlement pads, a settlement analysis has been undertaken to assist with confirming the anticipated level of settlement over the site. The analysis of predicted levels of settlement has been undertaken using Settle 3D using the CPT data collected by GeoCivil and Perry Geotech, prior to earthworks being conducted on-site. From a review of the CPT interpretative data, the Holocene Deposits beneath the very stiff clay crust are indicated to be normally consolidated to slightly overconsolidated. The depth of Holocene Deposits has been assessed and averaged on the upper limits from the data available in this stage. The additional fill applied over this stage is expected to result in further consolidation of the underlying soils which has been assessed as part of the development earthworks monitoring. The settlement analysis was conducted in nine stages to evaluate the sensitivity of anticipated settlement post-earthworks. These stages are as follows, with anticipated cumulative settlement summarised as follows;

Stage	Time (Years)	Total Settlement	Notes
1	0	0mm	Start of filling
2	0.1year	52.2mm	Post Earthworks
3	0.5year	214.0mm	
4	1year	228.0mm	
5	2years	228.0mm	Assumed12kPa Loading for dwellings
6	10years	290.0mm	No further change
7	50years	290.0mm	
8	100years	290.0mm	

The above results have been included in Figure 4, which shows a comparison to the observed total settlement levels measured on-site. From a comparison of the measured and calculated settlement rates, the rates have generally been consistent, with potentially 50mm of additional movement likely expected with the additional loading from residential development. A further assessment of the settlement was conducted without the 12kPa loading from residential development; this resulted in overall long-term settlement rates being significantly lower.

An additional secondary check using CPeT-IT was conducted using the CPT data undertaken prior to the earthworks stage and applied 2m of engineered fill. From this check, the expected settlement from the application of additional fill generally ranged between 200mm and 300mm, concurring with our settlement analysis above.

Groundwater levels in these areas have shifted approximately 0.7m to 1.1m deeper than pre-development levels. This confirms that the observations from settlement and fill applied have induced changes to groundwater levels. Overall this change in groundwater levels is expected, along with the settlement monitoring showing a reduction in rates of settlement

provides further assurances that the engineered fill is now moved to within the secondary settlement phase.

From the site observations and settlement analysis of both theoretical and observed, CES Ltd is satisfied that the earth fill is within the secondary settlement phase, with rates of settlement gradually decreasing over the coming year. At the current stage, any immediate residential development on the engineered fill shall be suspended and piled to avoid further surcharging to the engineered fill. Piles will need to be pre-augured through the engineered fill and geocomposite to ensure piles extend below the engineered fill layer.

Settlement pads are to continue to be monitored on a 3 monthly basis by Reyburn and Bryant, and shall remain in place over the next two years or until the allotments in which the pads occupy are developed and be supplied to CES Ltd so that potential options for shallow foundations can be considered for any site-specific developments, subject to specific engineering design. This information can then be used to assist any future site-specific development of each site.

Provided the recommendations above are adopted, CES Ltd is satisfied that the risk of instability from subsidence is low.

5.5.2 Secondary Settlement Effects for Underground Services

Settlement rates have generally decreased in the past six months, with on-site council services being installed post-earthworks and supported by a geocomposite beneath the lines. All pipes are surrounded with pipe bedding which will allow for any minor movement. The 1350mm diameter stormwater culvert line which runs through the property has less loading than the surrounding 2.0m of engineered fill; therefore expected, secondary settlement in this location is expected to be less and well supported by geocomposite fabric.

Groundwater recharge is to remain constant from the catchment above and is unlikely to reduce due to the surrounding terrain. However, the use of groundwater bores in the area should be avoided. It is recommended that a Consent Notice be placed at this stage to prevent groundwater bores from being installed.

The use of reinforced gravel rafts is recommended to further manage secondary settlement and shall extend a minimum of 1.0m from the building footprint to manage the transition back to engineering fill. The use of a minimum of 150mm pipe beddings surrounding any underground services should be adopted.

The use of flexible private service connections to scheme services should be adopted, in order to minimise any risk of damage to connections caused by settlement during or after the construction of dwellings.

Site-specific foundation recommendations are contained within Appendix 2 and the conclusion of this report.

5.6 Bearing Capacity

Based upon the results of our testing and our observations during the subdivision construction, CES Ltd is satisfied that all areas of bulk filling meet the requirements of engineered fill as per NZS4431:1989, under which this subdivision was started.

From the subdivision construction monitoring and testing throughout the filled areas within Stages 1 and 3, CES Ltd is satisfied that the engineered fill has a minimum Ultimate Bearing Strength of 300kPa. Further construction monitoring is recommended to be conducted as part of site-specific development works on each new allotment. As required by the Building Code, a strength reduction factor must be applied to the above values in order to determine the dependable values for use in ultimate limit state design; a reduction factor of 0.5 is recommended.

When considering the above and ignoring the topsoil layer, near-surface soils (within 2m of finished ground levels) within each building platform are generally considered to comply with the requirements of NZS3604:2011, and, with the exception of expansive soil properties, should otherwise be designated as 'good ground'.

5.7 Lot Gradients & Stability

Within Stage Three, the majority of residential Lots have been finished with a nearly level or gently sloping gradient.

Lot 27 and Lot 28 are at the base of a hill sloping up to the west. Any alterations to the batter slopes on this hill, additional excavation or retaining at the base of this slope should be approved by a Chartered Professional Engineer prior to earthworks commencement.

Lots 29 through 32 overlie much softer Holocene deposits. These sites will require site-specific assessment at the Building Consent stage by a Geo-professional.

Lot 32 borders the wetlands on the northern side of the site. A batter face down to the wetland is located on the northern side of the section.

Batter slopes between properties, in particularly lots 24-30 were initially constructed with engineered fill which was on the maximum grades as per the CES Ltd original recommendations. Following topsoiling of the site and AS-Built earthwork plans, the batter slopes are now in excess of these recommendations. The batter slopes are now planted with upslope stormwater runoff being evenly dispersed over the land. Review of the position of batter slopes has been undertaken and due to the grades present, a minimum setback of 1.0m from crest of slope shall be maintained.

It is also recommended that any alteration especially undercutting or surcharging to these batters will need to be assessed by a geo-professional. Guidance on buildable areas and setbacks is shown under Appendix 4 of the report and a summary for future building development under Appendix 2.

CES Ltd recommends piling as the most appropriate solution for Stage 3 sections.

5.8 Retaining Walls

No retaining walls have been constructed within Stage Three of this development.

5.9 Piped Services, Service Trenches and Drainage

As indicated within the approved engineering plans for the development, the locations of the council sewer reticulation is present with an open drain along the eastern side of this stage. In general, these services are either constructed within road reserves or adjacent to Lot boundaries. As such, we consider it unlikely that such constructed services would be encountered during individual Lot development. Regardless, all building works on individual Lots should be laid out so as not to disturb any nearby services.

Should any site-specific development layouts that encroach near or over these services be unavoidable, foundations must be designed per current WDC Engineering Standards guidelines for building near or over services (WDC Policy #0022).

As part of the Bond requirements, as agreed by the developer and council, ongoing settlement monitoring is to remain in place for the duration of the bond period. This is to confirm that movement which may impact services has ceased and ensure that the lines are fit for purpose prior to releasing of any bond.

5.10 Topsoil

Topsoil depths were checked during Hand Auger testing on individual Lots. The topsoil check indicated variable topsoil thicknesses, ranging from 70mm to 300mm. An average thickness of approximately 150mm is anticipated across the subdivision.

5.11 Stormwater Control

A stormwater reticulation system servicing the subdivision was constructed as part of the site formation works. All stormwater run-off from hard-standing areas (driveways, patios, footpaths etc) and any outflow from rainwater tank overflow, should be directed towards the stormwater system for disposal.

On-site stormwater disposal or soakage systems are not recommended unless further site-specific assessment is undertaken by a suitably qualified and experienced engineer. Under no circumstances should stormwater be disposed of by allowing it to flow onto or into the ground in an uncontrolled manner at any location on the subdivision.

5.12 Restricted Development Areas

Lots 29-32 include areas termed by CES Ltd as Specific Engineering Design required (SED).

Any developments that encroach into a SED Area will need to be subject to a specific engineering investigation and design at the Building Consent stage of each development. This may include a requirement to pile due to the very soft soils encountered.

For reference, CES Ltd has prepared a site plan outlining and summarising areas suitable for residential development and recommendations within Appendix 2 and 4 of this report.

6. CONCLUSION

From our assessment of the site and construction monitoring, CES Ltd is satisfied that the proposed new allotments with Stage 3 are suitable for lightweight residential development. A summary of each site is appended to this report for referral for site-specific developments. This report is intended to provide design guidance for the future development of individual allotments. Should any works deviate from the recommendations of this report, then a site-specific assessment by a Geo-Professional (as defined within the WDCEES) should be undertaken prior to the application for Building Consent.

A summary of the site restrictions are as follows;

Lot 22 to 28

- Piled foundations will be required. It is anticipated that the piles will need to be preaugered through the geogrid fabic. Refer to Section 5.5 of this report. SED design of foundations will be required at Building Consent Stage.
- No undercutting of batter slopes between Lots 24-28, or upslope surcharging shall be undertaken unless further review and design by a geo-professional has been conducted. SED foundation design is required for these properties and will need to consider the above.
- A minimum setback of 1.0m from Crest of slope to any building foundations.
- Foundations will need to be designed for Class M – Moderately Expansive in accordance with NZBC – B1 Structure.
- All stormwater run-off from hard-standing areas (driveways, patios, footpaths etc) and any outflow from rainwater tank overflow, should be directed towards the stormwater system for disposal.

- On-site stormwater disposal or soakage systems are not recommended unless further site-specific assessment is required by a suitably qualified and experienced engineer.
- No inground swimming pools are to be constructed on-site.

Lot 29 to 32

- Any future structures within these allotments require a site-specific geotechnical assessment to accompany any Building Consent application.
- Piled foundations will be required. It is anticipated that the piles will need to be preaugered through the geogrid fabic. Refer to Section 5.5 of this report. SED design of foundations will be required at Building Consent Stage.
- Foundations will need to be designed for Class M – Moderately Expansive in accordance with NZBC – B1 Structure.
- No undercutting of batter slopes or upslope surcharging shall be undertaken which may impact the neighbouring properties unless further review and design by a geo-professional has been conducted. SED foundation design is required for these properties and will need to consider the above.
- A minimum setback of 1.0m from Crest of slope to any building foundations.
- All stormwater run-off from hard-standing areas (driveways, patios, footpaths etc) and any outflow from rainwater tank overflow, should be directed towards the stormwater system for disposal.
- On-site stormwater disposal or soakage systems are not recommended unless further site-specific assessment is required by a suitably qualified and experienced engineer.
- No inground swimming pools are to be constructed on-site.

Refer to Appendix 2 for further details on the above summary.

7. APPENDICES

APPENDIX 1 – STATEMENT OF PROFESSIONAL OPINION .....
APPENDIX 2 – SUMMARY OF GEOTECHNICAL DESIGN RECOMMENDATIONS.....
APPENDIX 3 – REYBURN & BRYANT LTD SCHEME PLAN .....
APPENDIX 4 – CORE ENGINEERING SOLUTIONS LTD DRAWINGS SET .....
APPENDIX 5 – TESTING RESULTS.....
APPENDIX 6 – INSPECTION RECORDS .....
APPENDIX 7 – PRODUCER STATEMENTS FOR CONSTRUCTION FROM CONTRACTOR .....
APPENDIX 8 – SETTLEMENT ANALYSIS .....

APPENDIX 1 – STATEMENT OF PROFESSIONAL OPINION

Statement of Professional Opinion on Suitability of Land for Building Construction

Development	Traverse Ltd - Te Maika Road Development
Developer	Traverse Ltd
Location	51 Te Maika Road, Ngunguru, Whangarei
I *(full name)*	David Andrew Leslie
Of *(Name and address of firm)*	Core Engineering Solutions Ltd, 31 Vine Street Whangarei

1 I am a Geo-Professional as defined in Section 1.3 Abbreviations and Definitions and was retained by the Developer as the geo-professional on the above development

2 The extent of my preliminary investigations are described in my Report(s) number ___Subdivision Report Ref :20-0078 _ dated __Rev 01 21/05/2021 __ and the conclusions and recommendations of that/those document(s) have been re-evaluated in the preparation of this report. The extent of my inspections during construction, and the results of all tests and/or re-evaluations carried out are as described in my geotechnical completion report dated _22/12/2022_____.

3 In my professional opinion, not to be construed as a guarantee, I consider that *(delete as appropriate)*:

a. The earth fills shown on the attached Plan No _____EWA16042_____have been placed in compliance with the requirements of the Whangārei District Council and my specification. (However, lots _____29-32 (Stage 3)_____ did not pass final fill specification testing and as a result, specific site investigations and foundation designs will be required here at the time of building consent application)

b. The completed works take into account land slope and foundation stability considerations, subject to the appended foundation recommendations and earthworks restrictions, *(which should be read in conjunction with the appended final site contour plan)*

c. Subject to 3(a) and 3(b) above, the original ground not affected by filling satisfies the description of 'good ground' as described in B1 Acceptable Solutions and Verification Methods and NZS 4229:2013 _☐ Yes ☒ No

(If no, a specific foundation investigation/design will be required at the time of Building Consent)

d. Subject to 3(a) and 3(b) above, the filled ground satisfies the description of 'good ground' as described in NZS 3604:2011 and NZS 4229:2013 ☐ Yes ☒ No

(If no, a specific foundation investigation/design will be required at the time of Building Consent)

e. The original ground not affected by filling and the filled ground are not subject to erosion, subsidence, or slippage in accordance with the

provisions of section 106 of the Resource Management Act 1991 provided that:

i. Compliance with the Subdivison Report and Geotechnical Completion Reports by CES Ltd for this development.

ii. Vibrations and Land Excavations within Stage 3 for site specific developements, are overseen and undertaken in responsible manner by suitably experienced contractors.

iii.

iv.

4 This professional opinion is furnished to the TA and the Developer for their purposes alone on the express condition that it will not be relied upon by any other person and does not remove the necessity for the normal inspection of foundation conditions at the time of erection of any building

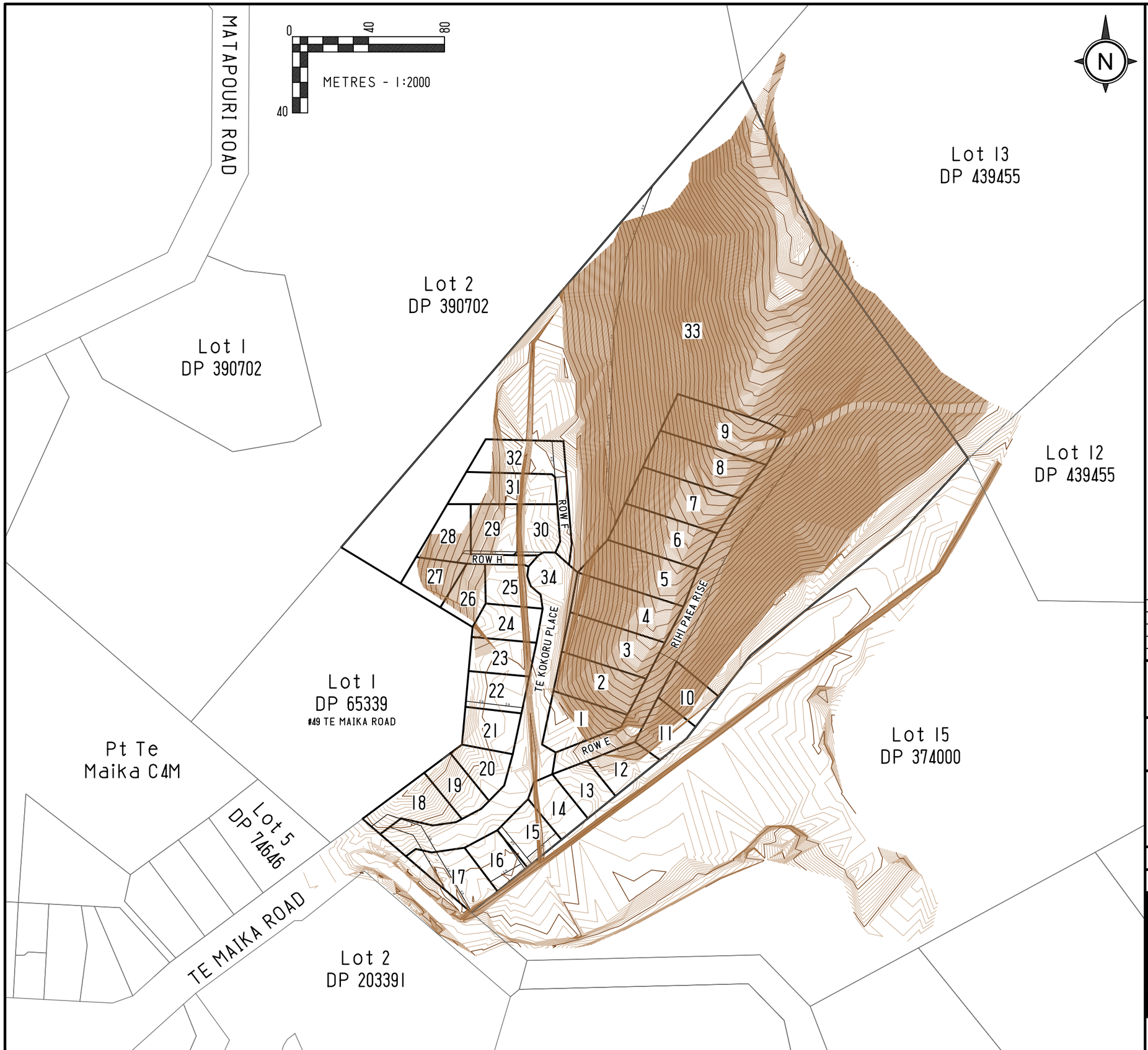
5 This certificate shall be read in conjunction with my geotechnical report referred to in clause 2 above and shall not be copied or reproduced except in conjunction with the full geotechnical completion report

	BEng(Civil), DipEng(Civil),MEMgt(Hons) CMENGNZ, CPEng(Geotechnical/Structural)	5/12/2022
Signature	*Professional Qualifications*	*Date*

APPENDIX 2 – SUMMARY OF GEOTECHNICAL DESIGN RECOMMENDATIONS

Lot No	Anticipated Soil Type	Subdivision Filled Ground present within Lot		Unworked Natural Ground Present within Lot	Foundations may be designed to 3604:2011	Shallow Foundations Ultimate Unfactored Bearing Capacity	Expansive Soils Present	Site Soil Classification (as defined in NZBC - B1)	Restricted Development Area Present on Lot	Other Comments
	In Situ Soil / Engineered Fill	Y/N	Max Depth (m approx)	Y/N	Y/N	(kPa)	Y/N	(S, M, H, E)	Y/N/SED	
22	Engineered Fill	Y	1.5m	N	No, SED Design to account for expansive soils and piled to mitigate effects of secondary settlement	SED	Y	M	N	Piled foundations will be required. It is anticipated that the piles will need to be pre-augered through the geogrid fabric. Refer to Section 5.5 and 5.7 of this report. SED design of foundations will be required at Building Consent Stage. Estimated depth of piles is 14m-16m embedment and designed for end bearing only to support foundations, subject to building loads.
23	Engineered Fill	Y	1.5m	N		300	Y	M	N	
24	Engineered Fill	Y	1.5m	N		SED	Y	M	N	Piled foundations will be required. It is anticipated that the piles will need to be pre-augered through the geogrid fabric. Refer to Section 5.5 and 5.7of this report. SED design of foundations will be required at Building Consent Stage. Estimated depth of piles is 14m-16m embedment and designed for end bearing only to support foundations, subject to building loads. No undercutting of batter slopes or upslope surcharging shall be undertaken which may impact the neighbouring properties unless further review and design by a geo-professional has been conducted. SED foundation design is required for these properties and will need to consider the above.
25	Engineered Fill	Y	4.0m	N		SED	Y	M	N	
26	Engineered Fill / In-situ Soil	Y	4.0m	Y		SED	Y	M	N	
27	Engineered Fill / In-situ Soil	Y	2.6m	Y		SED	Y	M	N	SED design of foundations will be required at Building Consent Stage, subject to building loads. Any further cuts into the flank and fill batters will require further assessment by a geo-professional
28	Engineered Fill / In-situ Soil	Y	3.0m	Y		SED	Y	M	N	SED design of foundations will be required at Building Consent Stage, subject to building loads. Any further cuts into the flank and fill batters will require further assessment by a geo-professional
29	Engineered Fill	Y	4.1m	N		SED	Y	M	SED	Site Specific Geotech required, anticipated that foundations are to be piled. Piles are anticpated to be 16m in depth. Alternative locations for development are avaliable on the flanks but will require further assessment including stability analysis. No undercutting of batter slopes or upslope surcharging shall be undertaken which may impact the neighbouring properties unless further review and design by a geo-professional has been conducted. SED foundation design is required for these properties and will need to consider the above.
30	Engineered Fill	Y	3.0m	N		SED	Y	M	SED	
31	Engineered Fill / In-situ Soil	Y	3.4m	Y		SED	Y	M	SED	
32	Engineered Fill / In-situ Soil	Y	3.5m	Y		SED	Y	M	SED	

APPENDIX 3 – REYBURN & BRYANT LTD SCHEME PLAN



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A	18.08.22	FIRST ISSUE - CK/PD

CLIENT
TRAVERSE LIMITED
51 TE MAIKA ROAD, NGUNGURU

DESCRIPTION
LOTS 1 - 24 BEING A PROPOSED SUBDIVISION OF LOT 14 DP 374000

TITLE
EARTHWORKS ASBUILT
ORIGINAL CONTOURS: OVERALL

SCALE: 1:2000 @A3

COUNCIL REFERENCE: SL2100003 AND P117722

reyburn & bryant
Ph: 09 438 3563
7 Selwyn Ave, Whangarei
PO Box 191, Whangarei 0140
www.reyburnandbryant.co.nz

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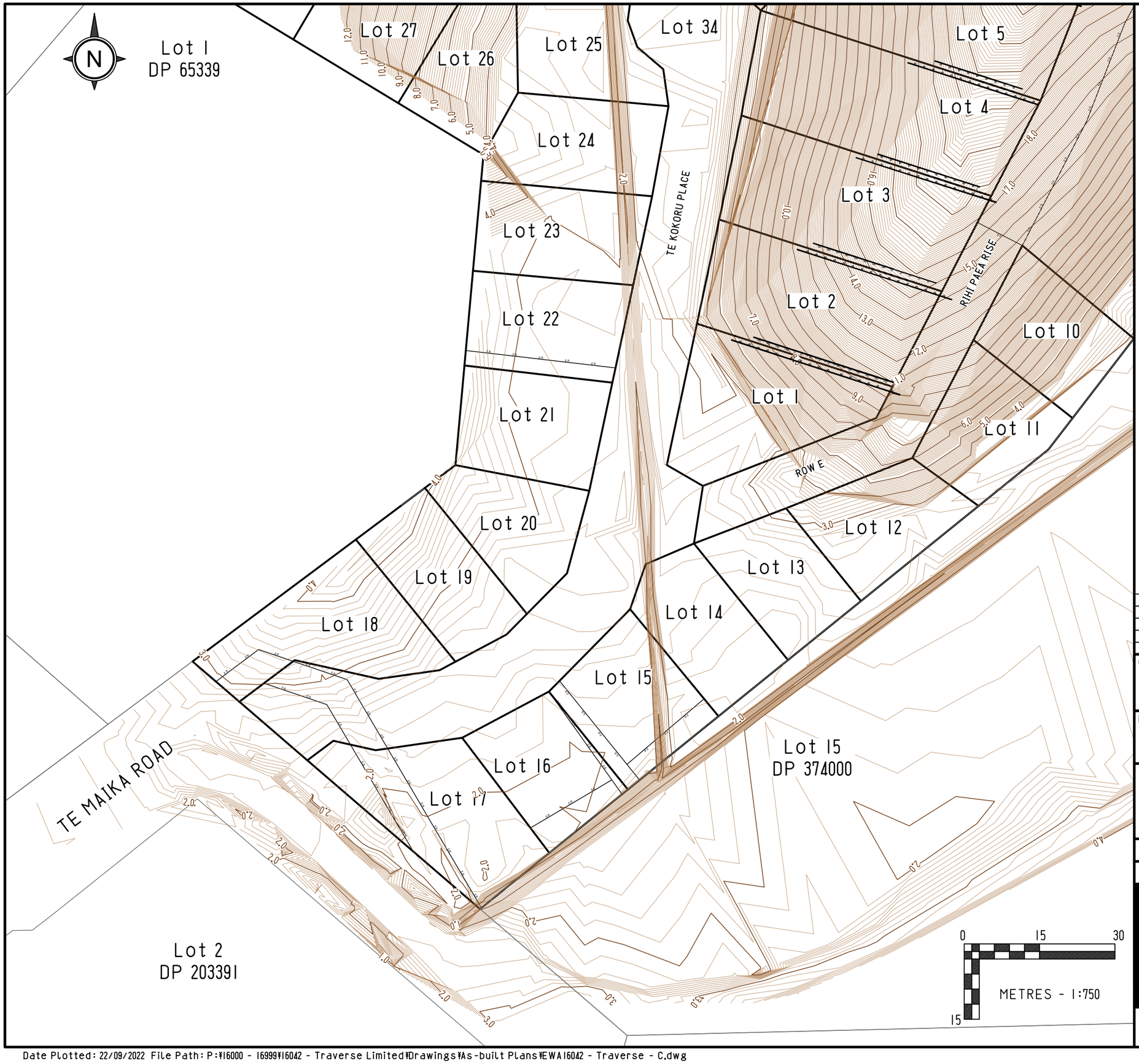

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TITLE
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ORIGINAL CONTOURS

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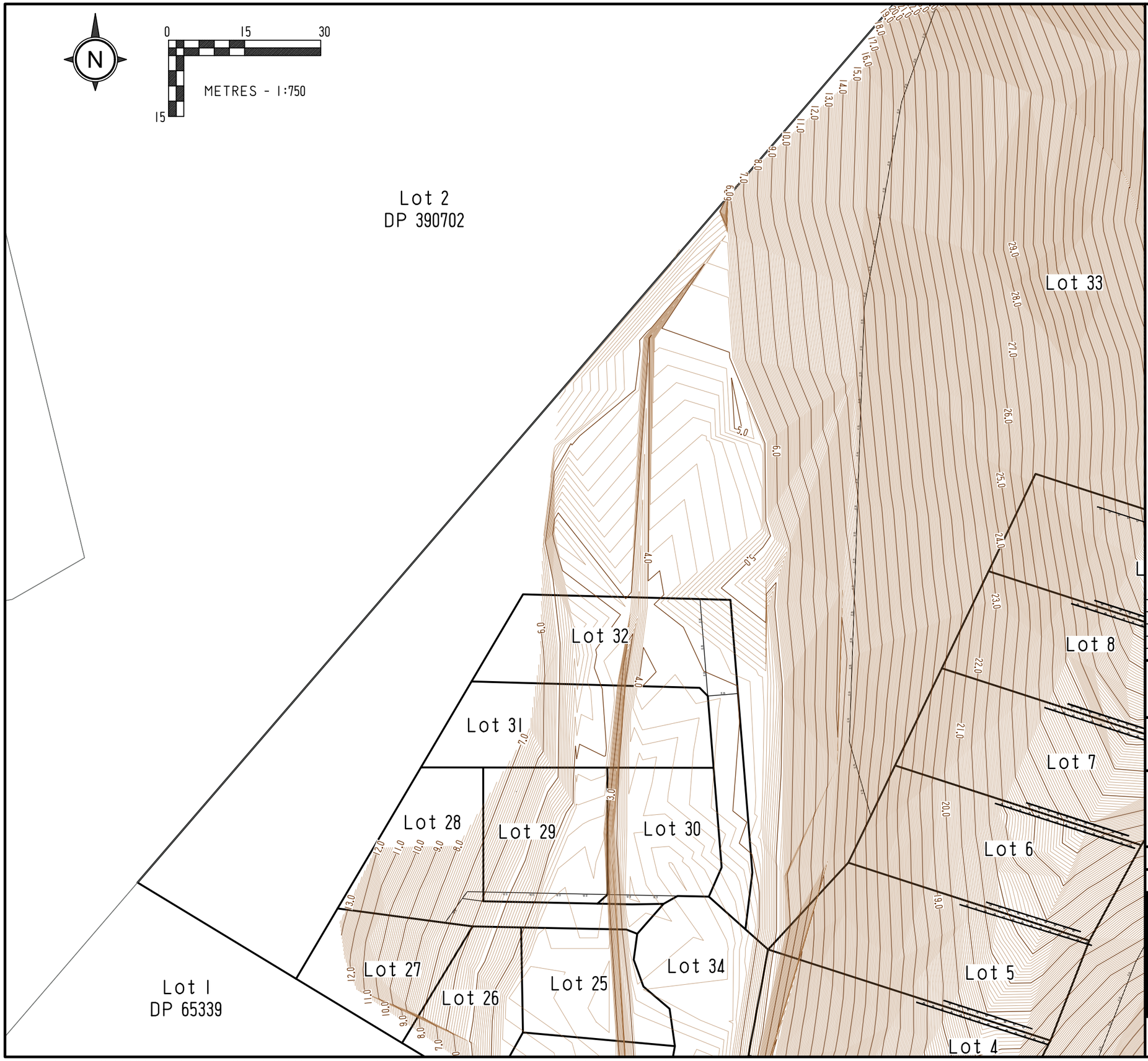

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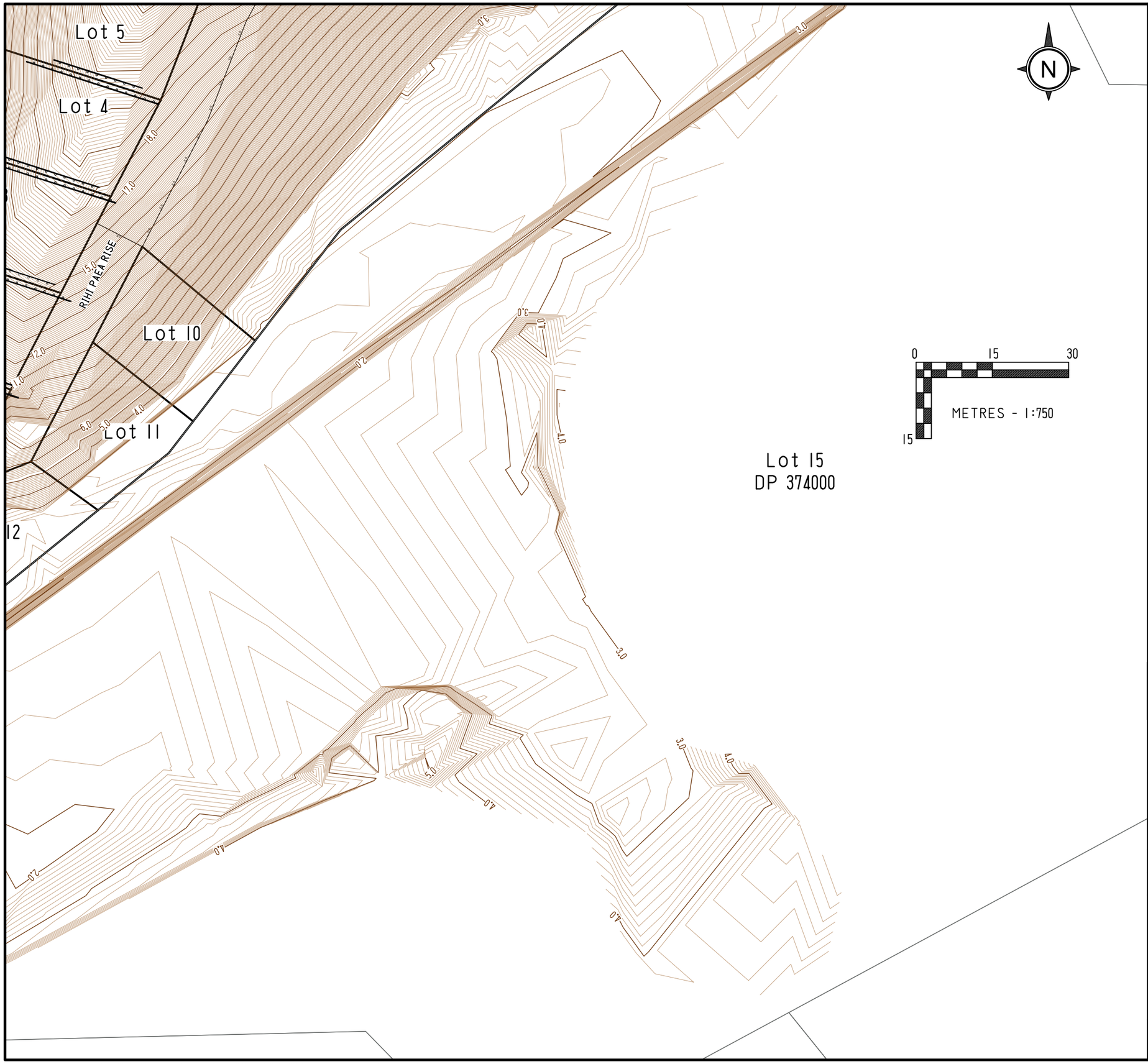

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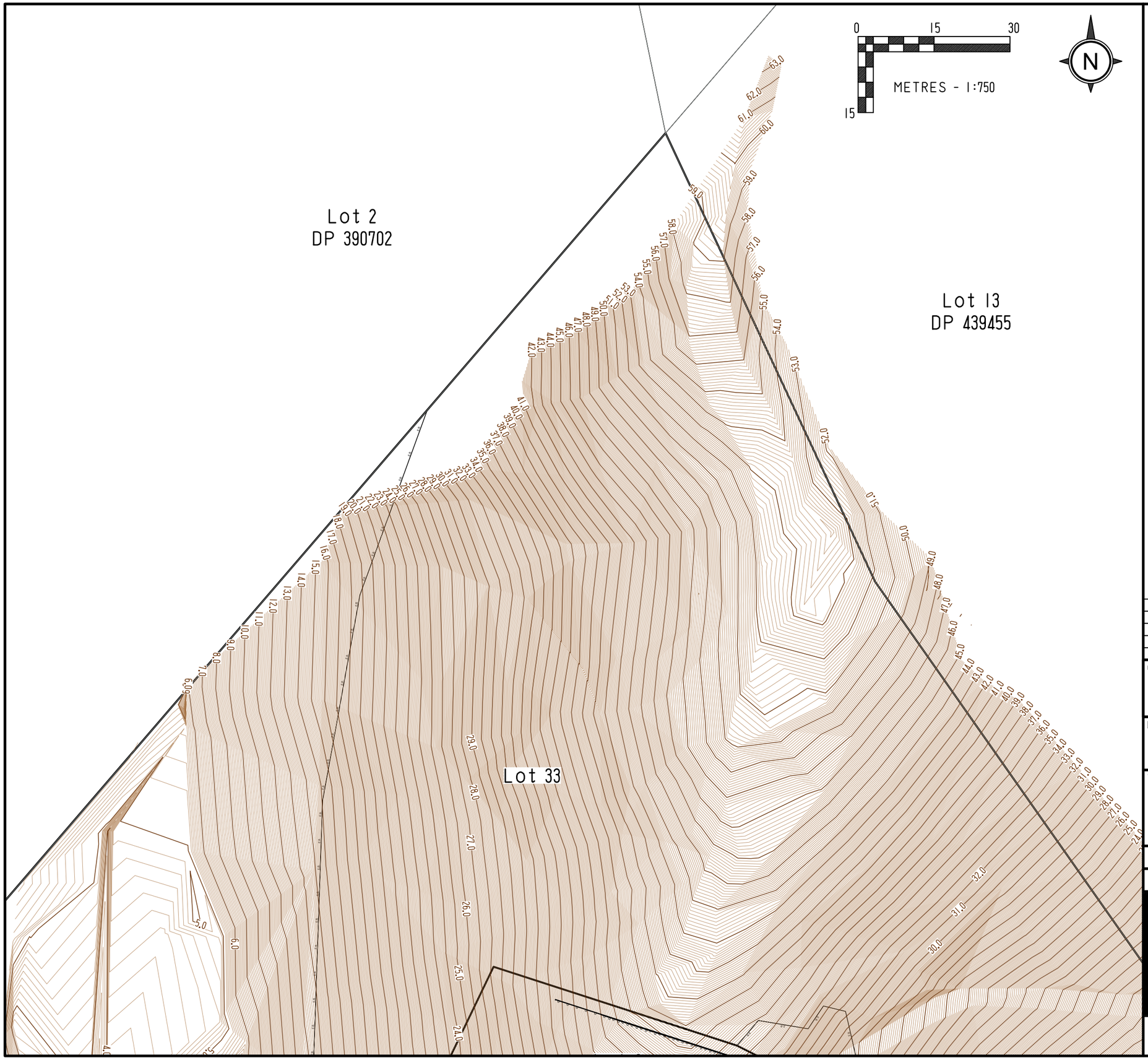

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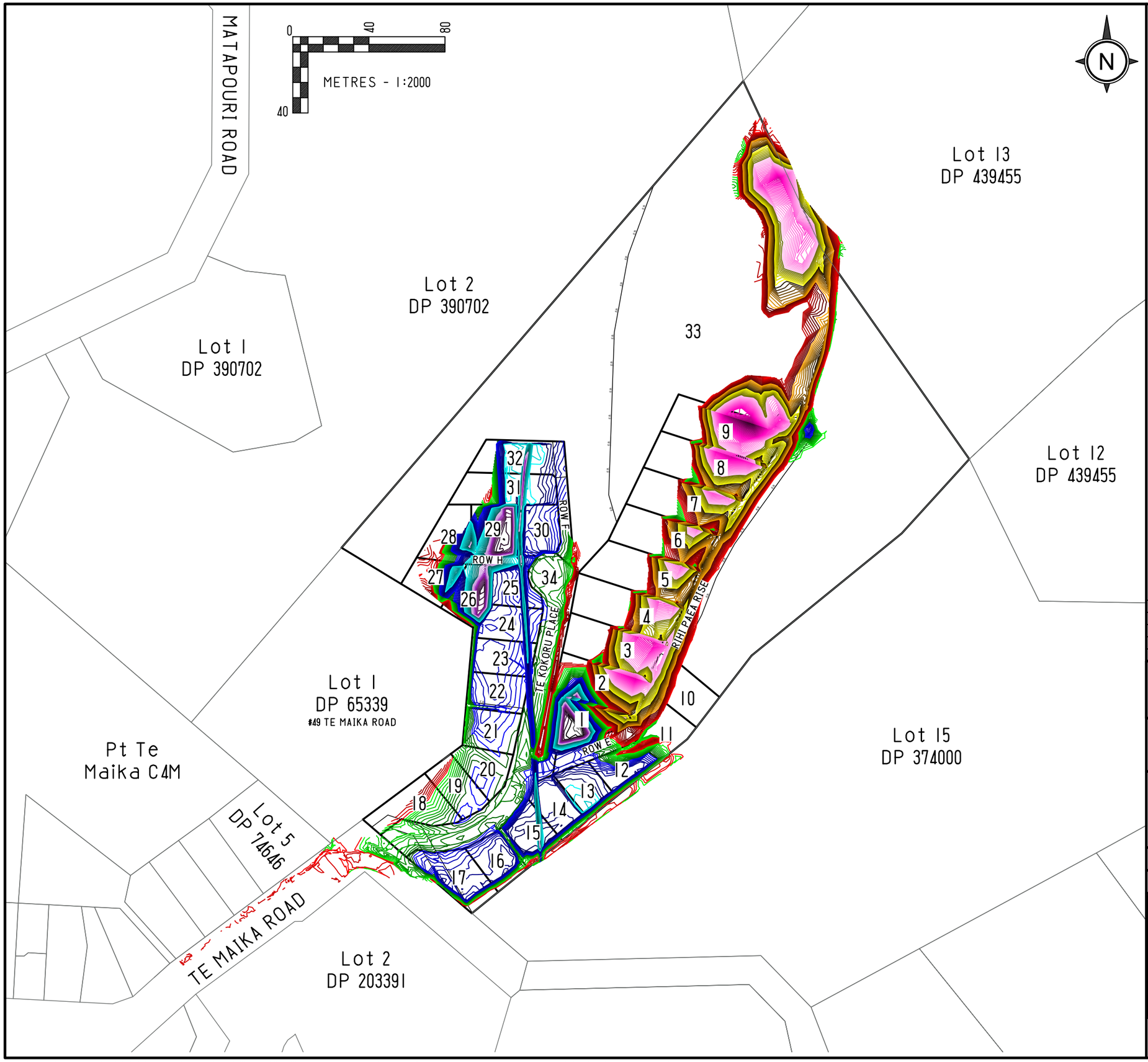

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DEPTH OF FILL:

0.00	TO 0.10	1.50	TO 1.60	3.00	TO
0.10	TO 0.20	1.60	TO 1.70	3.10	TO
0.20	TO 0.30	1.70	TO 1.80	3.20	TO
0.30	TO 0.40	1.80	TO 1.90	3.30	TO
0.40	TO 0.50	1.90	TO 2.00	3.40	TO
0.50	TO 0.60	2.00	TO 2.10	3.50	TO
0.60	TO 0.70	2.10	TO 2.20	3.60	TO
0.70	TO 0.80	2.20	TO 2.30	3.70	TO
0.80	TO 0.90	2.30	TO 2.40	3.80	TO
0.90	TO 1.00	2.40	TO 2.50	3.90	TO
1.00	TO 1.10	2.50	TO 2.60	4.00	TO
1.10	TO 1.20	2.60	TO 2.70	4.10	TO
1.20	TO 1.30	2.70	TO 2.80	4.20	TO
1.30	TO 1.40	2.80	TO 2.90	4.30	
1.40	TO 1.50	2.90	TO 3.00		

DEPTH OF CUT:

-0.10	TO -0.20	-3.00	TO -3.10	-5.90	TO
-0.20	TO -0.30	-3.10	TO -3.20	-6.00	TO
-0.30	TO -0.40	-3.20	TO -3.30	-6.10	TO
-0.40	TO -0.50	-3.30	TO -3.40	-6.20	TO
-0.50	TO -0.60	-3.40	TO -3.50	-6.30	TO
-0.60	TO -0.70	-3.50	TO -3.60	-6.40	TO
-0.70	TO -0.80	-3.60	TO -3.70	-6.50	TO
-0.80	TO -0.90	-3.70	TO -3.80	-6.60	TO
-0.90	TO -1.00	-3.80	TO -3.90	-6.70	TO
-1.00	TO -1.10	-3.90	TO -4.00	-6.80	TO
-1.10	TO -1.20	-4.00	TO -4.10	-6.90	TO
-1.20	TO -1.30	-4.10	TO -4.20	-7.00	
-1.30	TO -1.40	-4.20	TO -4.30		
-1.40	TO -1.50	-4.30	TO -4.40		
-1.50	TO -1.60	-4.40	TO -4.50		
-1.60	TO -1.70	-4.50	TO -4.60		
-1.70	TO -1.80	-4.60	TO -4.70		
-1.80	TO -1.90	-4.70	TO -4.80		
-1.90	TO -2.00	-4.80	TO -4.90		
-2.00	TO -2.10	-4.90	TO -5.00		
-2.10	TO -2.20	-5.00	TO -5.10		
-2.20	TO -2.30	-5.10	TO -5.20		
-2.30	TO -2.40	-5.20	TO -5.30		
-2.40	TO -2.50	-5.30	TO -5.40		
-2.50	TO -2.60	-5.40	TO -5.50		
-2.60	TO -2.70	-5.50	TO -5.60		
-2.70	TO -2.80	-5.60	TO -5.70		
-2.80	TO -2.90	-5.70	TO -5.80		
-2.90	TO -3.00	-5.80	TO -5.90		

REV	DATE	AMENDMENTS
C	22.09.22	RETAINING WALL DETAILS - CK/PD
B	02.09.22	RETAINING WALLS - CK/CC
A	18.08.22	FIRST ISSUE - CK/PD

CLIENT

TRAVERSE LIMITED
51 TE MAIKA ROAD, NGUNGURU

DESCRIPTION

LOTS 1 - 24 BEING A PROPOSED SUBDIVISION OF LOT 14 DP 374000

TITLE

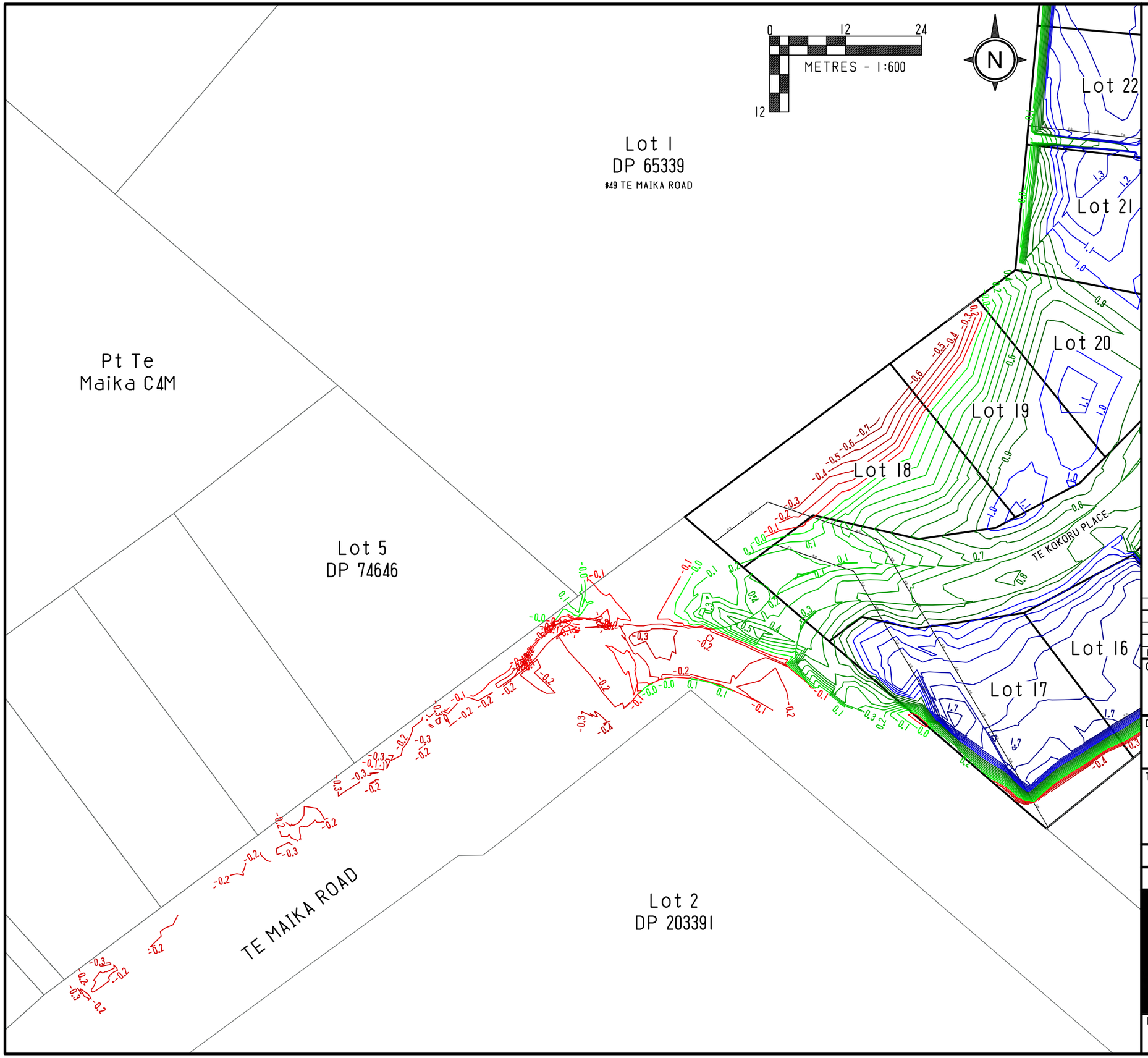
EARTHWORKS ASBUILT
CUTFILL: OVERALL

SCALE: 1:2000 @A3

COUNCIL REFERENCE: SL2100003 AND P117722

reyburn & bryant
Ph: 09 438 3563
7 Selwyn Ave, Whangarei
PO Box 191, Whangarei 0140
www.reyburnandbryant.co.nz

DRAWING REF. EWA16042 | SHEET 07 OF 19 | REV C



CAUTION:

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DEPTH OF FILL:

0.00	TO 0.10	1.50	TO 1.60	3.00	TO
0.10	TO 0.20	1.60	TO 1.70	3.10	TO
0.20	TO 0.30	1.70	TO 1.80	3.20	TO
0.30	TO 0.40	1.80	TO 1.90	3.30	TO
0.40	TO 0.50	1.90	TO 2.00	3.40	TO
0.50	TO 0.60	2.00	TO 2.10	3.50	TO
0.60	TO 0.70	2.10	TO 2.20	3.60	TO
0.70	TO 0.80	2.20	TO 2.30	3.70	TO
0.80	TO 0.90	2.30	TO 2.40	3.80	TO
0.90	TO 1.00	2.40	TO 2.50	3.90	TO
1.00	TO 1.10	2.50	TO 2.60	4.00	TO
1.10	TO 1.20	2.60	TO 2.70	4.10	TO
1.20	TO 1.30	2.70	TO 2.80	4.20	TO
1.30	TO 1.40	2.80	TO 2.90	4.30	
1.40	TO 1.50	2.90	TO 3.00		

DEPTH OF CUT:

-0.10	TO -0.20	-3.00	TO -3.10	-5.90	TO
-0.20	TO -0.30	-3.10	TO -3.20	-6.00	TO
-0.30	TO -0.40	-3.20	TO -3.30	-6.10	TO
-0.40	TO -0.50	-3.30	TO -3.40	-6.20	TO
-0.50	TO -0.60	-3.40	TO -3.50	-6.30	TO
-0.60	TO -0.70	-3.50	TO -3.60	-6.40	TO
-0.70	TO -0.80	-3.60	TO -3.70	-6.50	TO
-0.80	TO -0.90	-3.70	TO -3.80	-6.60	TO
-0.90	TO -1.00	-3.80	TO -3.90	-6.70	TO
-1.00	TO -1.10	-3.90	TO -4.00	-6.80	TO
-1.10	TO -1.20	-4.00	TO -4.10	-6.90	TO
-1.20	TO -1.30	-4.10	TO -4.20	-7.00	
-1.30	TO -1.40	-4.20	TO -4.30		
-1.40	TO -1.50	-4.30	TO -4.40		
-1.50	TO -1.60	-4.40	TO -4.50		
-1.60	TO -1.70	-4.50	TO -4.60		
-1.70	TO -1.80	-4.60	TO -4.70		
-1.80	TO -1.90	-4.70	TO -4.80		
-1.90	TO -2.00	-4.80	TO -4.90		
-2.00	TO -2.10	-4.90	TO -5.00		
-2.10	TO -2.20	-5.00	TO -5.10		
-2.20	TO -2.30	-5.10	TO -5.20		
-2.30	TO -2.40	-5.20	TO -5.30		
-2.40	TO -2.50	-5.30	TO -5.40		
-2.50	TO -2.60	-5.40	TO -5.50		
-2.60	TO -2.70	-5.50	TO -5.60		
-2.70	TO -2.80	-5.60	TO -5.70		
-2.80	TO -2.90	-5.70	TO -5.80		
-2.90	TO -3.00	-5.80	TO -5.90		

REV	DATE	AMENDMENTS
C	22.09.22	RETAINING WALL DETAILS - CK/PD
B	02.09.22	RETAINING WALLS - CK/CC
A	18.08.22	FIRST ISSUE - CK/PD

CLIENT

TRAVERSE LIMITED
51 TE MAIKA ROAD, NGUNGURU

DESCRIPTION

LOTS 1 - 24 BEING A PROPOSED SUBDIVISION OF LOT 14 DP 374000

TITLE

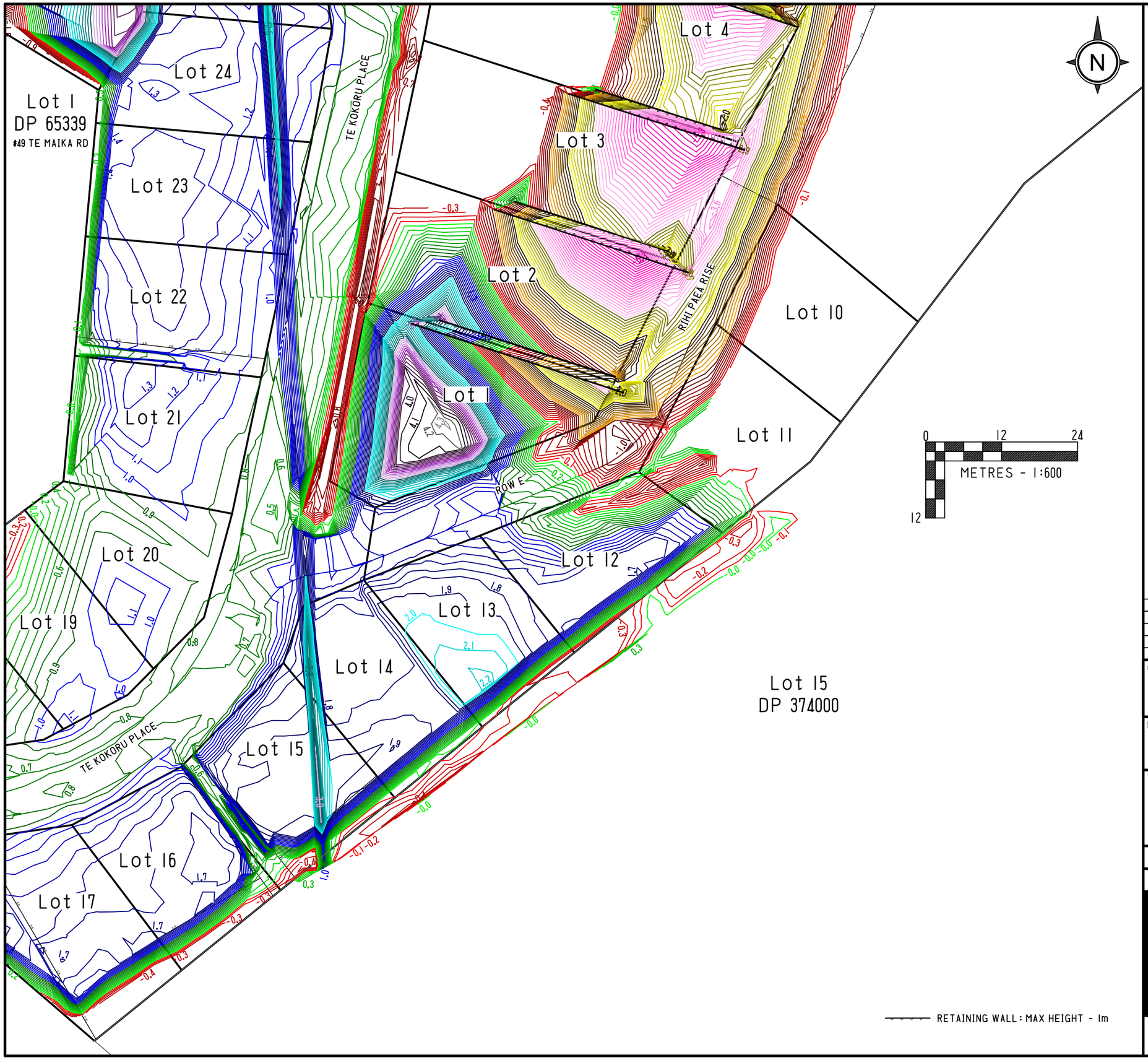
EARTHWORKS ASBUILT
CUTFILL LAYOUT

SCALE: 1:600 @A3

COUNCIL REFERENCE: SL2100003 AND P117722

reyburn & bryant
Ph: 09 438 3563
7 Selwyn Ave, Whangarei
PO Box 191, Whangarei 0140
www.reyburnandbryant.co.nz

DRAWING REF. EWA16042 | SHEET 08 OF 19 | REV C



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DEPTH OF FILL :

0.00	TO	0.10	1.50	TO	1.60	3.00	TO	
0.10	TO	0.20	1.60	TO	1.70	3.10	TO	
0.20	TO	0.30	1.70	TO	1.80	3.20	TO	
0.30	TO	0.40	1.80	TO	1.90	3.30	TO	
0.40	TO	0.50	1.90	TO	2.00	3.40	TO	
0.50	TO	0.60	2.00	TO	2.10	3.50	TO	
0.60	TO	0.70	2.10	TO	2.20	3.60	TO	
0.70	TO	0.80	2.20	TO	2.30	3.70	TO	
0.80	TO	0.90	2.30	TO	2.40	3.80	TO	
0.90	TO	1.00	2.40	TO	2.50	3.90	TO	
1.00	TO	1.10	2.50	TO	2.60	4.00	TO	
1.10	TO	1.20	2.60	TO	2.70	4.10	TO	
1.20	TO	1.30	2.70	TO	2.80	4.20	TO	
1.30	TO	1.40	2.80	TO	2.90	4.30		
1.40	TO	1.50	2.90	TO	3.00			

DEPTH OF CUT :

-0.10	TO	-0.20	-3.00	TO	-3.10	-5.90	TO	
-0.20	TO	-0.30	-3.10	TO	-3.20	-6.00	TO	
-0.30	TO	-0.40	-3.20	TO	-3.30	-6.10	TO	
-0.40	TO	-0.50	-3.30	TO	-3.40	-6.20	TO	
-0.50	TO	-0.60	-3.40	TO	-3.50	-6.30	TO	
-0.60	TO	-0.70	-3.50	TO	-3.60	-6.40	TO	
-0.70	TO	-0.80	-3.60	TO	-3.70	-6.50	TO	
-0.80	TO	-0.90	-3.70	TO	-3.80	-6.60	TO	
-0.90	TO	-1.00	-3.80	TO	-3.90	-6.70	TO	
-1.00	TO	-1.10	-3.90	TO	-4.00	-6.80	TO	
-1.10	TO	-1.20	-4.00	TO	-4.10	-6.90	TO	
-1.20	TO	-1.30	-4.10	TO	-4.20	-7.00		
-1.30	TO	-1.40	-4.20	TO	-4.30			
-1.40	TO	-1.50	-4.30	TO	-4.40			
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-1.70	TO	-1.80	-4.60	TO	-4.70			
-1.80	TO	-1.90	-4.70	TO	-4.80			
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-2.00	TO	-2.10	-4.90	TO	-5.00			
-2.10	TO	-2.20	-5.00	TO	-5.10			
-2.20	TO	-2.30	-5.10	TO	-5.20			
-2.30	TO	-2.40	-5.20	TO	-5.30			
-2.40	TO	-2.50	-5.30	TO	-5.40			
-2.50	TO	-2.60	-5.40	TO	-5.50			
-2.60	TO	-2.70	-5.50	TO	-5.60			
-2.70	TO	-2.80	-5.60	TO	-5.70			
-2.80	TO	-2.90	-5.70	TO	-5.80			
-2.90	TO	-3.00	-5.80	TO	-5.90			

REV	DATE	AMENDMENTS
C	22.09.22	RETAINING WALL DETAILS - CK/PD
B	02.09.22	RETAINING WALLS - CK/CC
A	18.08.22	FIRST ISSUE - CK/PD

CLIENT

TRAVERSE LIMITED
51 TE MAIKA ROAD, NGUNGURU

DESCRIPTION

LOTS 1 - 24 BEING A PROPOSED SUBDIVISION OF LOT 14 DP 374000

TITLE

EARTHWORKS ASBUILT
CUTFILL LAYOUT

SCALE : 1:600 @A3

COUNCIL REFERENCE : SL2100003 AND P117722

reyburn & bryant
Ph: 09 438 3563
PO Box 191, Whangarei 0140
7 Selwyn Ave, Whangarei
www.reyburnandbryant.co.nz

DRAWING REF.	SHEET	REV
EWA16042	09 OF 19	C

RETAINING WALL : MAX HEIGHT - Im

Lot 2
DP 390702

Lot 33

0 12 24
METRES - 1:600

N

CAUTION:

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DEPTH OF FILL:

0.00	TO 0.10	1.50	TO 1.60	3.00	TO
0.10	TO 0.20	1.60	TO 1.70	3.10	TO
0.20	TO 0.30	1.70	TO 1.80	3.20	TO
0.30	TO 0.40	1.80	TO 1.90	3.30	TO
0.40	TO 0.50	1.90	TO 2.00	3.40	TO
0.50	TO 0.60	2.00	TO 2.10	3.50	TO
0.60	TO 0.70	2.10	TO 2.20	3.60	TO
0.70	TO 0.80	2.20	TO 2.30	3.70	TO
0.80	TO 0.90	2.30	TO 2.40	3.80	TO
0.90	TO 1.00	2.40	TO 2.50	3.90	TO
1.00	TO 1.10	2.50	TO 2.60	4.00	TO
1.10	TO 1.20	2.60	TO 2.70	4.10	TO
1.20	TO 1.30	2.70	TO 2.80	4.20	TO
1.30	TO 1.40	2.80	TO 2.90	4.30	
1.40	TO 1.50	2.90	TO 3.00		

DEPTH OF CUT:

-0.10	TO -0.20	-3.00	TO -3.10	-5.90	TO
-0.20	TO -0.30	-3.10	TO -3.20	-6.00	TO
-0.30	TO -0.40	-3.20	TO -3.30	-6.10	TO
-0.40	TO -0.50	-3.30	TO -3.40	-6.20	TO
-0.50	TO -0.60	-3.40	TO -3.50	-6.30	TO
-0.60	TO -0.70	-3.50	TO -3.60	-6.40	TO
-0.70	TO -0.80	-3.60	TO -3.70	-6.50	TO
-0.80	TO -0.90	-3.70	TO -3.80	-6.60	TO
-0.90	TO -1.00	-3.80	TO -3.90	-6.70	TO
-1.00	TO -1.10	-3.90	TO -4.00	-6.80	TO
-1.10	TO -1.20	-4.00	TO -4.10	-6.90	TO
-1.20	TO -1.30	-4.10	TO -4.20	-7.00	
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-1.40	TO -1.50	-4.30	TO -4.40		
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-1.90	TO -2.00	-4.80	TO -4.90		
-2.00	TO -2.10	-4.90	TO -5.00		
-2.10	TO -2.20	-5.00	TO -5.10		
-2.20	TO -2.30	-5.10	TO -5.20		
-2.30	TO -2.40	-5.20	TO -5.30		
-2.40	TO -2.50	-5.30	TO -5.40		
-2.50	TO -2.60	-5.40	TO -5.50		
-2.60	TO -2.70	-5.50	TO -5.60		
-2.70	TO -2.80	-5.60	TO -5.70		
-2.80	TO -2.90	-5.70	TO -5.80		
-2.90	TO -3.00	-5.80	TO -5.90		

REV	DATE	AMENDMENTS
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CLIENT
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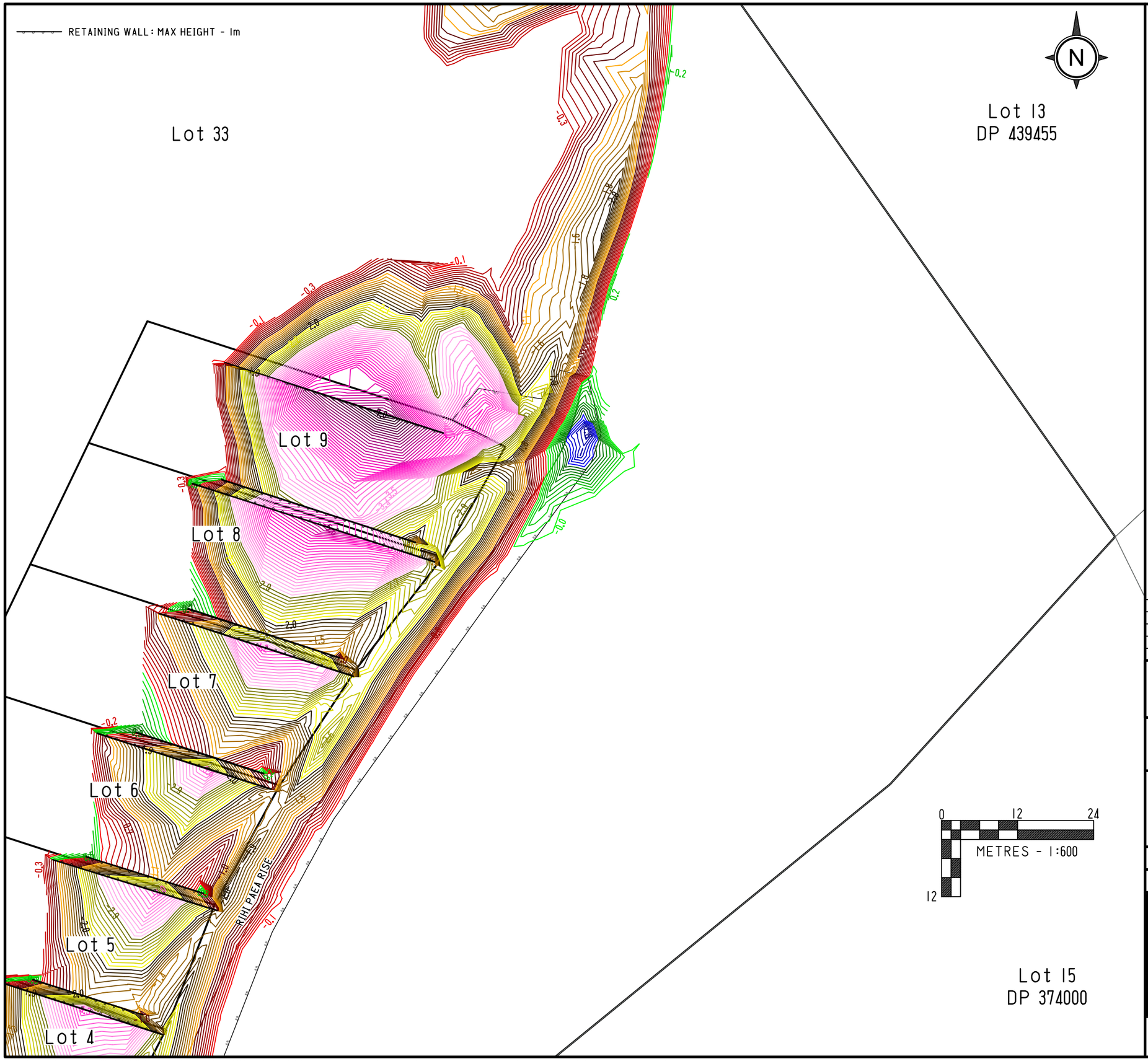
DRAWING REF. EWA16042 | SHEET 10 OF 19 | REV C

RETAINING WALL : MAX HEIGHT - Im



N

0 12 24

METRES - 1:600

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DEPTH OF FILL :

0.00	TO 0.10	1.50	TO 1.60	3.00	TO
0.10	TO 0.20	1.60	TO 1.70	3.10	TO
0.20	TO 0.30	1.70	TO 1.80	3.20	TO
0.30	TO 0.40	1.80	TO 1.90	3.30	TO
0.40	TO 0.50	1.90	TO 2.00	3.40	TO
0.50	TO 0.60	2.00	TO 2.10	3.50	TO
0.60	TO 0.70	2.10	TO 2.20	3.60	TO
0.70	TO 0.80	2.20	TO 2.30	3.70	TO
0.80	TO 0.90	2.30	TO 2.40	3.80	TO
0.90	TO 1.00	2.40	TO 2.50	3.90	TO
1.00	TO 1.10	2.50	TO 2.60	4.00	TO
1.10	TO 1.20	2.60	TO 2.70	4.10	TO
1.20	TO 1.30	2.70	TO 2.80	4.20	TO
1.30	TO 1.40	2.80	TO 2.90	4.30	
1.40	TO 1.50	2.90	TO 3.00		

DEPTH OF CUT :

-0.10	TO -0.20	-3.00	TO -3.10	-5.90	TO
-0.20	TO -0.30	-3.10	TO -3.20	-6.00	TO
-0.30	TO -0.40	-3.20	TO -3.30	-6.10	TO
-0.40	TO -0.50	-3.30	TO -3.40	-6.20	TO
-0.50	TO -0.60	-3.40	TO -3.50	-6.30	TO
-0.60	TO -0.70	-3.50	TO -3.60	-6.40	TO
-0.70	TO -0.80	-3.60	TO -3.70	-6.50	TO
-0.80	TO -0.90	-3.70	TO -3.80	-6.60	TO
-0.90	TO -1.00	-3.80	TO -3.90	-6.70	TO
-1.00	TO -1.10	-3.90	TO -4.00	-6.80	TO
-1.10	TO -1.20	-4.00	TO -4.10	-6.90	TO
-1.20	TO -1.30	-4.10	TO -4.20	-7.00	
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-2.70	TO -2.80	-5.60	TO -5.70		
-2.80	TO -2.90	-5.70	TO -5.80		
-2.90	TO -3.00	-5.80	TO -5.90		

REV	DATE	AMENDMENTS
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DRAWING REF.	SHEET	REV
EWA16042	11 OF 19	C

0 12 24

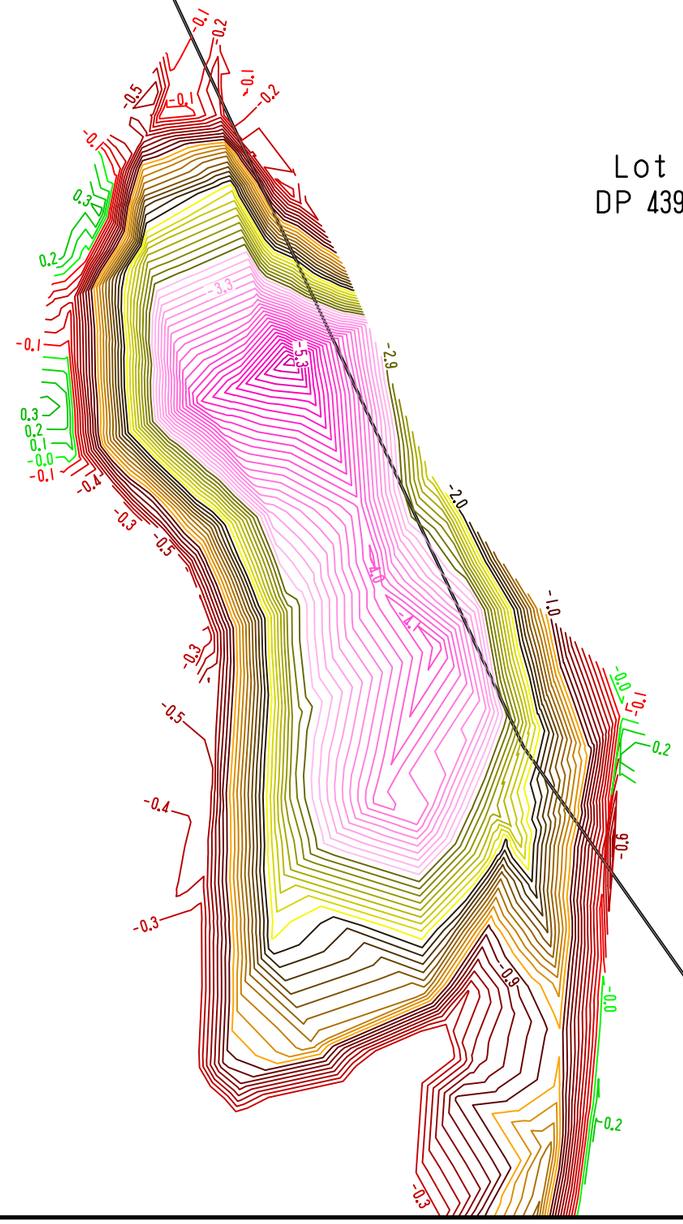
METRES - 1:600

12

N

Lot 2
DP 390702

Lot 13
DP 439455



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DEPTH OF FILL:

0.00	TO	0.10	1.50	TO	1.60	3.00	TO	
0.10	TO	0.20	1.60	TO	1.70	3.10	TO	
0.20	TO	0.30	1.70	TO	1.80	3.20	TO	
0.30	TO	0.40	1.80	TO	1.90	3.30	TO	
0.40	TO	0.50	1.90	TO	2.00	3.40	TO	
0.50	TO	0.60	2.00	TO	2.10	3.50	TO	
0.60	TO	0.70	2.10	TO	2.20	3.60	TO	
0.70	TO	0.80	2.20	TO	2.30	3.70	TO	
0.80	TO	0.90	2.30	TO	2.40	3.80	TO	
0.90	TO	1.00	2.40	TO	2.50	3.90	TO	
1.00	TO	1.10	2.50	TO	2.60	4.00	TO	
1.10	TO	1.20	2.60	TO	2.70	4.10	TO	
1.20	TO	1.30	2.70	TO	2.80	4.20	TO	
1.30	TO	1.40	2.80	TO	2.90	4.30		
1.40	TO	1.50	2.90	TO	3.00			

DEPTH OF CUT:

-0.10	TO	-0.20	-3.00	TO	-3.10	-5.90	TO	
-0.20	TO	-0.30	-3.10	TO	-3.20	-6.00	TO	
-0.30	TO	-0.40	-3.20	TO	-3.30	-6.10	TO	
-0.40	TO	-0.50	-3.30	TO	-3.40	-6.20	TO	
-0.50	TO	-0.60	-3.40	TO	-3.50	-6.30	TO	
-0.60	TO	-0.70	-3.50	TO	-3.60	-6.40	TO	
-0.70	TO	-0.80	-3.60	TO	-3.70	-6.50	TO	
-0.80	TO	-0.90	-3.70	TO	-3.80	-6.60	TO	
-0.90	TO	-1.00	-3.80	TO	-3.90	-6.70	TO	
-1.00	TO	-1.10	-3.90	TO	-4.00	-6.80	TO	
-1.10	TO	-1.20	-4.00	TO	-4.10	-6.90	TO	
-1.20	TO	-1.30	-4.10	TO	-4.20	-7.00		
-1.30	TO	-1.40	-4.20	TO	-4.30			
-1.40	TO	-1.50	-4.30	TO	-4.40			
-1.50	TO	-1.60	-4.40	TO	-4.50			
-1.60	TO	-1.70	-4.50	TO	-4.60			
-1.70	TO	-1.80	-4.60	TO	-4.70			
-1.80	TO	-1.90	-4.70	TO	-4.80			
-1.90	TO	-2.00	-4.80	TO	-4.90			
-2.00	TO	-2.10	-4.90	TO	-5.00			
-2.10	TO	-2.20	-5.00	TO	-5.10			
-2.20	TO	-2.30	-5.10	TO	-5.20			
-2.30	TO	-2.40	-5.20	TO	-5.30			
-2.40	TO	-2.50	-5.30	TO	-5.40			
-2.50	TO	-2.60	-5.40	TO	-5.50			
-2.60	TO	-2.70	-5.50	TO	-5.60			
-2.70	TO	-2.80	-5.60	TO	-5.70			
-2.80	TO	-2.90	-5.70	TO	-5.80			
-2.90	TO	-3.00	-5.80	TO	-5.90			

REV	DATE	AMENDMENTS
C	22.09.22	RETAINING WALL DETAILS - CK/PD
B	02.09.22	RETAINING WALLS - CK/CC
A	18.08.22	FIRST ISSUE - CK/PD

CLIENT

TRAVERSE LIMITED
51 TE MAIKA ROAD, NGUNGURU

DESCRIPTION

LOTS 1 - 24 BEING A PROPOSED SUBDIVISION
OF LOT 14 DP 374000

TITLE

EARTHWORKS ASBUILT
CUTFILL LAYOUT

SCALE: 1:600 @A3

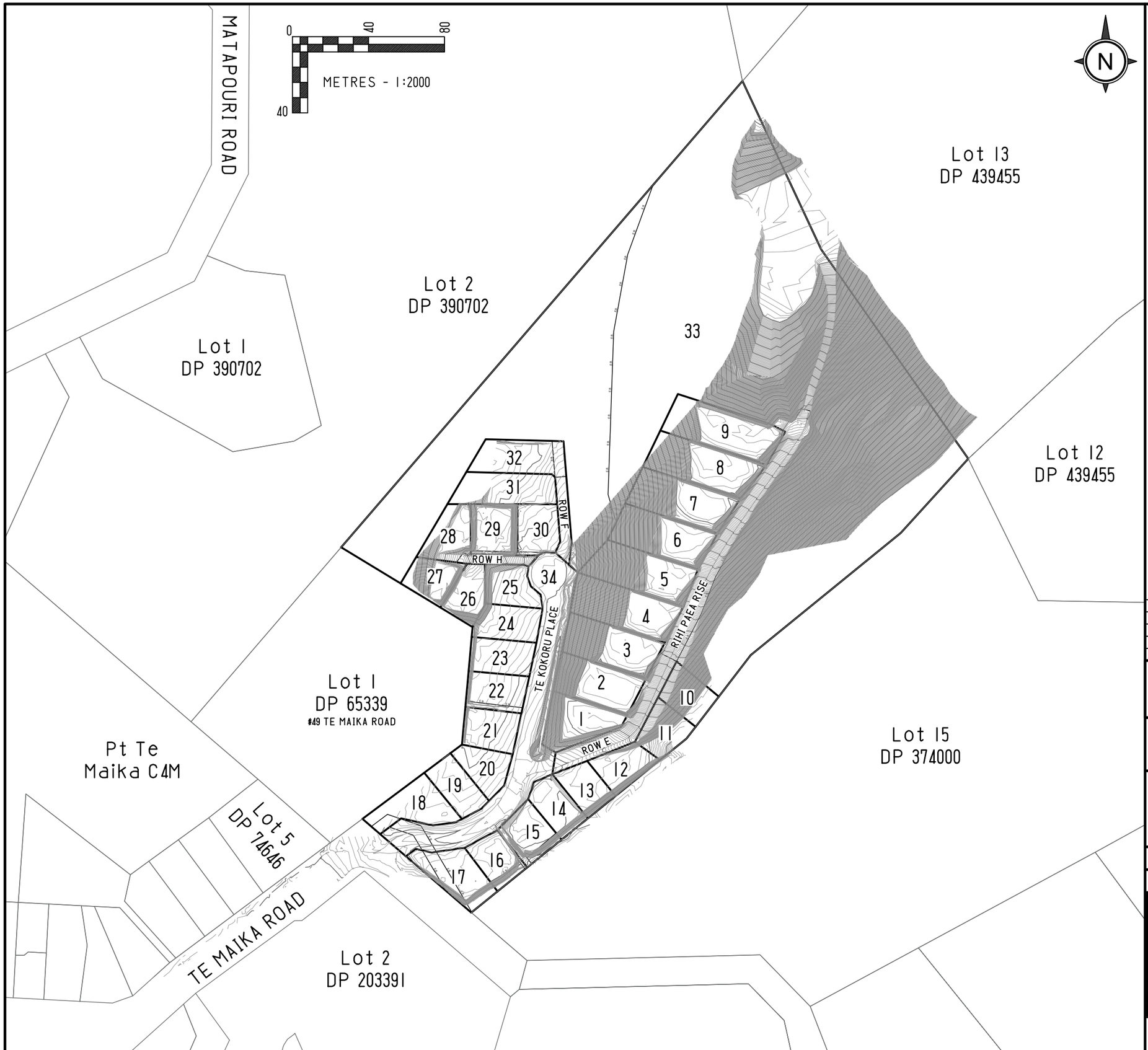
COUNCIL REFERENCE: SL2100003 AND P117722

reyburn & bryant

Ph: 09 438 3563
PO Box 191, Whangarei 0140
7 Selwyn Ave, Whangarei
www.reyburnandbryant.co.nz

DRAWING REF.	SHEET	REV
EWA16042	12 OF 19	C

Date Plotted: 22/09/2022 File Path: P:¥16000 - 16999¥16042 - Traverse Limited¥Drawings¥As-built Plans¥EWA16042 - Traverse - C.dwg



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MAJOR CONTOURS @ 1.0m INTERVALS
MINOR CONTOURS @ 0.1m INTERVALS

REV	DATE	AMENDMENTS
C	22.09.22	RETAINING WALL DETAILS - CK/PD
B	02.09.22	RETAINING WALLS - CK/CC
A	18.08.22	FIRST ISSUE - CK/PD

CLIENT
TRAVERSE LIMITED
51 TE MAIKA ROAD, NGUNGURU

DESCRIPTION
LOTS 1 - 24 BEING A PROPOSED SUBDIVISION OF LOT 14 DP 374000

TITLE
EARTHWORKS ASBUILT
FINAL CONTOURS: OVERALL

SCALE: 1:2000 @A3

COUNCIL REFERENCE: SL2100003 AND P117722

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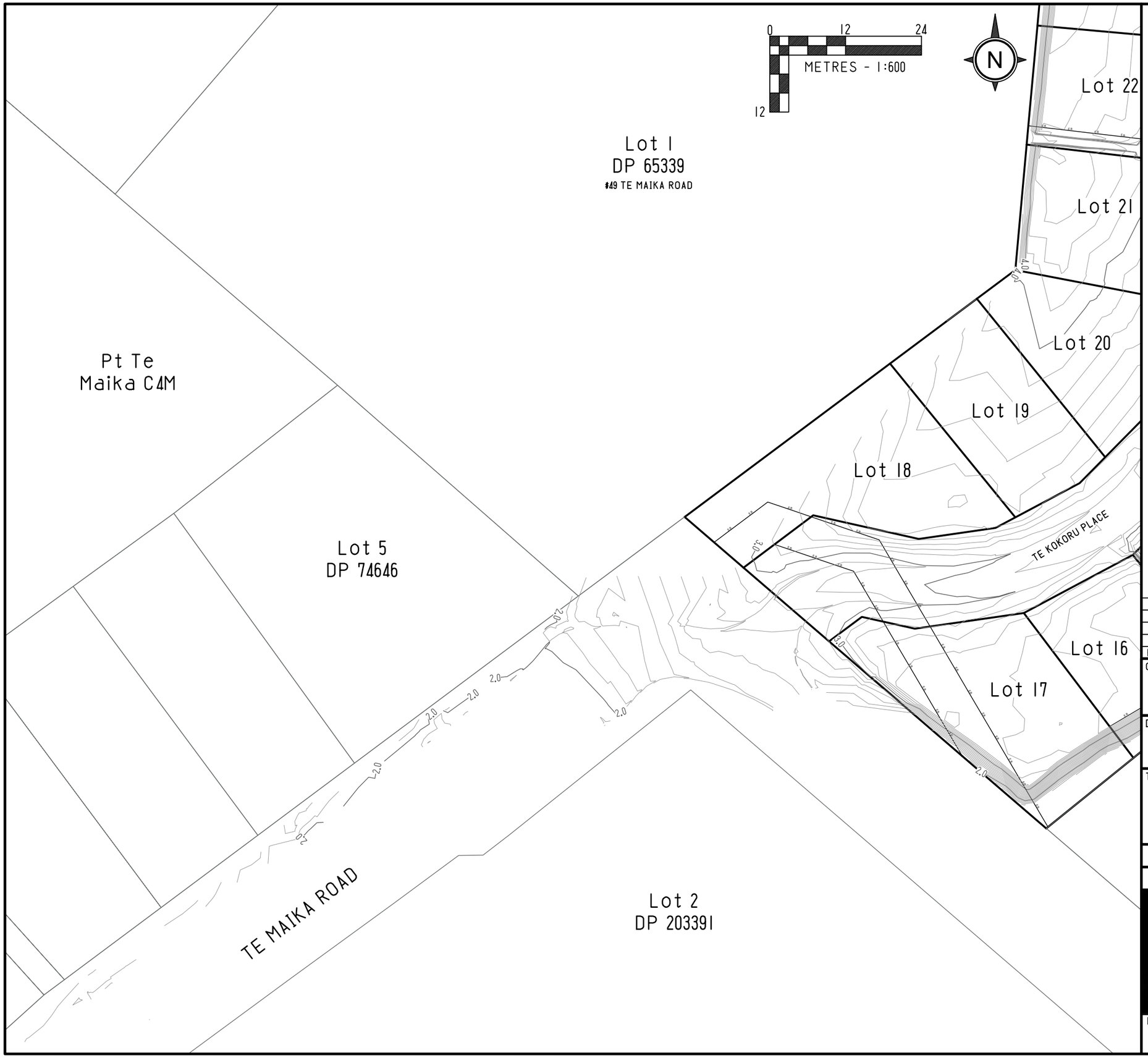
DRAWING REF.	SHEET	REV
EWA16042	13 OF 19	C

Date Plotted: 22/09/2022 File Path: P:¥16000 - 16999¥16042 - Traverse Limited¥Drawings¥As-built Plans¥EWA16042 - Traverse - C.dwg



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MAJOR CONTOURS @ 1.0m INTERVALS
MINOR CONTOURS @ 0.1m INTERVALS

REV	DATE	AMENDMENTS
C	22.09.22	RETAINING WALL DETAILS - CK/PD
B	02.09.22	RETAINING WALLS - CK/CC
A	18.08.22	FIRST ISSUE - CK/PD

CLIENT
TRAVERSE LIMITED
51 TE MAIKA ROAD, NGUNGURU

DESCRIPTION
LOTS 1 - 24 BEING A PROPOSED SUBDIVISION OF LOT 14 DP 374000

TITLE
EARTHWORKS ASBUILT
FINAL CONTOURS LAYOUT

SCALE: 1:600 @A3

COUNCIL REFERENCE: SL2100003 AND P117722

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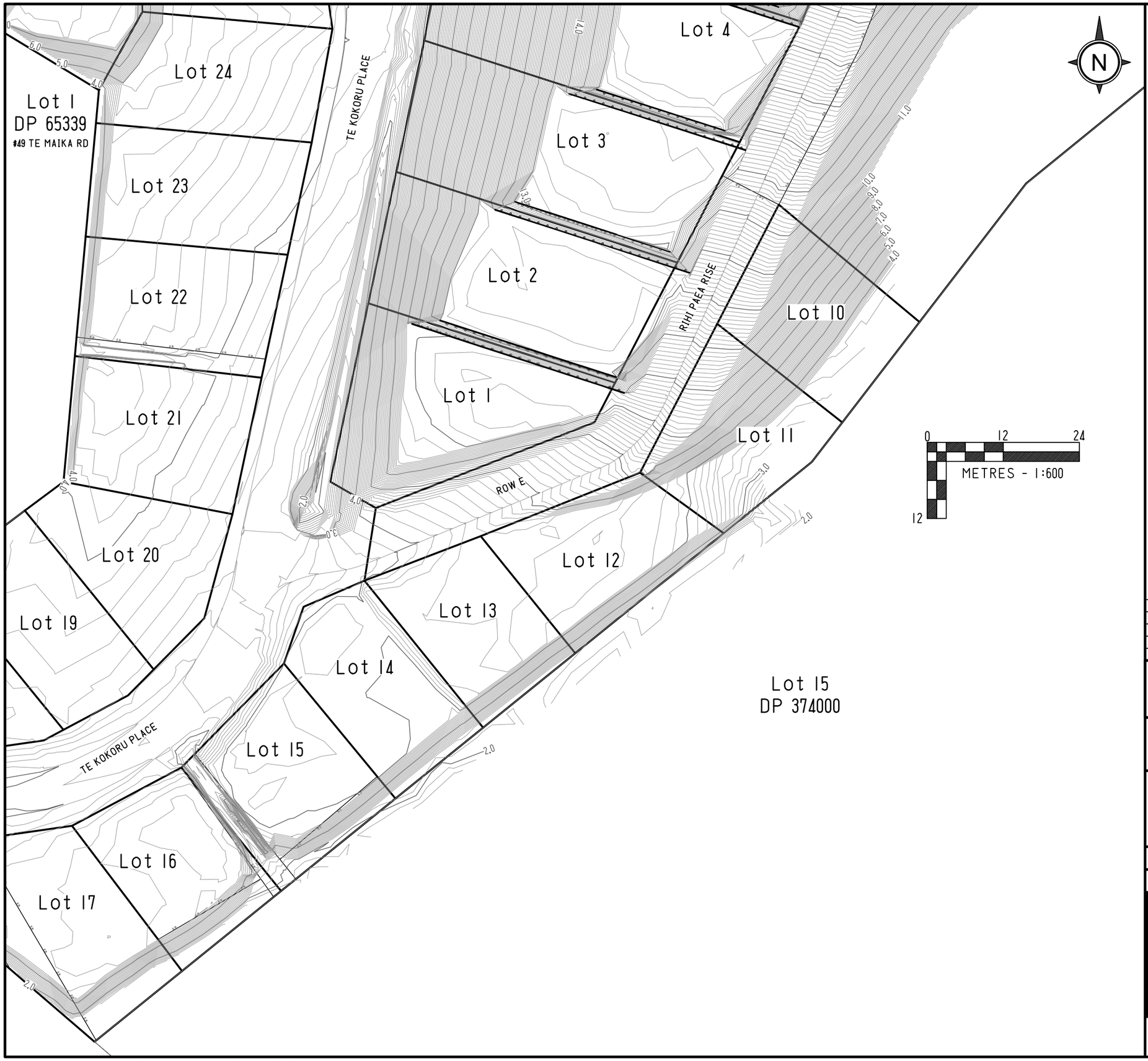
DRAWING REF. EWA16042 | SHEET 14 OF 19 | REV C



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MAJOR CONTOURS @ 1.0m INTERVALS
MINOR CONTOURS @ 0.1m INTERVALS
RETAINING WALL : MAX HEIGHT - 1m

REV	DATE	AMENDMENTS
C	22.09.22	RETAINING WALL DETAILS - CK/PD
B	02.09.22	RETAINING WALLS - CK/CC
A	18.08.22	FIRST ISSUE - CK/PD

CLIENT
TRAVERSE LIMITED
51 TE MAIKA ROAD, NGUNGURU

DESCRIPTION
LOTS 1 - 24 BEING A PROPOSED SUBDIVISION OF LOT 14 DP 374000

TITLE
EARTHWORKS ASBUILT
FINAL CONTOURS LAYOUT

SCALE : 1:600 @A3

COUNCIL REFERENCE : SL2100003 AND P117722

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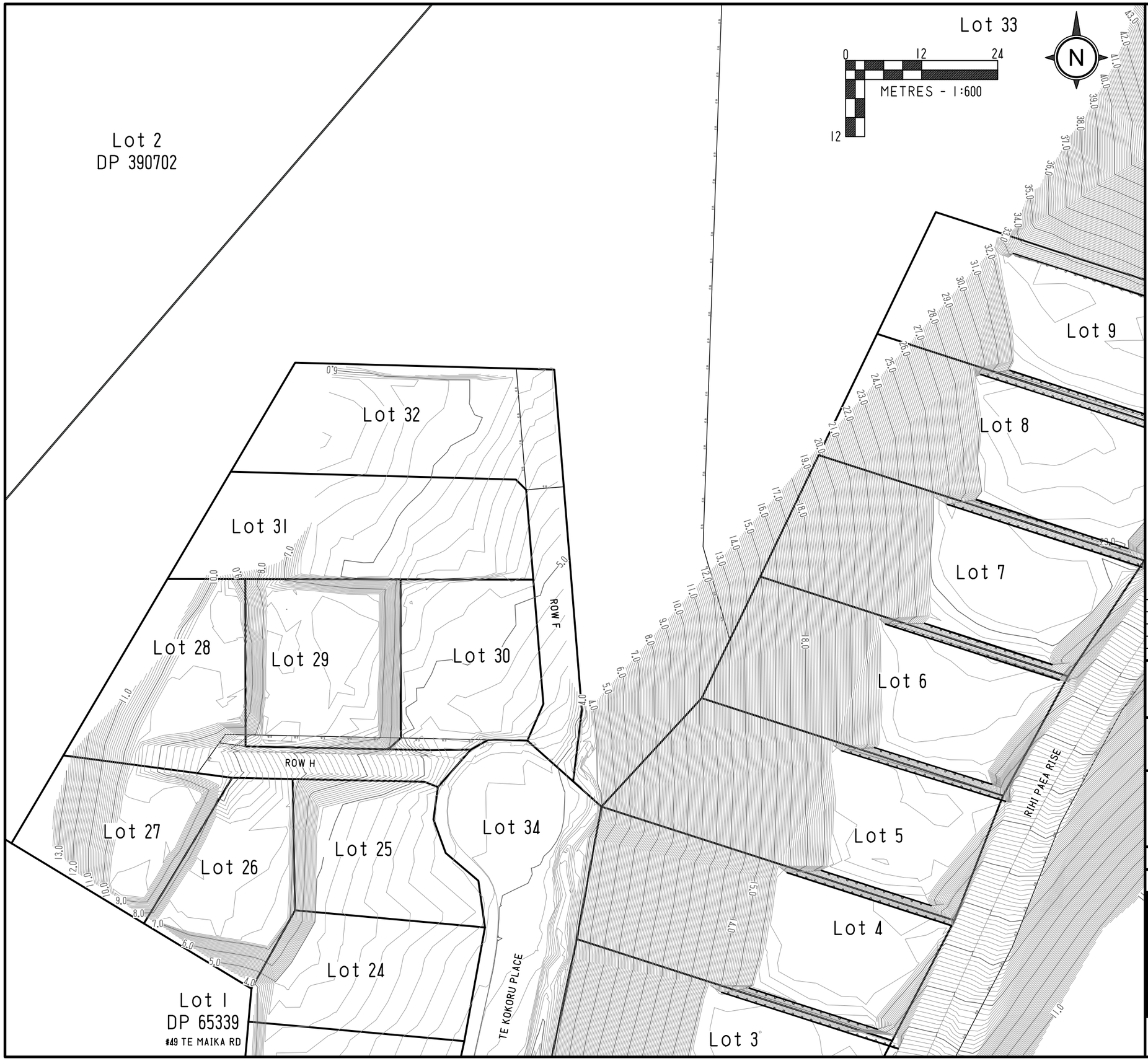
DRAWING REF. EWA16042 | SHEET 15 OF 19 | REV C

Date Plotted: 22/09/2022 File Path: P:¥16000 - 16999¥16042 - Traverse Limited¥Drawings¥As-built Plans¥EWA16042 - Traverse - C.dwg



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- MAJOR CONTOURS @ 1.0m INTERVALS
- MINOR CONTOURS @ 0.1m INTERVALS
- RETAINING WALL: MAX HEIGHT - 1m

REV	DATE	AMENDMENTS
C	22.09.22	RETAINING WALL DETAILS - CK/PD
B	02.09.22	RETAINING WALLS - CK/CC
A	18.08.22	FIRST ISSUE - CK/PD

CLIENT

TRAVERSE LIMITED
51 TE MAIKA ROAD, NGUNGURU

DESCRIPTION

LOTS 1 - 24 BEING A PROPOSED SUBDIVISION OF LOT 14 DP 374000

TITLE

EARTHWORKS ASBUILT
FINAL CONTOURS LAYOUT

SCALE: 1:600 @A3

COUNCIL REFERENCE: SL2100003 AND P117722

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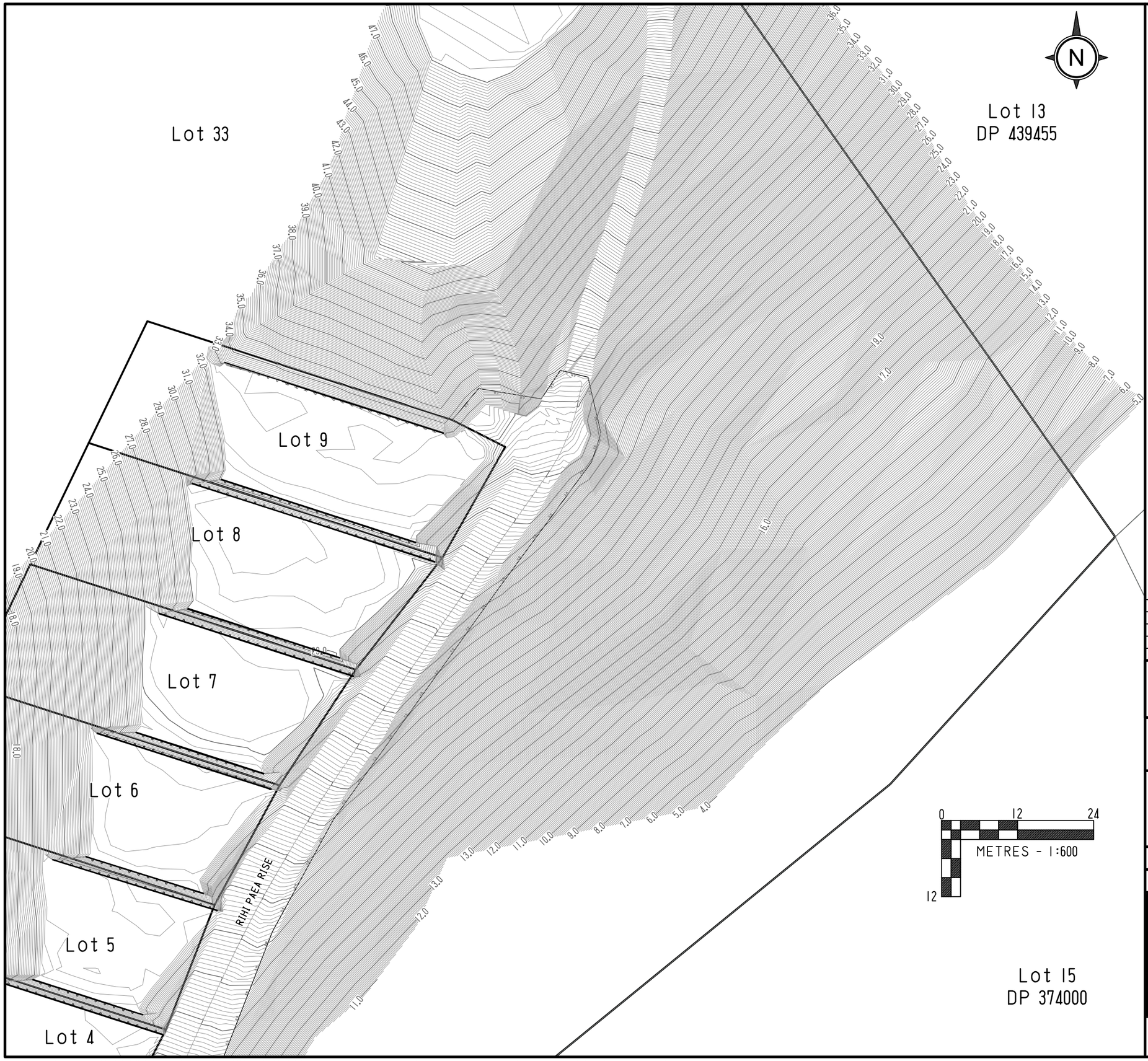
DRAWING REF. EWA16042 | SHEET 16 OF 19 | REV C



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MAJOR CONTOURS @ 1.0m INTERVALS
MINOR CONTOURS @ 0.1m INTERVALS
RETAINING WALL : MAX HEIGHT - 1m

REV	DATE	AMENDMENTS
C	22.09.22	RETAINING WALL DETAILS - CK/PD
B	02.09.22	RETAINING WALLS - CK/CC
A	18.08.22	FIRST ISSUE - CK/PD

CLIENT
TRAVERSE LIMITED
51 TE MAIKA ROAD, NGUNGURU

DESCRIPTION
LOTS 1 - 24 BEING A PROPOSED SUBDIVISION OF LOT 14 DP 374000

TITLE
EARTHWORKS ASBUILT
FINAL CONTOURS LAYOUT

SCALE : 1:600 @A3

COUNCIL REFERENCE : SL2100003 AND P117722

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PO Box 191, Whangarei 0140
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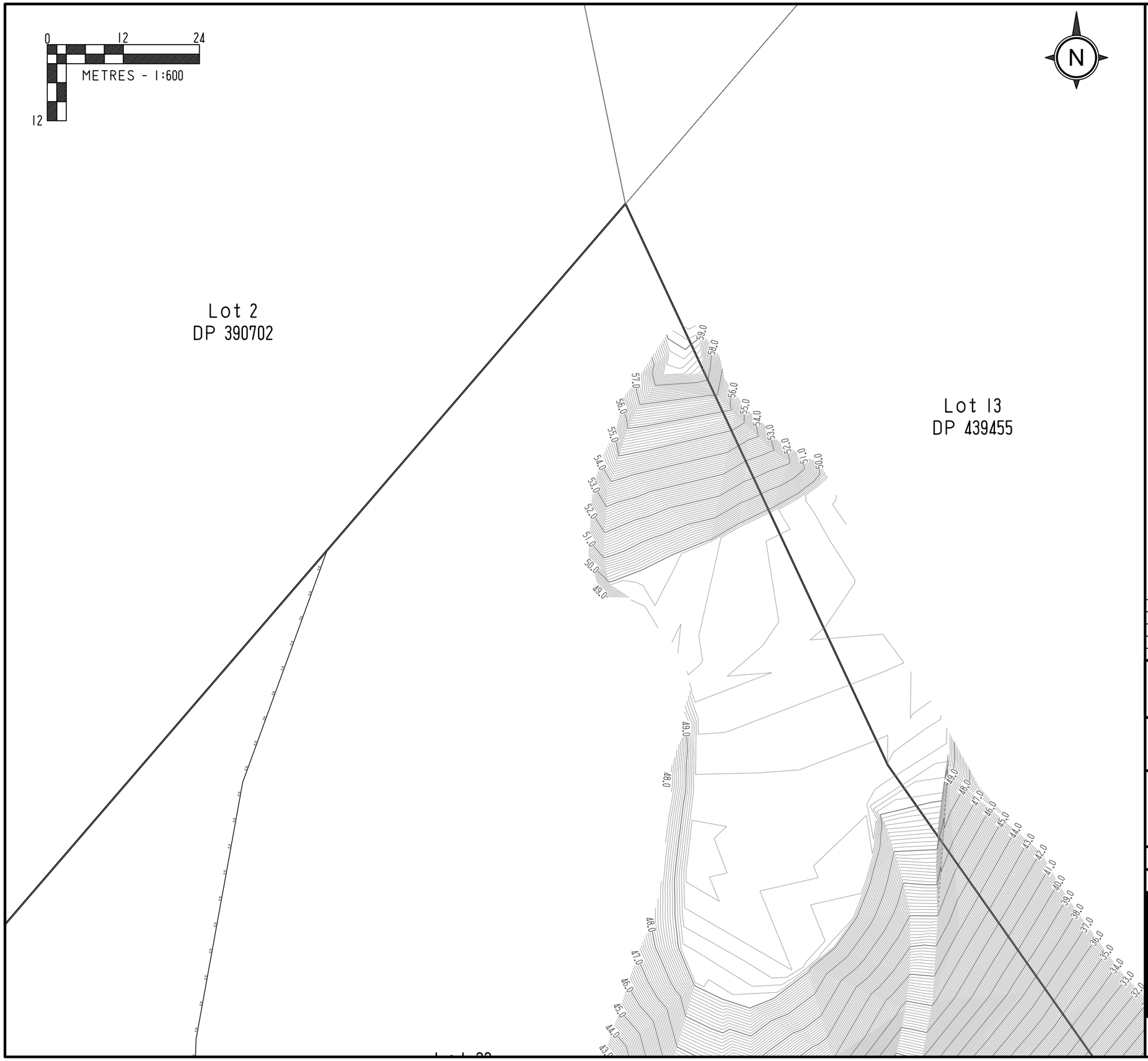
DRAWING REF. EWA16042 | SHEET 17 OF 19 | REV C

Date Plotted: 22/09/2022 File Path: P:¥16000 - 16999¥16042 - Traverse Limited¥Drawings¥As-built Plans¥EWA16042 - Traverse - C.dwg



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MAJOR CONTOURS @ 1.0m INTERVALS
MINOR CONTOURS @ 0.1m INTERVALS

REV	DATE	AMENDMENTS
C	22.09.22	RETAINING WALL DETAILS - CK/PD
B	02.09.22	RETAINING WALLS - CK/CC
A	18.08.22	FIRST ISSUE - CK/PD

CLIENT
TRAVERSE LIMITED
51 TE MAIKA ROAD, NGUNGURU

DESCRIPTION
LOTS 1 - 24 BEING A PROPOSED SUBDIVISION OF LOT 14 DP 374000

TITLE
EARTHWORKS ASBUILT
FINAL CONTOURS LAYOUT

SCALE: 1:600 @A3

COUNCIL REFERENCE: SL2100003 AND P117722

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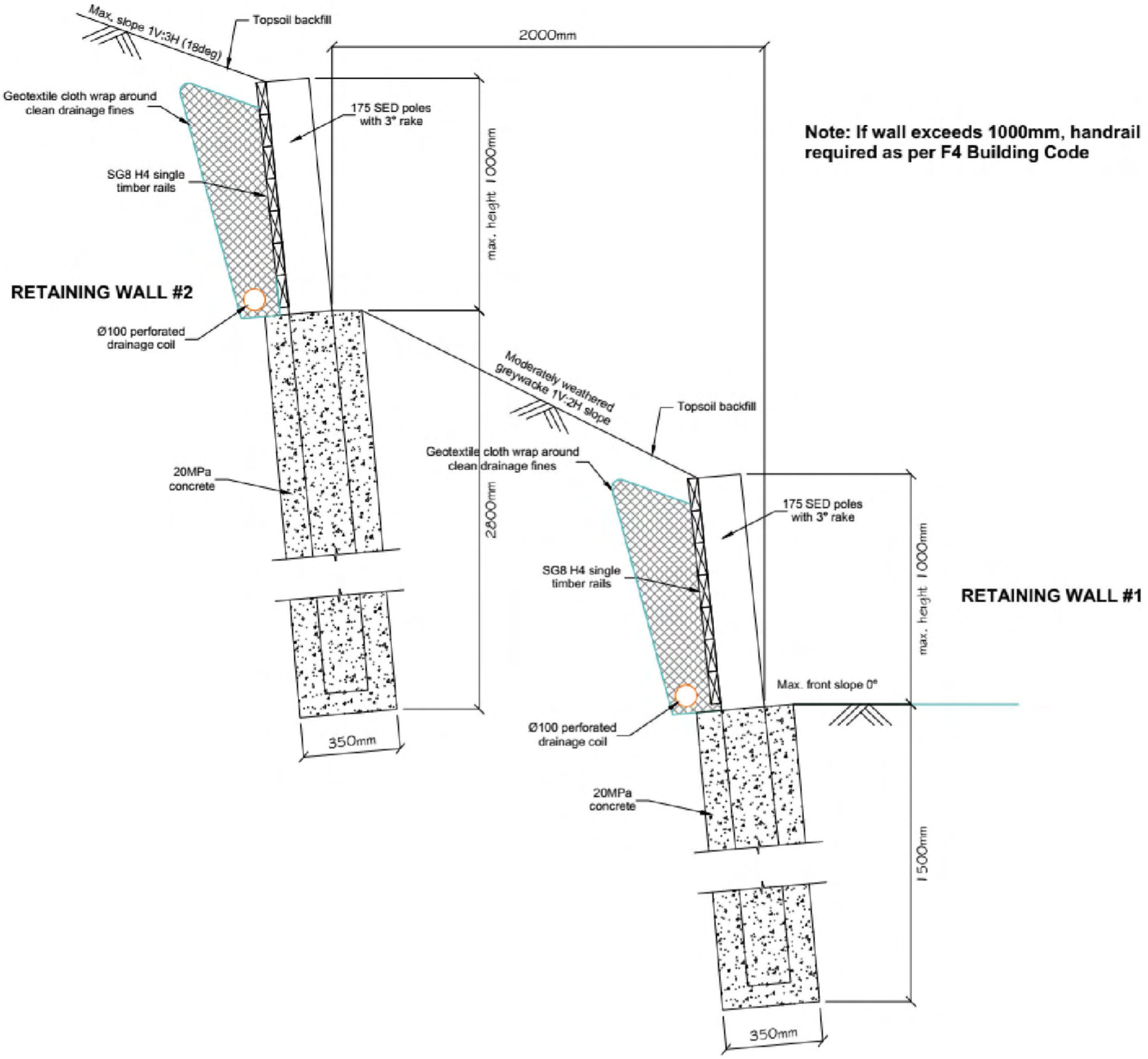
DRAWING REF.	SHEET	REV
EWA16042	18 OF 19	C



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MAJOR CONTOURS @ 1.0m INTERVALS
MINOR CONTOURS @ 0.1m INTERVALS

REV	DATE	AMENDMENTS
C	22.09.22	RETAINING WALL DETAILS - CK/PD
B	02.09.22	RETAINING WALLS - CK/CC
A	18.08.22	FIRST ISSUE - CK/PD

CLIENT
TRAVERSE LIMITED
51 TE MAIKA ROAD, NGUNGURU

DESCRIPTION
LOTS 1 - 24 BEING A PROPOSED SUBDIVISION OF LOT 14 DP 374000

TITLE
EARTHWORKS ASBUILT
CORE RETAINING WALL DETAILS

N.T.S.

COUNCIL REFERENCE: SL2100003 AND P117722

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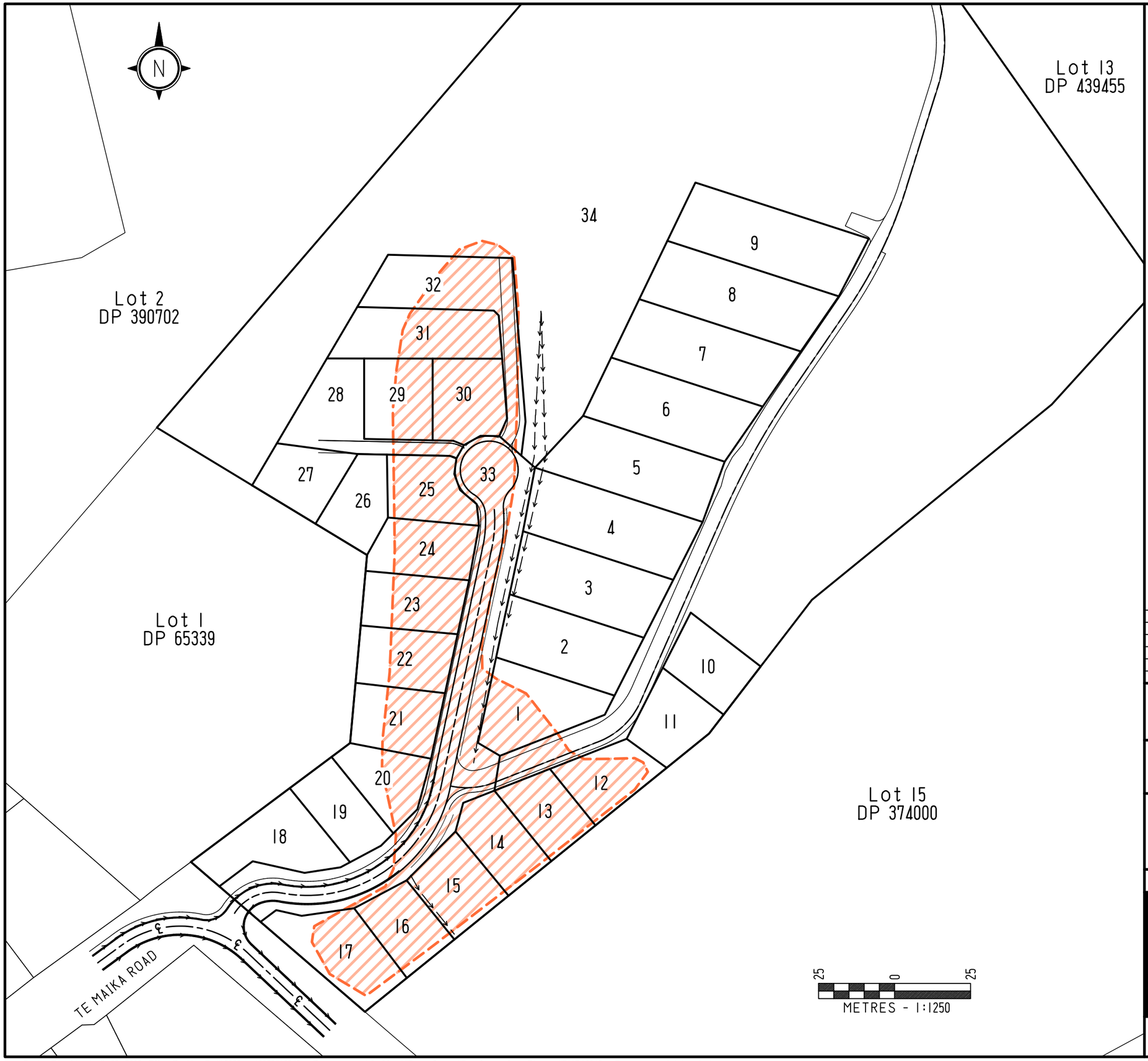
www.reyburnandbryant.co.nz

DRAWING REF. EWA16042
SHEET 19 OF 19
REV C



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NOTES:
1. ALL SEWER LINES FROM MANHOLE TO MANHOLE ARE 150mm ϕ uPVC.
2. ALL STORMWATER LINES FROM CESSPIT TO MANHOLE ARE 300mm ϕ.
3. ALL STORMWATER LINES ARE 300mm ϕ UNLESS OTHERWISE SHOWN.
5. ALL PROPERTY CONNECTIONS (SW & SS) ARE 100mm ϕ uPVC.
6. ALL MANHOLES ARE 1050mm ϕ UNLESS OTHERWISE SHOWN.

→ → → – EXISTING DRAIN
– – – – EXTENT OF CLOTH

REV	DATE	AMENDMENTS
A	02.09.22	FIRST ISSUE - CK/CC

REF. DATA:

CLIENT
TRAVERSE LTD
51 TE MAIKA ROAD, NGUNGURU

DESCRIPTION
LOTS 1 - 34 BEING A SUBDIVISION OF LOT 14 DP 374000

TITLE
ENGINEERING DESIGN
EXTENT OF CLOTH - SKETCH PLAN

SCALE: 1:1250 @A3

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7 Selwyn Ave, Whangarei
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DRAWING REF.	SHEET	REV
EXC16042	01 OF 01	A

APPENDIX 4 – CORE ENGINEERING SOLUTIONS LTD DRAWINGS SET

SITE INFO:
Parcel ID: 6881880
Legal Desc: Lot 14 DP 37400
Land District: Whangarei District
Titles: 298650
GIS Area: 66,490m² / 6.6490ha

SITE NOTES:
- Indicative Lidar contours @2.5m intervals from NZVD2016 Vertical Datum.

LEGEND:
- Proposed Section
- Proposed Retaining
- Proposed Section Building Setback
- SED Build Area

L04 STAGE 3 PLAN
SCALE 1:1,000

CORE Consulting Engineers
ENGINEERING SOLUTIONS
Structural | Geotechnical | Civil

T: 09 553 3660
jobs@coreeng.nz
Level 1, 31 Vine Street,
Whangarei 0110

Rev	Date	Notes
B	02/02/23	Stage 3 building setbacks added (SED)
A	16/08/22	Original Issue

CLIENT: Traverse Ltd

LOCATION: 51 Te Maika Road, Ngunguru

PROJECT DESCRIPTION: PROPOSED SUBDIVISION

SHEET TITLE: STAGE 3 PLAN

DRAWN BY:	APPROVED BY:
LJM	DL
ORIGINAL: A3	SCALE: 1:1,000
FILE: 20-0078	SHEET: L04

SITE INFO:
Parcel ID: 6881880
Legal Desc: Lot 14 DP 37400
Land District: Whangarei District
Titles: 298650
GIS Area: 66,490m² / 6.6490ha

SITE NOTES:
- Indicative Lidar contours @2.5m intervals from NZVD2016 Vertical Datum.

LEGEND:
- Proposed Section
- Proposed Section Building Setback

Surface Analysis: Elevation Ranges

Number	Color	Minimum Elevation (m)	Maximum Elevation (m)	2D Area (m²)
1		-8.000	-6.001	58.1
2		-6.000	-4.001	897.9
3		-4.000	-2.001	4823.8
4		-2.000	-0.001	17742.2
5		0.001	2.000	17292.9
6		2.001	4.000	2370.3
7		4.001	6.000	190.3
8		6.001	8.000	1.6

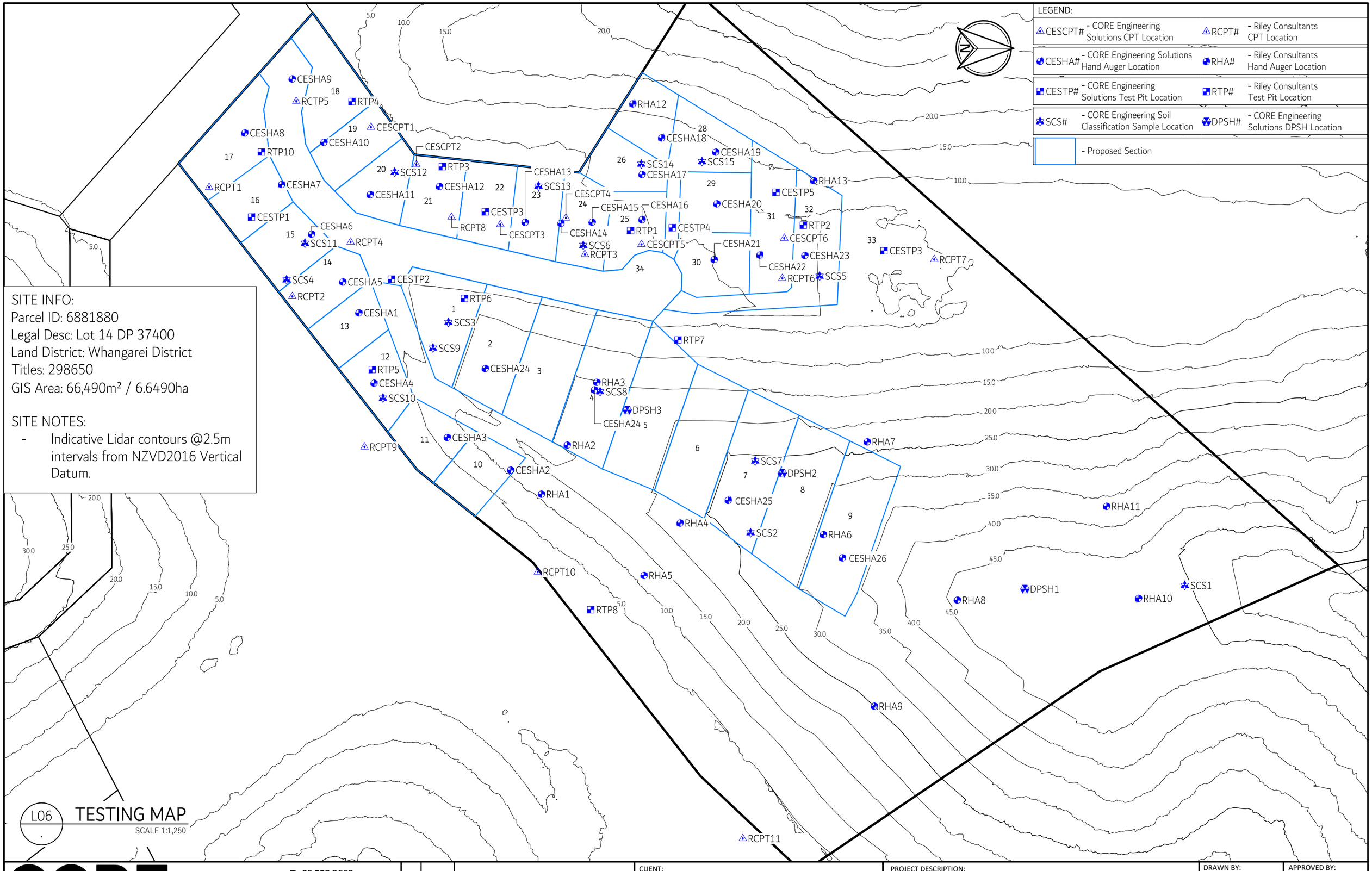
L05 EARTHWORKS PLAN
SCALE 1:1,000

CORE ENGINEERING SOLUTIONS
Consulting Engineers
Structural | Geotechnical | Civil
T: 09 553 3660
jobs@coreeng.nz
Level 1, 31 Vine Street, Whangarei 0110

Rev	Date	Notes
A	16/08/22	Original Issue

CLIENT: Traverse Ltd
LOCATION: 51 Te Maika Road, Ngunguru
PROJECT DESCRIPTION: PROPOSED SUBDIVISION
SHEET TITLE: EARTHWORKS PLAN

DRAWN BY:	APPROVED BY:
LJM	DL
ORIGINAL: A3	SCALE: 1:1,000
FILE: 20-0078	SHEET: L05



SITE INFO:
Parcel ID: 6881880
Legal Desc: Lot 14 DP 37400
Land District: Whangarei District
Titles: 298650
GIS Area: 66,490m² / 6.6490ha

SITE NOTES:
- Indicative Lidar contours @2.5m intervals from NZVD2016 Vertical Datum.

L06 TESTING MAP
SCALE 1:1,250

CORE ENGINEERING SOLUTIONS
Consulting Engineers
Structural | Geotechnical | Civil
T: 09 553 3660
jobs@coreeng.nz
Level 1, 31 Vine Street,
Whangarei 0110

Rev	Date	Notes
A	16/08/22	Original Issue

CLIENT: Traverse Ltd
LOCATION: 51 Te Maika Road, Ngunguru
PROJECT DESCRIPTION: PROPOSED SUBDIVISION
SHEET TITLE: TESTING MAP
DRAWN BY: LJM
APPROVED BY: DL
ORIGINAL: A3
SCALE: 1:1,250
FILE: 20-0078
SHEET: L06

APPENDIX 5 – TESTING RESULTS

CORE
ENGINEERING SOLUTIONS

SITE PLAN

JOB NO.: TM1

CLIENT:	TRAVERSE LTD
PROJECT:	Te Maika Road Peizo Borehole Locations
LOCATION:	51 Te Maika Rd, Ngunguru

CORE ENGINEERING SOLUTIONS

INVESTIGATION LOG

HOLE NO.: H RCPT2 (Piezo

CLIENT: TRAVERSE LTD

PROJECT: TE MAIKA RD, NGUNGURU - SUBDIVISION

JOB NO.: 20-0078

SITE LOCATION: TE MAIKA RD, NGUNGURU

CO-ORDINATES: 1737401mE, 6056478mN

START DATE: 27/09/2022

END DATE: 27/09/2022

LOGGED BY: RL

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 0mm)	VANE SHEAR STRENGTH (kPa)	WATER
Clayey TOPSOIL; brown. Moist; high plasticity.		0.0 – 0.2	TS	2 4 6 8 10 12 14 16 18	Vane: 50 100 150 200 Values	
Silty CLAY; orange tan brown. Dry; high plasticity.		0.2 – 2.6				
Silty CLAY; greyish. Moist; high plasticity.		2.6 – 3.4				
Peat (plastic) SAND; black. Wet; high plasticity.		3.4 – 4.0				
Silty SAND; dark grey. Wet; low plasticity; 4.1m saturated. EOH: 4.10m		4.0 – 4.8				◁

PHOTO(S)

REMARKS

Peizo Lot 14

WATER

- ▼ Standing Water Level
- ▷ Out flow
- ◁ In flow

INVESTIGATION TYPE

- ☑ Hand Auger
- ☐ Test Pit

CORE ENGINEERING SOLUTIONS

INVESTIGATION LOG

HOLE NO.: H RCPT6 (piezo

CLIENT: TRAVERSE LTD

PROJECT: TE MAIKA RD, NGUNGURU - SUBDIVISION

JOB NO.: 20-0078

SITE LOCATION: TE MAIKA RD, NGUNGURU

CO-ORDINATES: 1737393mE, 6056656mN

START DATE: 28/09/2022

END DATE: 28/09/2022

LOGGED BY: RL

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 0mm) 2 4 6 8 10 12 14 16 18	VANE SHEAR STRENGTH (kPa) Vane: 50 100 150 200 Values	WATER
TOPSOIL; dark brown. Wet; high plasticity.		0.0	TS			
Silty CLAY; orange. Moist; high plasticity; 2.3m saturated.		0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0 2.2				
EOH: 2.30m		2.4				◁

PHOTO(S)

REMARKS

Peizo Lot 32

WATER

- ▼ Standing Water Level
- ▷ Out flow
- ◁ In flow

INVESTIGATION TYPE

- ☑ Hand Auger
- ☐ Test Pit

CORE ENGINEERING SOLUTIONS

INVESTIGATION LOG

HOLE NO.: H RCPT8 (Piezo

CLIENT: TRAVERSE LTD

PROJECT: TE MAIKA RD, NGUNGURU - SUBDIVISION

JOB NO.: 20-0078

SITE LOCATION: TE MAIKA RD, NGUNGURU

CO-ORDINATES: 1737378mE, 6056539mN

START DATE: 27/09/2022

END DATE: 27/09/2022

LOGGED BY: RL

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 0mm)	VANE SHEAR STRENGTH (kPa)	WATER
Clayey TOPSOIL, with some silt and gravel; brown. Moist; high plasticity.		0.0	TS	2 4 6 8 10 12 14 16 18	Vane: 50 100 150 200 Values	
Silty CLAY; orange tan brown. Moist; high plasticity; 2.2m Wet 2.3m Geogrid .		0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0 2.2				
Silty CLAY; grey. Wet; high plasticity; 2.5m Saturated. EOH: 2.50m		2.4 2.6 2.8				◁

PHOTO(S)

REMARKS

Peizo Lot 21

WATER

- ▼ Standing Water Level
- ▷ Out flow
- ◁ In flow

INVESTIGATION TYPE

- ☑ Hand Auger
- ☐ Test Pit

CORE
ENGINEERING SOLUTIONS

SITE PLAN

JOB NO.: 20-0078

CLIENT:	TRAVERSE LTD
PROJECT:	TE MAIKA RD, NGUNGURU - SUBDIVISION
LOCATION:	TE MAIKA RD, NGUNGURU

CORE ENGINEERING SOLUTIONS

INVESTIGATION LOG

HOLE NO.: BH Lot 22

CLIENT: TRAVERSE LTD

PROJECT: TE MAIKA RD, NGUNGURU - SUBDIVISION

JOB NO.: 20-0078

SITE LOCATION: TE MAIKA RD, NGUNGURU

CO-ORDINATES: 1737376mE, 6056561mN

START DATE: 01/08/2022

END DATE: 01/08/2022

LOGGED BY: RL

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 0mm)	VANE SHEAR STRENGTH (kPa) Vane: V03	Values	WATER
TOPSOIL; light greyish brown. Saturated; high plasticity.		0		2 4 6 8 10 12 14 16 18	50 100 150 200		
Silty CLAY; dark orange with black streaks. Wet; high plasticity; 0.4m Saturated 0.5m tan brown colour coming in.		0.2				221+	
		0.4				-	
		0.6				221+	
		0.8				-	
		1.0				221+	
Silty CLAY; tan and orange with white flecks. Moist; high plasticity.		1.2				-	
		1.4				197	
		1.6				50	
		1.8				221+	
		2.0				-	
		2.2				158	
		2.4				82	
EOH: 2.50m						158	
						79	
						110	
						47	

Groundwater Not Encountered

PHOTO(S)

REMARKS

WATER

- Standing Water Level
- Out flow
- In flow

INVESTIGATION TYPE

- [x] Hand Auger
- [ ] Test Pit

INVESTIGATION LOG

ENGINEERING SOLUTIONS

HOLE NO.: BH lot 23

CLIENT: TRAVERSE LTD

PROJECT: TE MAIKA RD, NGUNGURU - SUBDIVISION

JOB NO.: 20-0078

SITE LOCATION: TE MAIKA RD, NGUNGURU

CO-ORDINATES: 1737376mE, 6056575mN

START DATE: 01/08/2022

END DATE: 01/08/2022

LOGGED BY: RL

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 0mm)	VANE SHEAR STRENGTH (kPa) Vane: V03	Values	WATER
TOPSOIL & CLAY; light grey. Wet; high plasticity.		0.0	TS	2 4 6 8 10 12 14 16 18	50 100 150 200		
Silty CLAY; dark orange and tan brown. Moist; high plasticity.		0.2				221+	Groundwater Not Encountered
		0.4				-	
		0.6				181	
		0.8				55	
		1.0				174	
		1.2				66	
		1.4				155	
		1.6				60	
		1.8				158	
		2.0				60	
EOH: 2.00m						134	
						71	
						150	
						39	

PHOTO(S)

REMARKS

WATER

- Standing Water Level
- Out flow
- In flow

INVESTIGATION TYPE

- [x] Hand Auger
- [ ] Test Pit

CORE ENGINEERING SOLUTIONS

INVESTIGATION LOG

HOLE NO.: BH lot 24

CLIENT: TRAVERSE LTD

PROJECT: TE MAIKA RD, NGUNGURU - SUBDIVISION

JOB NO.: 20-0078

SITE LOCATION: TE MAIKA RD, NGUNGURU

CO-ORDINATES: 1737376mE, 6056586mN

START DATE: 02/08/2022

END DATE: 02/08/2022

LOGGED BY: RL

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 0mm)	VANE SHEAR STRENGTH (kPa) Vane: V03	Values	WATER
Clayey TOPSOIL; dark grey. Wet; high plasticity.		0.0		2 4 6 8 10 12 14 16 18	50 100 150 200		
Silty CLAY; tan/orange brown. Moist; high plasticity.		0.2				174	
		0.4				47	
		0.6				221+	
		0.8				-	
		1.0				110	Groundwater Not Encountered
		1.2				32	
		1.4				208	
		1.6				69	
		1.8				221+	
EOH: 2.00m		2.0				-	
						79	
						44	

PHOTO(S)

REMARKS

WATER

- Standing Water Level
- Out flow
- In flow

INVESTIGATION TYPE

- [x] Hand Auger
- [ ] Test Pit

CORE ENGINEERING SOLUTIONS

INVESTIGATION LOG

HOLE NO.: BH lot 25

CLIENT: TRAVERSE LTD

PROJECT: TE MAIKA RD, NGUNGURU - SUBDIVISION

JOB NO.: 20-0078

SITE LOCATION: TE MAIKA RD, NGUNGURU

CO-ORDINATES: 1737375mE, 6056605mN

START DATE: 02/08/2022

END DATE: 02/08/2022

LOGGED BY: RL

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 0mm)	VANE SHEAR STRENGTH (kPa) Vane: V03	Values	WATER
TOPSOIL; dark grey. Wet; high plasticity.		0.0		2 4 6 8 10 12 14 16 18	50 100 150 200		Groundwater Not Encountered
Silty CLAY; tan brown with white and orange flecks. Moist; high plasticity; 1.1m topsoil present 1.2m orange colour.		0.2				221+	
		0.4				-	
		0.6				221+	
		0.8				-	
		1.0				221+	
		1.2				-	
		1.4				174 71	
		1.6				221+	
		1.8				-	
		2.0				174 79	
EOH: 2.00m							

PHOTO(S)

REMARKS

WATER

- Standing Water Level
- Out flow
- In flow

INVESTIGATION TYPE

- [x] Hand Auger
- [ ] Test Pit

CORE ENGINEERING SOLUTIONS

INVESTIGATION LOG

HOLE NO.: BH lot 26

CLIENT: TRAVERSE LTD

PROJECT: TE MAIKA RD, NGUNGURU - SUBDIVISION

JOB NO.: 20-0078

SITE LOCATION: TE MAIKA RD, NGUNGURU

CO-ORDINATES: 1737358mE, 6056605mN

START DATE: 02/08/2022

END DATE: 02/08/2022

LOGGED BY: RL

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 0mm)	VANE SHEAR STRENGTH (kPa) Vane: V03	Values	WATER
TOPSOIL; dark greyish brown. Wet; high plasticity.		0.0	TS	2 4 6 8 10 12 14 16 18	50 100 150 200		
Silty CLAY; orange with tan streaks. Moist; high plasticity.		0.2				158	
		0.4				71	
		0.6				126	
		0.8				55	
		1.0				221+	
		1.2				-	
		1.4				186	
		1.6				76	
		1.8				189	
		2.0				60	
EOH: 2.00m						205	
						110	

Groundwater Not Encountered

PHOTO(S)

REMARKS

WATER

- Standing Water Level
- Out flow
- In flow

INVESTIGATION TYPE

- [x] Hand Auger
- [ ] Test Pit

CORE ENGINEERING SOLUTIONS

INVESTIGATION LOG

HOLE NO.: BH lot 27

CLIENT: TRAVERSE LTD

PROJECT: TE MAIKA RD, NGUNGURU - SUBDIVISION

JOB NO.: 20-0078

SITE LOCATION: TE MAIKA RD, NGUNGURU

CO-ORDINATES: 1737344mE, 6056612mN

START DATE: 02/08/2022

END DATE: 02/08/2022

LOGGED BY: RL

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 0mm)	VANE SHEAR STRENGTH (kPa) Vane: V03	Values	WATER
TOPSOIL; dark grey. Wet; high plasticity.		0.0	TS	2 4 6 8 10 12 14 16 18	50 100 150 200		
Silty CLAY; reddish orange. Moist; high plasticity; 1.2m tan brown.		0.2				158	
		0.4				66	
		0.6				213	
		0.8				107	
		1.0				177	
		1.2				60	
		1.4				221+	
		1.6				-	
		1.8				221+	
		2.0				-	
EOH: 2.00m						213	
						103	
						221+	
						-	

Groundwater Not Encountered

PHOTO(S)

REMARKS

WATER

- Standing Water Level
- Out flow
- In flow

INVESTIGATION TYPE

- [x] Hand Auger
- [ ] Test Pit

CORE ENGINEERING SOLUTIONS

INVESTIGATION LOG

HOLE NO.: BH lot 28

CLIENT: TRAVERSE LTD

PROJECT: TE MAIKA RD, NGUNGURU - SUBDIVISION

JOB NO.: 20-0078

SITE LOCATION: TE MAIKA RD, NGUNGURU

CO-ORDINATES: 1737349mE, 6056633mN

START DATE: 02/08/2022

END DATE: 02/08/2022

LOGGED BY: RL

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 0mm)	VANE SHEAR STRENGTH (kPa) Vane: V03	Values	WATER
TOPSOIL; dark grey. Moist; high plasticity.		0.0		2 4 6 8 10 12 14 16 18	50 100 150 200		
Silty CLAY; orange/red with black and white flecks. Moist; high plasticity; 1.3m wet 1.4m saturated.		0.2				166 44	
		0.4					
		0.6				177 60	
		0.8					
		1.0				221+ -	
		1.2					
		1.4				205 24	◁
		1.6				213 47	
		1.8					
		2.0				221+ -	
EOH: 2.00m							

PHOTO(S)

REMARKS

WATER

- Standing Water Level
- Out flow
- In flow

INVESTIGATION TYPE

- [x] Hand Auger
- [ ] Test Pit

INVESTIGATION LOG

CORE ENGINEERING SOLUTIONS

HOLE NO.: BH lot 29

CLIENT: TRAVERSE LTD

PROJECT: TE MAIKA RD, NGUNGURU - SUBDIVISION

JOB NO.: 20-0078

SITE LOCATION: TE MAIKA RD, NGUNGURU

CO-ORDINATES: 1737369mE, 6056633mN

START DATE: 02/08/2022

END DATE: 02/08/2022

LOGGED BY: RL

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 0mm)	VANE SHEAR STRENGTH (kPa) Vane: V03	Values	WATER
TOPSOIL; dark grey. Wet; high plasticity.		0					
Silty CLAY; orange/tan brown. Moist; high plasticity; 1.7m unable to penetrate.		0.2				110	
						24	
		0.4					
						174	
		0.6				79	
		0.8				145	Groundwater Not Encountered
						24	
		1.0					
						166	
		1.2				39	
		1.4				221+	
						-	
		1.6				197	
EOH: 1.70m						95	
		1.8					

SCALA PENETROMETER: 2 4 6 8 10 12 14 16 18

VANE SHEAR STRENGTH (kPa): 50 100 150 200

PHOTO(S)

REMARKS

WATER

- Standing Water Level
- Out flow
- In flow

INVESTIGATION TYPE

- [x] Hand Auger
- [ ] Test Pit

CORE ENGINEERING SOLUTIONS

INVESTIGATION LOG

HOLE NO.: BH lot 30

CLIENT: TRAVERSE LTD

PROJECT: TE MAIKA RD, NGUNGURU - SUBDIVISION

JOB NO.: 20-0078

SITE LOCATION: TE MAIKA RD, NGUNGURU

CO-ORDINATES: 1737390mE, 6056632mN

START DATE: 02/08/2022

END DATE: 02/08/2022

LOGGED BY: RL

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 0mm)	VANE SHEAR STRENGTH (kPa) Vane: V03	Values	WATER
TOPSOIL; dark greyish brown. Moist; high plasticity.		0.0	TS	2 4 6 8 10 12 14 16 18	50 100 150 200		
Silty CLAY; orange/ tan brown. Moist; high plasticity; 1.4m more orange in colour.		0.2				221+	
		0.4				-	
		0.6				118	
		0.8				44	
		1.0				142	
		1.2				39	
		1.4				221+	
		1.6				-	
		1.8				126	
EOH: 2.00m		2.0				66	
						150	
						63	

Groundwater Not Encountered

PHOTO(S)

REMARKS

WATER

- Standing Water Level
- Out flow
- In flow

INVESTIGATION TYPE

- [x] Hand Auger
- [ ] Test Pit

CORE ENGINEERING SOLUTIONS

INVESTIGATION LOG

HOLE NO.: BH lot 31

CLIENT: TRAVERSE LTD

PROJECT: TE MAIKA RD, NGUNGURU - SUBDIVISION

JOB NO.: 20-0078

SITE LOCATION: TE MAIKA RD, NGUNGURU

CO-ORDINATES: 1737388mE, 6056649mN

START DATE: 02/08/2022

END DATE: 02/08/2022

LOGGED BY: RL

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 0mm)	VANE SHEAR STRENGTH (kPa) Vane: V03	Values	WATER
TOPSOIL; dark greyish brown. Moist; high plasticity.							
Silty CLAY; orange and tan brown. Moist; high plasticity; 0.8m white flecks 1.8m unable to penetrate.		0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6		2 4 6 8 10 12 14 16 18	50 100 150 200	197 47 213 63 120 24 189 95 221+ -	Groundwater Not Encountered
EOH: 1.80m		1.8				221+ -	

PHOTO(S)

REMARKS

WATER

- Standing Water Level
- Out flow
- In flow

INVESTIGATION TYPE

- [x] Hand Auger
- [ ] Test Pit

CORE ENGINEERING SOLUTIONS

INVESTIGATION LOG

HOLE NO.: BH lot 32

CLIENT: TRAVERSE LTD

PROJECT: TE MAIKA RD, NGUNGURU - SUBDIVISION

JOB NO.: 20-0078

SITE LOCATION: TE MAIKA RD, NGUNGURU

CO-ORDINATES: 1737388mE, 6056666mN

START DATE: 02/08/2022

END DATE: 02/08/2022

LOGGED BY: RL

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 0mm)	VANE SHEAR STRENGTH (kPa) Vane: V03	Values	WATER
TOPSOIL; dark greyish brown. Moist; high plasticity.		0.0	TS				
Silty CLAY; orange/ tan brown. Moist; high plasticity; 2m UTP.		0.2				87	
		0.4				32	
		0.6				110	
		0.8				44	
		1.0				103	
		1.2				47	
		1.4				221+	
		1.6				-	
		1.8				134	
EOH: 2.00m		2.0				55	
						221+	
						-	

Groundwater Not Encountered

PHOTO(S)

REMARKS

WATER

- Standing Water Level
- Out flow
- In flow

INVESTIGATION TYPE

- [x] Hand Auger
- [ ] Test Pit

Whangarei Laboratory
166 Bank Street,
Whangarei
M: 021 0263 7711
E: martin@geocivil.co.nz

TEST REPORT

Lab Job No: 8550-004

Your ref.: -

Date of Issue: 31/10/2022

Date of Re-Issue: -

Page: 1 of 3

Test Report No. WRE8550-004-R001

PROJECT: **Te Maika Road - Compaction testing - 21/10/2022**

CLIENT: Core Engineering Solutions
Level 1, 31 Vine Street

ATTENTION: Stuart Gemmell

TEST METHODS: Determination of the field dry density & water content using a nuclear densometer – Direct Transmission
NZS 4407:2015 Test 4.2
Hand Held Shear Vane Test
NZGS: August 2001
Determination of the Water Content of soils
NZS 4402:1986 Test 2.1
Determination of the Dry density / water content relationship – New Zealand Standard Compaction
NZS 4402: 1986 Test 4.1.1

SAMPLING METHOD: Hand sampled – Sampling not accredited

TEST RESULTS: As per attached sheets

M. Adams
General Manager

J. Agnew
Approved Signatory

ACCREDITED IANZ TESTING LABORATORY

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

Geocivil Laboratory
Northland - Wellington - Christchurch - Otago
P: 09 438 4417
E: info@geocivil.co.nz

NUCLEAR DENSOMETER READINGS

NZS 4407:2015 Test 4.2, 4.3

Lab Job No:	8550-004	**Tested By:**	L.C / D.O
Client:	Core Engineering Solutions	**Date:**	21/10/2022
Job:	51 Te Maika Road	**Checked By:**	M.A
Location:	Ngunguru	**Date:**	31/10/2022
REF:	-	**Page:**	2 of 3
Report No:	WRE8550-004-R001		

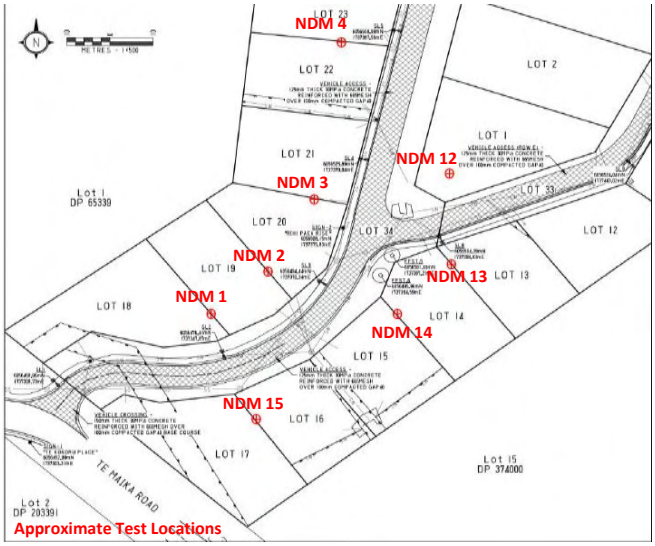
Material: Silty CLAY, traces of fine sands, reddish brown and yellowish brown.

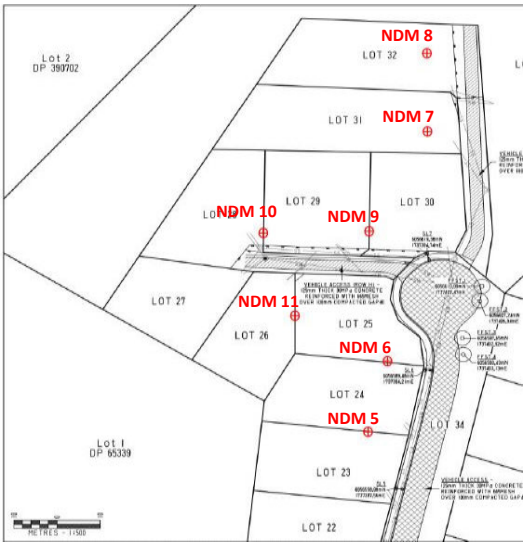
Solid Density (assumed): 2.72 t/m^3 **Max dry Density (assumed)*:** 1.33 t/m^3

Date	Site No	Depth Below GL (m)	Bulk Density t/m^3	Dry Density t/m^3	Water Content %**	% Air Voids	% Compaction	Probe Depth (mm)	Vane Shear Strength (corrected) kPa		Comments
21/10/2022	1	0.5	1.79	1.33	35.2	5	100	300	170/69	>243	-35.62583, 174.51667
21/10/2022		1.0	1.92	1.41	36.4	0	106	300	111/35	132/31	-35.62586, 174.51672
21/10/2022	2	0.5	1.84	1.39	32.3	4	105	250	153/49	>243	-35.62581, 174.51681
21/10/2022		1.0	1.70	1.24	37.1	9	93	300	222/55	225/73	-35.62578, 174.51681
21/10/2022	3	0.5	1.88	1.39	35.3	0	104	300	>243	>243	-35.62556, 174.51692
21/10/2022		1.0	1.89	1.44	31.1	2	108	300	>243	>243	-35.62556, 174.51692
21/10/2022	4	0.5	1.89	1.41	33.7	1	106	300	>243	>243	-35.62519, 174.51700
21/10/2022		1.0	1.74	1.27	37.5	6	95	300	>243	>243	-35.62517, 174.51703
21/10/2022	5	0.5	1.76	1.27	38.4	4	96	300	142/52	170/62	-35.62506, 174.51708
21/10/2022		1.0	1.67	1.18	41.0	8	89	300	135/49	125/38	-35.62506, 174.51708
21/10/2022	6	0.5	1.73	1.29	34.2	9	97	300	146/45	173/49	-35.62492, 174.51711
21/10/2022		1.0	1.76	1.32	33.0	8	99	300	118/31	128/52	-35.62489, 174.51714
21/10/2022	7	0.5	1.80	1.35	33.6	5	101	300	121/31	146/42	-35.62433, 174.51717
21/10/2022		1.0	1.84	1.34	38.0	0	100	300	125/59	125/45	-35.62436, 174.51717
21/10/2022	8	0.5	1.80	1.29	39.4	2	97	250	229/66	173/52	-35.62422, 174.51717
21/10/2022		1.0	1.74	1.32	31.8	9	99	300	90/21	83/17	-35.62422, 174.51717
21/10/2022	9	0.5	1.76	1.34	31.4	9	101	300	90/17	128/24	-35.62458, 174.51692
21/10/2022		1.0	1.77	1.36	30.1	9	102	300	101/21	101/24	-35.62458, 174.51692
21/10/2022	10	0.5	1.80	1.27	42.1	0	95	300	153/62	159/76	-35.62458, 174.51669
21/10/2022		1.0	1.76	1.29	36.4	5	97	300	173/66	211/69	-35.62458, 174.51669
21/10/2022	11	0.5	1.78	1.28	39.5	3	96	300	170/62	153/62	-35.62481, 174.51678
21/10/2022		1.0	1.78	1.23	44.6	0	92	300	142/52	139/55	-35.62481, 174.51675
21/10/2022	12	0.5	1.64	1.18	39.1	11	89	300	142/45	156/42	-35.6255, 174.51733
21/10/2022		1.0	1.78	1.26	41.0	2	95	300	146/52	135/38	-35.6255, 174.51736
21/10/2022	13	0.5	1.77	1.27	39.9	3	95	300	139/66	149/69	-35.62581, 174.51733
21/10/2022		1.0	1.86	1.36	36.6	0	102	300	>243	>243	-35.62583, 174.51733
21/10/2022	14	0.5	1.79	1.26	41.8	1	95	300	>243	>243	-35.62592, 174.51719
21/10/2022		1.0	1.76	1.25	40.6	3	94	300	>243	>243	-35.62592, 174.51719
21/10/2022	15	0.5	1.84	1.38	32.9	4	104	300	222/73	>243	-35.62617, 174.51678
21/10/2022		1.0	1.81	1.35	34.1	4	101	300	159/31	159/35	-35.62617, 174.51681

** Max dry density assumed on single point Standard Compaction test NZS 4402: 1986 Test 4.1.1*

*** Oven dried water content NZS 4402 1986 test 2.1*





Geocivil Laboratory
Northland - Wellington - Christchurch - Otago
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DETERMINATION OF DRY DENSITY/ WATER CONTENT RELATIONSHIP
NEW ZEALAND STANDARD COMPACTION

NZS 4402:1986 Test 4.1.1

Lab Job No:	8550-004	**Sample No.:**	WRE8550-004-S031
Client:	Core Engineering Solutions	**Tested By:**	D.O
Project:	Te Maika Road	**Date:**	23/10/2022
Location:	Ngunguru	**Checked By:**	M.A
		Date:	31/10/2022
Date Received:	21/10/2022	**Page:**	3 of 3
Report No:	WRE8550-004-R001		
REF:	-		
Sampling Method:	Hand sampled – Sampling not accredited	**Sampled By:**	D.O
Date Sampled:	21/10/2022		
Compaction used:	New Zealand Standard Compaction Test performed on: Whole sample		

History: As received

Sample Description: Blended material from NDM testpits; Silty CLAY, traces of fine sands, reddish brown. / Clayey SILT, minor fine-medium sands, yellowish brown.

Total mass of sample: 12,000 g

Mass retained on 19.0mm BS test sieve: 0 g

Bulk Density	**(t/m^3)**	**1.813**
Water Content	**(%)**	**36.3**
Dry Density	**(t/m^3)**	**1.33**
Solid Density (Assumed)	**(t/m^3)**	**2.72**
Air Voids	**(%)**	**3**
Shear Vane Reading	**(kPa)**	**143/67**

Comments: Sample tested at an assumed Optimum Water Content

J. Agnew
Approved Signatory

Whangarei Laboratory
166 Bank Street,
Whangarei
M: 021 0263 7711
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TEST REPORT

Lab Job No: 8690-001

Your ref.: -

Date of Issue: 12/07/2022

Date of Re-Issue: -

Page: 1 of 9

Test Report No. WRE8690-001-R001

PROJECT: **Te Maika Road - Soil Classification Testing**

CLIENT: Core Engineering Solutions
Level 1, 31 Vine Street

ATTENTION: Stuart Gemmell

TEST METHODS: Determination of the liquid & plastic limits, plasticity index and water content
NZS 4402:1986 Tests 2.1,2.2,2.3,2.4
Determination of the Linear Shrinkage
NZS 4402:1986 Test 2.6

SAMPLING METHOD: Sampled by client – Sampling not accredited

TEST RESULTS: As per attached sheets

A. Agnew
Laboratory Technician

D. Krissansen
Approved Signatory

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

Geocivil Laboratory
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DETERMINATION OF THE LIQUID & PLASTIC LIMITS, PLASTICITY INDEX & WATER CONTENT

NZS 4402:1986 Test 2.2,2.3,2.4

Lab Job No:	8690-001	**Sample No.:**	WRE8690-001-S001
Client:	Core Engineering Solutions	**Tested By:**	N.K
Location:	Te Maika Road Sample 1	**Date Tested:** **Checked By:**	1/07/2022 A.A
Date Received:	17/06/2022	**Date Checked:**	8/07/2022
Report No:	WRE8690-001-R001	**Page:**	2 of 9
REF:	-		
Sampling Method:	Sampled by client – Sampling not accredited	**Sampled By:**	Client
Date Sampled:	15/06/2022		

Test Details:

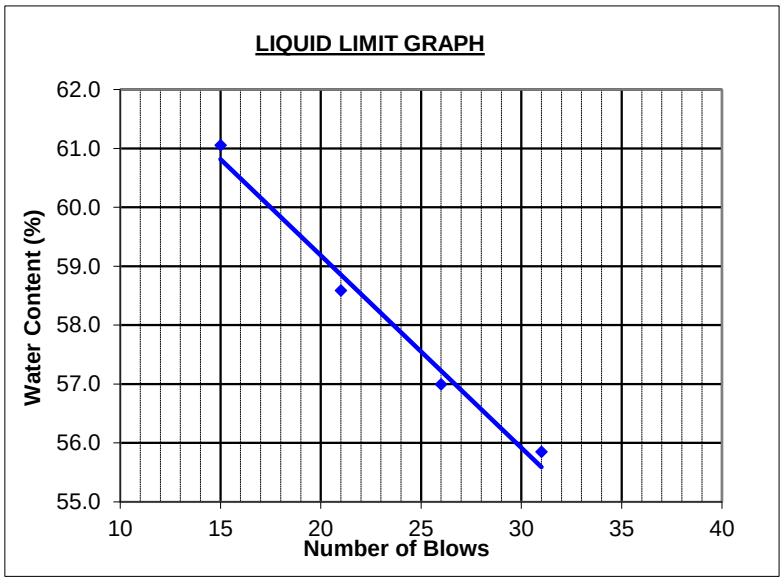
Test performed on: Fraction passing 425μm sieve

Sample history: Natural state

Description of Sample: Clayey SILT, minor fine sands to 2mm, light red mottled brown and grey, moist

	Liquid Limit				Plastic Limit	
No. of blows	15	21	26	31		
Water content (%)	61.1	58.6	57.0	55.8	34.7	34.5

NWC	**41.2**
Liquid Limit	**58**
Plastic Limit	**35**
Plasticity Index	**23**



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DETERMINATION OF THE LINEAR SHRINKAGE

NZS 4402:1986 Test 2.6

Lab Job No:	8690-001	**Sample No:**	WRE8690-001-S001
Client:	Core Engineering Solutions	**Tested By:**	N.K
Location:	Te Maika Road Sample 1	**Date:**	1/07/2022
		Checked By:	A.A
Date Received:	17/06/2022	**Date:**	8/07/2022
Report No:	WRE8690-001-R001	**Page:**	3 of 9
REF:	-		

Test performed on: Fraction passing 425mm sieve
History: Natural state

Description of Sample: Clayey SILT, minor fine sands to 2mm, light red mottled brown and grey, moist

Linear shrinkage	**13**

D. Krissansen
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DETERMINATION OF THE LINEAR SHRINKAGE

NZS 4402:1986 Test 2.6

Lab Job No:	8690-001	**Sample No:**	WRE8690-001-S002
Client:	Core Engineering Solutions	**Tested By:**	N.K
Location:	Te Maika Road Sample 2	**Date:** **Checked By:**	1/07/2022 A.A
Date Received:	17/06/2022	**Date:**	8/07/2022
Report No:	WRE8690-001-R001	**Page:**	4 of 9
REF:	-		

Test performed on: Fraction passing 425mm sieve
History: Natural state

Description of Sample: Clayey SILT, minor sands to 2mm, light red mottled brown and yellow, moist

Linear shrinkage	**16**

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DETERMINATION OF THE LINEAR SHRINKAGE

NZS 4402:1986 Test 2.6

Lab Job No:	8690-001	**Sample No:**	WRE8690-001-S003
Client:	Core Engineering Solutions	**Tested By:**	N.K
Location:	Te Maika Road Sample 3	**Date:** **Checked By:**	1/07/2022 A.A
Date Received:	17/06/2022	**Date:**	8/07/2022
Report No:	WRE8690-001-R001	**Page:**	5 of 9
REF:	-		

Test performed on: Fraction passing 425mm sieve
History: Natural state

Description of Sample: Silty CLAY, minor sands to 2mm, traces of organics, light red mottled brown and yellow, moist

Linear shrinkage	**18**

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DETERMINATION OF THE LINEAR SHRINKAGE

NZS 4402:1986 Test 2.6

Lab Job No:	8690-001	**Sample No:**	WRE8690-001-S004
Client:	Core Engineering Solutions	**Tested By:**	N.K
Location:	Te Maika Road Sample 4	**Date:** **Checked By:**	1/07/2022 A.A
Date Received:	17/06/2022	**Date:**	8/07/2022
Report No:	WRE8690-001-R001	**Page:**	6 of 9
REF:	-		

Test performed on: Fraction passing 425mm sieve
History: Natural state

Description of Sample: Clayey SILT, minor sands to 2mm, traces of organics, red brown mottled orange, moist

Linear shrinkage	**17**

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DETERMINATION OF THE LIQUID & PLASTIC LIMITS, PLASTICITY INDEX & WATER CONTENT

NZS 4402:1986 Test 2.2,2.3,2.4

Lab Job No:	8690-001	**Sample No.:**	WRE8690-001-S005
Client:	Core Engineering Solutions	**Tested By:**	N.K
Location:	Te Maika Road Sample 5	**Date Tested:** **Checked By:**	4/07/2022 A.A
Date Received:	17/06/2022	**Date Checked:**	8/07/2022
Report No:	WRE8690-001-R001	**Page:**	7 of 9
REF:	-		
Sampling Method:	NZS 4407:2015 2.4.8.3 Sampling compacted mat	**Sampled By:**	Client
Date Sampled:	6/15/2022		

Test Details:

Test performed on: Fraction passing 425μm sieve

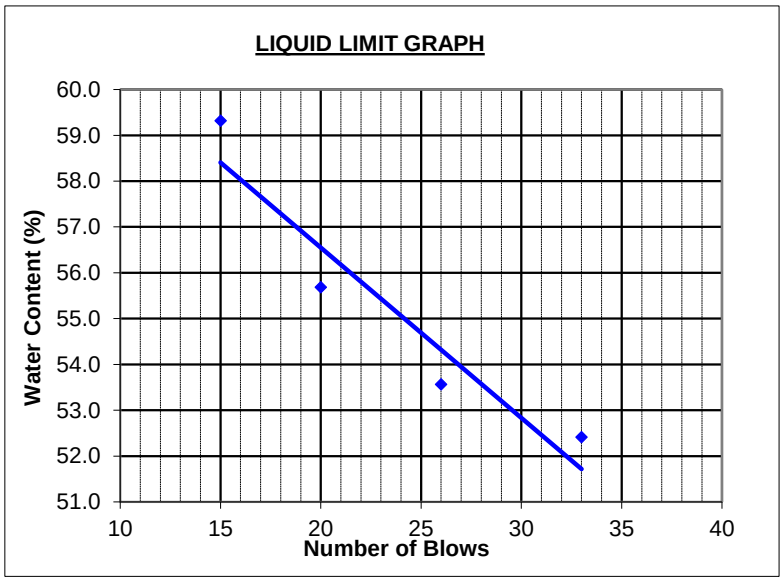
Sample history: Natural state

Description of Sample: Clayey SILT, minor sands to 2mm, light red mottled orange, brown and grey, moist

	Liquid Limit			
No. of blows	15	20	26	33
Water content (%)	59.3	55.7	53.6	52.4

Plastic Limit	
32.4	32.2

NWC	**39.2**
Liquid Limit	**55**
Plastic Limit	**32**
Plasticity Index	**23**



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DETERMINATION OF THE LINEAR SHRINKAGE

NZS 4402:1986 Test 2.6

Lab Job No:	8690-001	**Sample No:**	WRE8690-001-S005
Client:	Core Engineering Solutions	**Tested By:**	N.K
Location:	Te Maika Road Sample 5	**Date:**	1/07/2022
		Checked By:	A.A
Date Received:	17/06/2022	**Date:**	8/07/2022
Report No:	WRE8690-001-R001	**Page:**	8 of 9
REF:	-		

Test performed on: Fraction passing 425mm sieve
History: Natural state

Description of Sample: Clayey SILT, minor sands to 2mm, light red mottled orange, brown and grey, moist

Linear shrinkage	**13**

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DETERMINATION OF THE LINEAR SHRINKAGE

NZS 4402:1986 Test 2.6

Lab Job No:	8690-001	**Sample No:**	WRE8690-001-S006
Client:	Core Engineering Solutions	**Tested By:**	N.K
Location:	Te Maika Road Sample 6	**Date:**	4/07/2022
		Checked By:	A.A
Date Received:	17/06/2022	**Date:**	8/07/2022
Report No:	WRE8690-001-R001	**Page:**	9 of 9
REF:	-		

Test performed on: Fraction passing 425mm sieve
History: Natural state

Description of Sample: Clayey SILT, minor sands to 2mm, light red mottled brown, orange and grey, moist

Linear shrinkage	**19**

D. Krissansen
Approved Signatory

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TEST REPORT

Lab Job No: 8690-001

Your ref.: -

Date of Issue: 27/09/2022

Date of Re-Issue: -

Test Report No. WRE8690-001-R002

PROJECT: **Te Maika Road - Soil Classification Testing**

CLIENT: Core Engineering Solutions
Level 1, 31 Vine Street

ATTENTION: Stuart Gemmell

TEST METHODS: Determination of the liquid & plastic limits, plasticity index and water content
NZS 4402:1986 Tests 2.1,2.2,2.3,2.4
Determination of the Linear Shrinkage
NZS 4402:1986 Test 2.6

SAMPLING METHOD: Sampled by client – Sampling not accredited

TEST RESULTS: As per attached sheets

N. Krissansen
Laboratory Technician

D. Krissansen
Approved Signatory

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

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DETERMINATION OF THE LIQUID & PLASTIC LIMITS, PLASTICITY INDEX & WATER CONTENT

NZS 4402:1986 Test 2.2,2.3,2.4

Lab Job No:	8690-001	**Sample No.:**	WRE8690-001-S007
Client:	Core Engineering Solutions	**Tested By:**	A.A/ N.K
Location:	Te Maika Road Lot 7 Stage 2	**Date Tested:** **Checked By:**	22/09/2022 N.K.
Date Received:	6/09/2022	**Date Checked:**	27/09/2022
Report No:	WRE8690-001-R002	**Page:**	2 of 5
REF:	-		

Sampling Method:	Sampled by client – Sampling not accredited	**Sampled By:**	Client
Date Sampled:	Unknown		

Test Details:

Test performed on: Fraction passing 425μm sieve

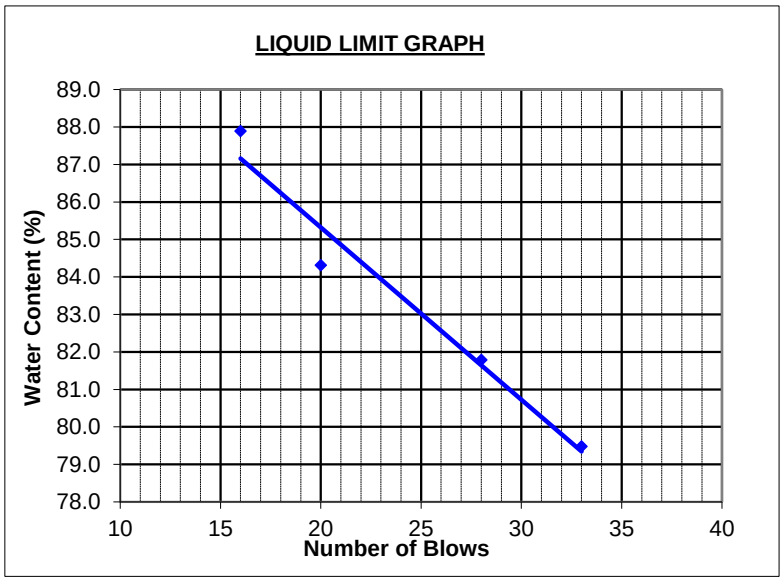
Sample history: As received

Description of Sample: Clayey SILT, minor fine sands, light red mottled orange,yellow and grey, moist

	Liquid Limit			
No. of blows	16	20	28	33
Water content (%)	87.9	84.3	81.8	79.5

Plastic Limit	
38.9	38.6

NWC	**38.9**
Liquid Limit	**83**
Plastic Limit	**39**
Plasticity Index	**44**



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DETERMINATION OF THE LINEAR SHRINKAGE

NZS 4402:1986 Test 2.6

Lab Job No:	8690-001	**Sample No:**	WRE8690-001-S007
Client:	Core Engineering Solutions	**Tested By:**	A.A
Location:	Te Maika Road Lot 7 Stage 2	**Date:** **Checked By:**	22/09/2022 N.K.
Date Received:	6/09/2022	**Date:**	27/09/2022
Report No:	WRE8690-001-R002	**Page:**	3 of 5
REF:	-		

Test performed on: Fraction passing 425mm sieve
History: As received

Description of Sample: Clayey SILT, minor fine sands, light red mottled orange,yellow and grey, moist

Linear shrinkage	**17**

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DETERMINATION OF THE LIQUID & PLASTIC LIMITS, PLASTICITY INDEX & WATER CONTENT

NZS 4402:1986 Test 2.2,2.3,2.4

Lab Job No:	8690-001	**Sample No.:**	WRE8690-001-S008
Client:	Core Engineering Solutions	**Tested By:**	A.A/N.K
Location:	Te Maika Road Lot 4, Stage 2	**Date Tested:** **Checked By:**	22/09/2022 N.K.
Date Received:	6/09/2022	**Date Checked:**	27/09/2022
Report No:	WRE8690-001-R002	**Page:**	4 of 5
REF:	-		
Sampling Method:	Sampled by client – Sampling not accredited	**Sampled By:**	Client
Date Sampled:	Unknown		

Test Details:

Test performed on: Fraction passing 425μm sieve

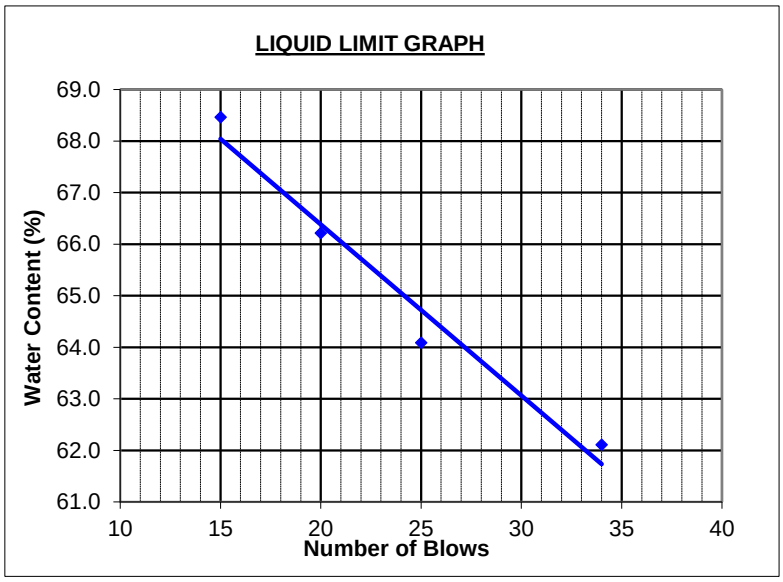
Sample history: As received

Description of Sample: Clayey SILT, traces of fine sands and rootlets, light red brown with black veins, moist

	Liquid Limit			
No. of blows	15	20	25	34
Water content (%)	68.5	66.2	64.1	62.1

Plastic Limit	
38.0	38.6

NWC	**46.5**
Liquid Limit	**65**
Plastic Limit	**38**
Plasticity Index	**27**



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DETERMINATION OF THE LINEAR SHRINKAGE

NZS 4402:1986 Test 2.6

Lab Job No:	8690-001	**Sample No:**	WRE8690-001-S008
Client:	Core Engineering Solutions	**Tested By:**	A.A
Location:	Te Maika Road Lot 4, Stage 2	**Date:** **Checked By:**	22/09/2022 N.K.
Date Received:	6/09/2022	**Date:**	27/09/2022
Report No:	WRE8690-001-R002	**Page:**	5 of 5
REF:	-		
Test performed on:	Fraction passing 425mm sieve		
History:	As received		

Description of Sample: Clayey SILT, traces of fine sands and rootlets, light red brown with black veins, moist

Linear shrinkage	**11**

D.Krissansen
Approved Signatory

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TEST REPORT

Lab Job No: 8690-001

Your ref.: -

Date of Issue: 4/10/2022

Date of Re-Issue: -

Test Report No. WRE8690-001-R003

PROJECT: **Te Maika Road - Laboratory Testing**

CLIENT: Core Engineering Solutions
Level 1, 31 Vine Street

ATTENTION: Stuart Gemmell

TEST METHODS: Determination of the liquid & plastic limits, plasticity index and water content
NZS 4402:1986 Tests 2.1,2.2,2.3,2.4
Determination of the Linear Shrinkage
NZS 4402:1986 Test 2.6

SAMPLING METHOD: Sampled by client – Sampling not accredited

TEST RESULTS: As per attached sheets

N. Krissansen
Laboratory Technician

S. Kokich
Approved Signatory

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

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DETERMINATION OF THE LIQUID & PLASTIC LIMITS, PLASTICITY INDEX & WATER CONTENT

NZS 4402:1986 Test 2.2,2.3,2.4

Lab Job No:	8690-001	**Sample No.:**	WRE8690-001-S009
Client:	Core Engineering Solutions	**Tested By:**	A.A
Location:	Te Maika Road Lot 1, Stage 1	**Date Tested:**	28/09/2022
		Checked By:	N.K
Date Received:	6/09/2022	**Date Checked:**	4/10/2022
Report No:	WRE8690-001-R003	**Page:**	2 of 9
REF:	-		
Sampling Method:	Sampled by client – Sampling not accredited	**Sampled By:**	Client
Date Sampled:	Unknown		

Test Details:

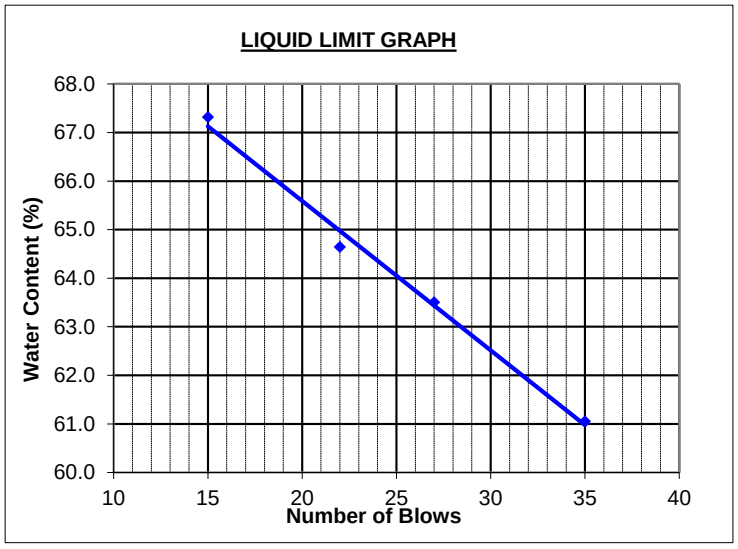
Test performed on: Fraction passing 425μm sieve

Sample history: As received

Description of Sample: Clayey SILT, traces of rootlets, light red brown mottled black and light brown, moist

	Liquid Limit				Plastic Limit	
No. of blows	15	22	27	35		
Water content (%)	67.3	64.6	63.5	61.1	37.4	37.4

NWC	**34.4**
Liquid Limit	**64**
Plastic Limit	**37**
Plasticity Index	**27**



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DETERMINATION OF THE LINEAR SHRINKAGE

NZS 4402:1986 Test 2.6

Lab Job No:	8690-001	**Sample No:**	WRE8690-001-S009
Client:	Core Engineering Solutions	**Tested By:**	A.A
Location:	Te Maika Road Lot 1, Stage 1	**Date:**	28/09/2022
		Checked By:	N.K
Date Received:	6/09/2022	**Date:**	4/10/2022
Report No:	WRE8690-001-R003	**Page:**	3 of 9
REF:	-		

Test performed on: Fraction passing 425mm sieve
History: As received

Description of Sample: Clayey SILT, traces of rootlets, light red brown mottled black and light brown, moist

Linear shrinkage	**12**

S. Kokich
Approved Signatory

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DETERMINATION OF THE LIQUID & PLASTIC LIMITS, PLASTICITY INDEX & WATER CONTENT

NZS 4402:1986 Test 2.2,2.3,2.4

Lab Job No:	8690-001	**Sample No.:**	WRE8690-001-S010
Client:	Core Engineering Solutions	**Tested By:**	A.A
Location:	Te Maika Road Lot 12, Stage 1	**Date Tested:**	28/09/2022
		Checked By:	N.K
Date Received:	6/09/2022	**Date Checked:**	4/10/2022
Report No:	WRE8690-001-R003	**Page:**	4 of 9
REF:	-		
Sampling Method:	Sampled by client – Sampling not accredited	**Sampled By:**	Client
Date Sampled:	Unknown		

Test Details:

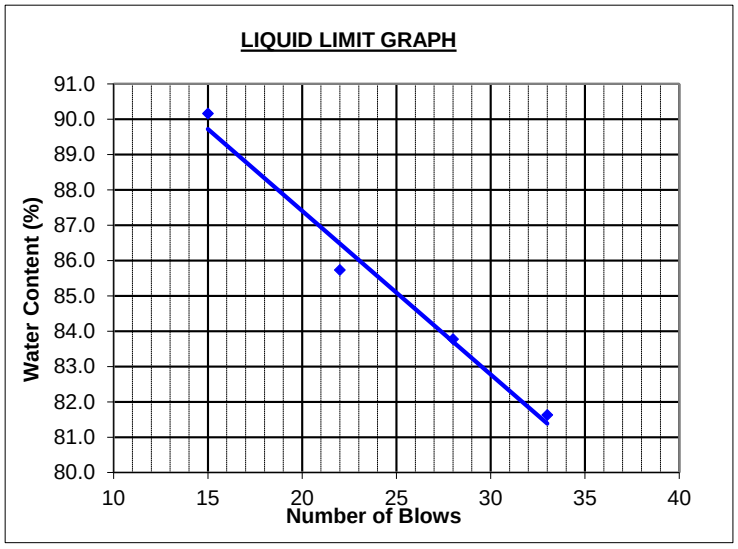
Test performed on: Fraction passing 425μm sieve

Sample history: As received

Description of Sample: Silty CLAY, minor fine sands, traces of rootlets, orange brown mottled red and dark brown, moist

	Liquid Limit				Plastic Limit	
No. of blows	15	22	28	33		
Water content (%)	90.2	85.7	83.8	81.6	39.8	39.7

NWC	**43.5**
Liquid Limit	**85**
Plastic Limit	**40**
Plasticity Index	**45**



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DETERMINATION OF THE LINEAR SHRINKAGE

NZS 4402:1986 Test 2.6

Lab Job No:	8690-001	**Sample No:**	WRE8690-001-S010
Client:	Core Engineering Solutions	**Tested By:**	A.A
Location:	Te Maika Road Lot 12, Stage 1	**Date:** **Checked By:**	28/09/2022 N.K
Date Received:	6/09/2022	**Date:**	4/10/2022
Report No:	WRE8690-001-R003	**Page:**	5 of 9
REF:	-		

Test performed on: Fraction passing 425mm sieve
History: As received

Description of Sample: Silty CLAY, minor fine sands, traces of rootlets, orange brown mottled red and dark brown, moist

Linear shrinkage	**17**

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DETERMINATION OF THE LIQUID & PLASTIC LIMITS, PLASTICITY INDEX & WATER CONTENT

NZS 4402:1986 Test 2.2,2.3,2.4

Lab Job No:	8690-001	**Sample No.:**	WRE8690-001-S011
Client:	Core Engineering Solutions	**Tested By:**	A.A
Location:	Te Maika Road Lot 15, Stage 1	**Date Tested:**	29/09/2022
		Checked By:	N.K
Date Received:	6/09/2022	**Date Checked:**	4/10/2022
Report No:	WRE8690-001-R003	**Page:**	6 of 9
REF:	-		
Sampling Method:	Sampled by client – Sampling not accredited	**Sampled By:**	Client
Date Sampled:	Unknown		

Test Details:

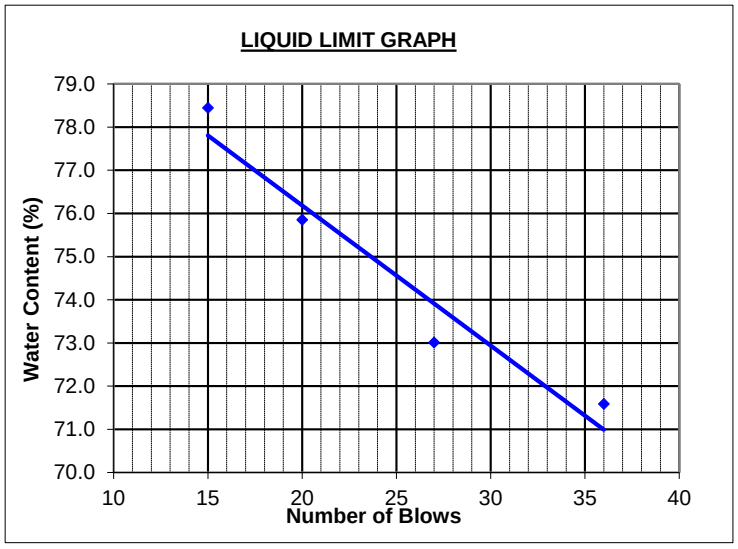
Test performed on: Fraction passing 425μm sieve

Sample history: As received

Description of Sample: Silty CLAY, traces of fine sands and rootlets, reddy brown mottled dark brown pink, moist

	Liquid Limit				Plastic Limit	
No. of blows	15	20	27	36		
Water content (%)	78.4	75.9	73.0	71.6	39.9	39.8

NWC	**40.6**
Liquid Limit	**75**
Plastic Limit	**40**
Plasticity Index	**35**



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DETERMINATION OF THE LINEAR SHRINKAGE

NZS 4402:1986 Test 2.6

Lab Job No:	8690-001	**Sample No:**	WRE8690-001-S011
Client:	Core Engineering Solutions	**Tested By:**	A..A
Location:	Te Maika Road Lot 15, Stage 1	**Date:**	29/09/2022
		Checked By:	N.K
Date Received:	6/09/2022	**Date:**	4/10/2022
Report No:	WRE8690-001-R003	**Page:**	7 of 9
REF:	-		

Test performed on: Fraction passing 425mm sieve
History: As received

Description of Sample: Silty CLAY, traces of fine sands and rootlets, reddy brown mottled dark brown pink, moist

Linear shrinkage	**16**

S. Kokich
Approved Signatory

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DETERMINATION OF THE LIQUID & PLASTIC LIMITS, PLASTICITY INDEX & WATER CONTENT

NZS 4402:1986 Test 2.2,2.3,2.4

Lab Job No:	8690-001	**Sample No.:**	WRE8690-001-S012
Client:	Core Engineering Solutions	**Tested By:**	A.A
Location:	Te Maika Road Lot 20, Stage 1	**Date Tested:**	29/09/2022
		Checked By:	N.K
Date Received:	6/09/2022	**Date Checked:**	4/10/2022
Report No:	WRE8690-001-R003	**Page:**	8 of 9
REF:	-		
Sampling Method:	Sampled by client – Sampling not accredited	**Sampled By:**	Client
Date Sampled:	Unknown		

Test Details:

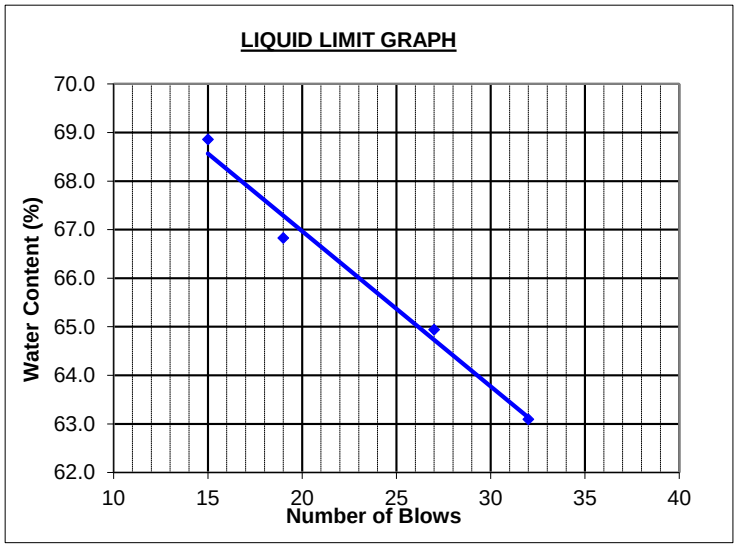
Test performed on: Fraction passing 425μm sieve

Sample history: As received

Description of Sample: Silty CLAY, some sand and gravels to 60mm, traces of rootlets, yellow brown mottled red dark brown and grey, moist

	Liquid Limit				Plastic Limit	
No. of blows	15	19	27	32		
Water content (%)	68.9	66.8	64.9	63.1	31.0	31.0

NWC	**29.5**
Liquid Limit	**65**
Plastic Limit	**31**
Plasticity Index	**34**



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DETERMINATION OF THE LINEAR SHRINKAGE

NZS 4402:1986 Test 2.6

Lab Job No:	8690-001	**Sample No:**	WRE8690-001-S012
Client:	Core Engineering Solutions	**Tested By:**	A.A
Location:	Te Maika Road Lot 20, Stage 1	**Date:**	29/09/2022
		Checked By:	N.K
Date Received:	6/09/2022	**Date:**	4/10/2022
Report No:	WRE8690-001-R003	**Page:**	9 of 9
REF:	-		

Test performed on: Fraction passing 425mm sieve
History: As received

Description of Sample: Silty CLAY, some sand and gravels to 60mm, traces of rootlets, yellow brown mottled red dark brown and grey, moist

Linear shrinkage	**15**

S. Kokich
Approved Signatory

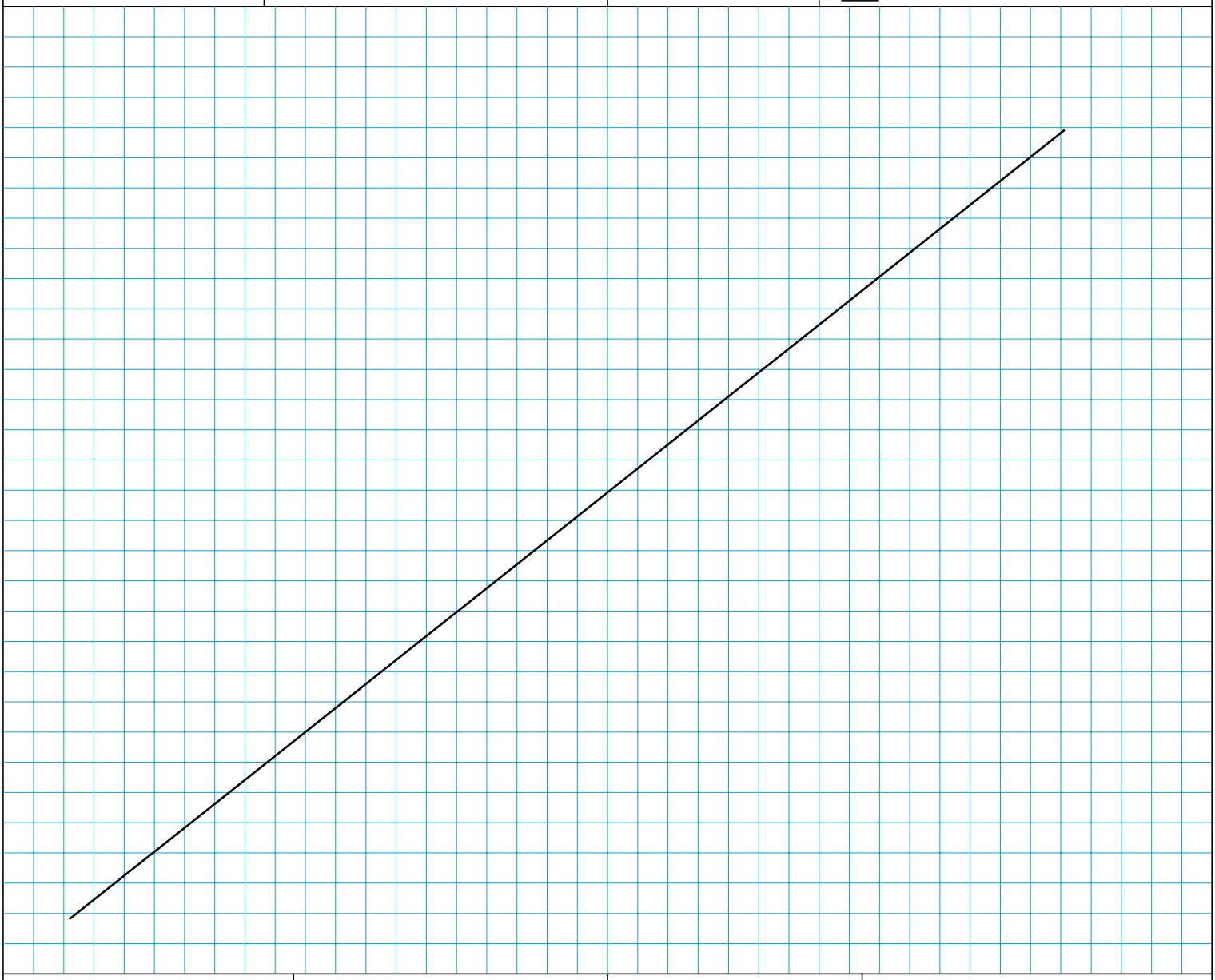
APPENDIX 6 – INSPECTION RECORDS

Date	Staff	Purpose	Notes
10/08/2022	SG, RL	Hand Auger Testing on remaining Stage One Lots	7 ton digger parked on recently (2 weeks) poured roadway
20/07/2022	SG, GO	inspection of Fire Tank Cantilever	Inspection for cantilevers for Fire Tanks, approved for pour, Shear Vanes
19/07/2022	SG	Drone Flyover of site, progress inspection	Shear Vanes
15/06/2022	SG	Progrss Inspection	Shear Vanes
11/06/2022	SG	Progress Inspection (Saturday)	Shear Vanes
25/05/2022	SG, RL	CPT Testing	Shear Vanes
23/05/2022	SG	Progress Inspection, Drone Flyover	Good progress with pouring roads, two more settlement pads damaged
3/05/2022	SG	Progress Inspection	Shear Vanes
2/05/2022	SG	Progress Inspection	Shear Vanes
6/04/2022	SG	Progress Inspection	Shear Vanes
31/03/2022	SG	Progress Inspection, Drone Flyover	Shear Vanes
14/03/2022	SG	Progress Inspection, Drone Flyover	Shear Vanes
25/02/2022	SG	DPSH Testing on hill Lots, Drone Flyover	Shear Vanes
22/02/2022	SG	Progress Inspection	Shear Vanes, Delivered Replacement Settlement Pads
14/02/2022	SG	Progress Inspection	Shear Vanes
8/02/2022	SG	Progress Inspection	Shear Vanes
18/01/2022	SG	Progress Inspection	Shear Vanes
12/01/2022	SG	Progress Inspection, Drone Flyover	Shear Vanes
9/12/2021	SG	Inspection - Retaining Walls, Drone Flyover	Shear Vanes
25/11/2021	SG	Inspection - Retaining Walls, Drone Flyover	Shear Vanes
16/11/2021	SG	Inspection - Retaining Walls, Drone Flyover	Shear Vanes
2/11/2021	SG	Inspection - Retaining Walls, Drone Flyover	Inspection cuts. Standing vertical, highly weathered to moderately weathered, Shear Vanes
11/10/2021	SG	Progress Inspection, Drone Flyover	Shear Vanes
14/09/2021	SG	Progress Inspection	Shear Vanes
10/09/2021	SG	Progress Inspection	Shear Vanes
3/09/2021	SG	Progress Inspection	Shear Vanes
11/08/2021	SG	Progress Inspection	Shear Vanes
19/07/2021	SG	Progress Inspection, Drone Flyover	Shear Vanes
16/06/2021	SG	Progress Inspection, Drone Flyover	Shear Vanes
4/05/2021	SG	Progress Inspection, Drone Flyover	Shear Vanes
30/04/2021	SG	Progress Inspection, Drone Flyover	Shear Vanes
27/04/2022	SG	Progress Inspection, Photos no drone	Shear Vanes
21/04/2021	SG	Progress Inspection, Drone Flyover	Progress inspection for mat. Wet conditions causing issues carting materials from the hill sites
15/04/2021	SG DL	Meeting regarding Drainage	Shear Vanes
14/04/2021	SG	Progress Inspection, Drone Flyover	Drone flyover and progress inspection
12/04/2021	SG	Progress Inspection	Met site manager, shear vanes in a number of locations
9/04/2021	SG, DL	Progress Inspection	Site walkover with Kent, review of site, Large Digger buried on site

SITE INSPECTION RECORD

ENGINEERING SOLUTIONS
Consulting Engineers

CES JOB No. & REV.		**INSPECTION No.**	RET-001
ADDRESS			
INSPECTOR			
TYPE OF INSPECTION			
	CIVIL ◉ **GEOTECHNICAL** ◉ **STRUCTURAL** ◉		
CONSENT No.		**DATE AND TIME**	
H & S ISSUES ON SITE		**H & S 'TAKE 5'**	◉



SITE CONTACT		**COUNCIL INSPECTOR**	
PASS ◉	**SIGNED**		
PENDING ○			
FAIL ○	**SIGNED**		

ENGINEERING SOLUTIONS
jobs@coreeng.nz
Shop 7, Quality Street,
Whangarei 0110

SITE INSPECTION RECORD

CORE ENGINEERING SOLUTIONS
Consulting Engineers

CES JOB No. & REV.	20-0078	INSPECTION No.	001
ADDRESS	Te Maika Rd Ngunguru		
INSPECTOR	DL + SG		
TYPE OF INSPECTION	INITIAL / Site Inspection		
	CIVIL ☑ GEOTECHNICAL ☐ STRUCTURAL ☐		
CONSENT No.		DATE AND TIME	9.30am 9/4/21
H & S ISSUES ON SITE	None	H & S 'TAKE 5'	☑

Initial Site visit, Met Kent + Clements Contractors on site.
Site walkover and review of site conditions.
No geo cloth down, digger stuck
Follow up 12/4, meet with Clements

SITE CONTACT		COUNCIL INSPECTOR	
PASS ☑	SIGNED		
PENDING ☐			
FAIL ☐	SIGNED		

SITE INSPECTION RECORD

CORE
ENGINEERING SOLUTIONS
Consulting Engineers

CES JOB No. & REV.	20-0078.	INSPECTION No.	✓
ADDRESS	Te Maika Rd		
INSPECTOR	Stuart / David.		
TYPE OF INSPECTION			
	CIVIL ☑ GEOTECHNICAL ☑ STRUCTURAL ☐		
CONSENT No.	✓	DATE AND TIME	4/5/21 11.00
H & S ISSUES ON SITE	✓	H & S 'TAKE 5'	☑

Bulldozer + Roller making good progress on lifts.
DL traced flow path of drain using drone down to sea.
Site looking much drier - no concerns.
Vanes western side of stream.
Overlap on Geo Grid.

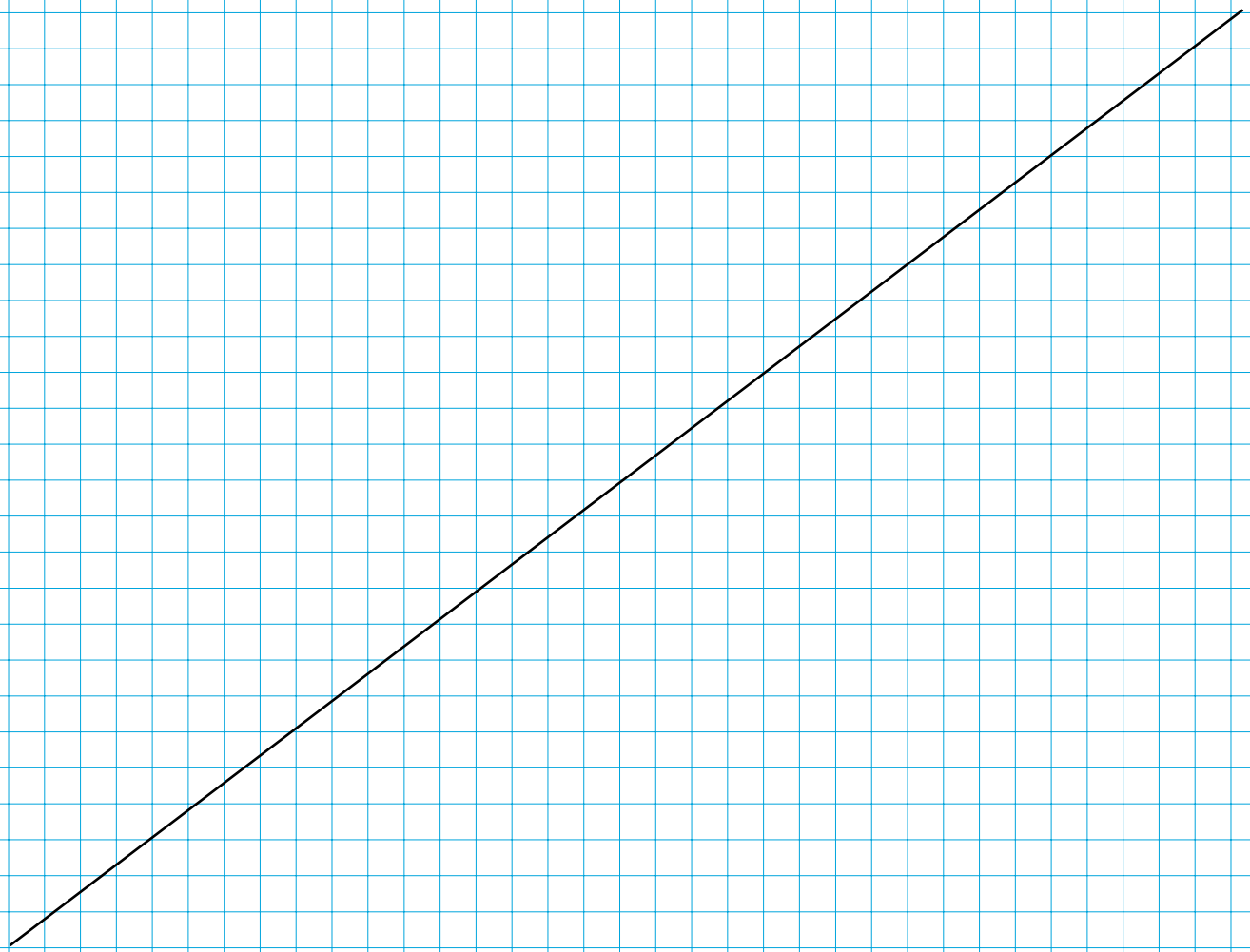
SITE CONTACT	✓	COUNCIL INSPECTOR	✓
PASS ☑	SIGNED		
PENDING ☐			
FAIL ☐	SIGNED		

SITE INSPECTION RECORD

ENGINEERING SOLUTIONS
Consulting Engineers

CES JOB No. & REV.		**INSPECTION No.**	RET-004
ADDRESS			
INSPECTOR			
TYPE OF INSPECTION			
	CIVIL ◯ **GEOTECHNICAL** ◯ **STRUCTURAL** ◯		
CONSENT No.		**DATE AND TIME**	9 Dec 21 11.30am
H & S ISSUES ON SITE		**H & S 'TAKE 5'**	◯

Cut complete for bottom retaining walls.
Good progress made on remaining walls, shear values continue high.
Walls hopefully completed prior to Christmas.
Bottom walls being built after top walls.



SITE CONTACT		**COUNCIL INSPECTOR**	
PASS ◯	**SIGNED**		
PENDING ◯			
FAIL ◯	**SIGNED**		

SITE INSPECTION RECORD

CORE ENGINEERING SOLUTIONS
Consulting Engineers

CES JOB No. & REV.	20-007B.	INSPECTION No.	
ADDRESS	Te Marua Rd.		
INSPECTOR	Steve Gemmell.		
TYPE OF INSPECTION			
	CIVIL ☑ GEOTECHNICAL ☑ STRUCTURAL ☐		
CONSENT No.		DATE AND TIME	11/10/21. 1.00.
H & S ISSUES ON SITE		H & S 'TAKE 5'	☑

Overflow drain.
Road formation progressing.
Significant filling now on eastern side.
Good overlap on Geogrid.
Still quite wet up valley.
Vanes on SE side.

SITE CONTACT		COUNCIL INSPECTOR	
PASS ☑	SIGNED		
PENDING ☐			
FAIL ☐	SIGNED		

SITE INSPECTION RECORD

CORE
ENGINEERING SOLUTIONS
Consulting Engineers

CES JOB No. & REV.	20-0078.	INSPECTION No.	✓
ADDRESS	Te Maika Rd Ngunguru.		
INSPECTOR	Stuart Gemmell.		
TYPE OF INSPECTION			
	CIVIL ☑ GEOTECHNICAL ☑ STRUCTURAL ☐		
CONSENT No.	✓	DATE AND TIME	12/1/22 10.00
H & S ISSUES ON SITE	✓	H & S 'TAKE 5'	☑

Good progress on walls - bottom wall just about finished.
Stream flowing well.
Site looking really good.
Noticeable wetland forming at valley head.

SITE CONTACT	✓	COUNCIL INSPECTOR	✓
PASS ☑	SIGNED		
PENDING ☐			
FAIL ☐	SIGNED		

SITE INSPECTION RECORD

CORE ENGINEERING SOLUTIONS
Consulting Engineers

CES JOB No. & REV.	20.0078.	INSPECTION No.	
ADDRESS	Te Maiha Rd Ngunguru.		
INSPECTOR	Stuart Gemmell.		
TYPE OF INSPECTION			
	CIVIL ☒ GEOTECHNICAL ☒ STRUCTURAL ☐		
CONSENT No.	—	DATE AND TIME	25/3/22 1200
H & S ISSUES ON SITE		H & S 'TAKE 5'	☐

Sheeps foot voller being removed.
Good build up of water in wetland despite dry summer.
No further progress on road cut to higher sections up valley.
Reading progress slow.

SITE CONTACT	—	COUNCIL INSPECTOR	—
PASS ☒	SIGNED		
PENDING ☐			
FAIL ☐	SIGNED		

SITE INSPECTION RECORD

CORE ENGINEERING SOLUTIONS
Consulting Engineers

CES JOB No. & REV.	20-0078	INSPECTION No.	002
ADDRESS	Te Maika Rd, Ngunguru		
INSPECTOR	SG, DL		
TYPE OF INSPECTION	Site Inspection		
	CIVIL ☑ GEOTECHNICAL ☐ STRUCTURAL ☐		
CONSENT No.		DATE AND TIME	12/4/21 10.30 am
H & S ISSUES ON SITE	N/A.	H & S 'TAKE 5'	☑

Met Steve, site manager Clements on site. Only Steve there. No geo cloth on ground. Took shear vane readings. Will call Steve tomorrow to see if geo cloth in place.

SITE CONTACT	Steve	COUNCIL INSPECTOR	
PASS ☑	SIGNED		
PENDING ☐			
FAIL ☐	SIGNED		

SITE INSPECTION RECORD

CORE ENGINEERING SOLUTIONS
Consulting Engineers

CES JOB No. & REV.	20-0078	INSPECTION No.	✓
ADDRESS	Te Maika Rd.		
INSPECTOR	Stuart Gemmell.		
TYPE OF INSPECTION			
	CIVIL ☑ GEOTECHNICAL ☑ STRUCTURAL ☐		
CONSENT No.	✓	DATE AND TIME	16/6/21 10.30.
H & S ISSUES ON SITE	✓	H & S 'TAKE 5'	☑

Nothing happening on site. V. wet.
Sections up valley along eastern boundary completed.
Good progress with hill cut + some area on eastern side of stream look up to height.
Gen'l shear values. (150kPa+)
on SE side. overlap OK.

SITE CONTACT	✓	COUNCIL INSPECTOR	✓
PASS ☑	SIGNED		
PENDING ☐			
FAIL ☐	SIGNED		

SITE INSPECTION RECORD

CORE ENGINEERING SOLUTIONS
Consulting Engineers

CES JOB No. & REV.	20-0078	INSPECTION No.	✓
ADDRESS	Te Maika Rd		
INSPECTOR	Stuart Gammell		
TYPE OF INSPECTION			
	CIVIL ☑ GEOTECHNICAL ☑ STRUCTURAL ☐		
CONSENT No.	—	DATE AND TIME	19/7/21 10.00.
H & S ISSUES ON SITE	—	H & S 'TAKE 5'	☑

No real change.
Grass growing on site. Very wet - unlikely to progress soon.
Shear vanes low with soft conditions.
Some progress with pulling in drain.

SITE CONTACT		COUNCIL INSPECTOR	
PASS ☑	SIGNED		
PENDING ☐			
FAIL ☐	SIGNED		

SITE INSPECTION RECORD

CORE
ENGINEERING SOLUTIONS
Consulting Engineers

CES JOB No. & REV.	20-0074	INSPECTION No.	003
ADDRESS	Te Maika Rd Ngunguru		
INSPECTOR	Stuart Gemmell		
TYPE OF INSPECTION	Progress		
	CIVIL ☑ GEOTECHNICAL ☑ STRUCTURAL ☐		
CONSENT No.		DATE AND TIME	14/4/21 9:30
H & S ISSUES ON SITE	N/A	H & S 'TAKE 5'	☑

Inspection of progress with Geocloth / Grid
Flew drone over site recorded progress
Hill cut started.

SITE CONTACT	Steve	COUNCIL INSPECTOR	
PASS ☑	SIGNED		
PENDING ☐			
FAIL ☐	SIGNED		

SITE INSPECTION RECORD

ENGINEERING SOLUTIONS
Consulting Engineers

CES JOB No. & REV.	20-0078	INSPECTION No.	1
ADDRESS	Te Maipa Rd.		
INSPECTOR	Stuart / David.		
TYPE OF INSPECTION			
	CIVIL ☑ GEOTECHNICAL ☑ STRUCTURAL ☐		
CONSENT No.	TBC	DATE AND TIME	15/4/21. 11.00
H & S ISSUES ON SITE	Heavy Vehicles	H & S 'TAKE 5'	☑

Meeting on site re drainage.
DL checking to see if drains at Southern end are tidal in nature and what effects this has on flow. Good progress on site.

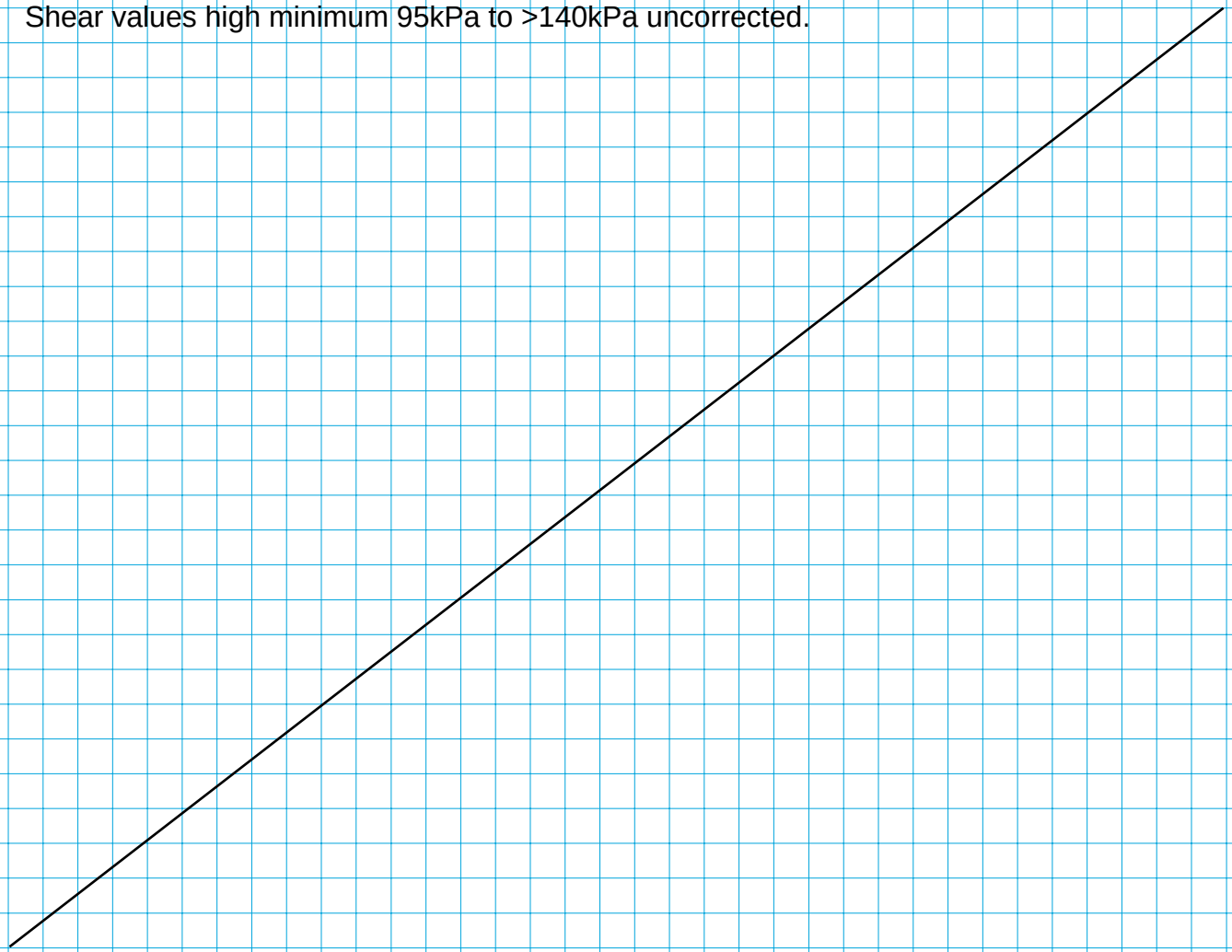
SITE CONTACT	N/A.	COUNCIL INSPECTOR	
PASS ☑	SIGNED		
PENDING ☐			
FAIL ☐	SIGNED		

SITE INSPECTION RECORD

ENGINEERING SOLUTIONS
Consulting Engineers

CES JOB No. & REV.		**INSPECTION No.**	RET 002
ADDRESS			
INSPECTOR			
TYPE OF INSPECTION			
	CIVIL ◯ **GEOTECHNICAL** ◯ **STRUCTURAL** ◯		
CONSENT No.		**DATE AND TIME**	16 Nov 21 10.00am
H & S ISSUES ON SITE		**H & S 'TAKE 5'**	◯

Check of progress on site for retaining walls. Site filling progressing for Lot 1, contactors planning to undertake Lot 1 retaining later.
All holes checked were to depth as specified.
Shear values high minimum 95kPa to >140kPa uncorrected.



SITE CONTACT		**COUNCIL INSPECTOR**	
PASS ◯	**SIGNED**		
PENDING ◯			
FAIL ◯	**SIGNED**		

ENGINEERING SOLUTIONS
jobs@coreeng.nz
Shop 7, Quality Street,
Whangarei 0110

SITE INSPECTION RECORD

ENGINEERING SOLUTIONS
Consulting Engineers

CES JOB No. & REV.	20-0078	**INSPECTION No.**	005
ADDRESS	Te Maika Road, Ngunguru		
INSPECTOR	Gilles Ollivier		
TYPE OF INSPECTION	Concrete slab		
	CIVIL ◯ **GEOTECHNICAL** ◯ **STRUCTURAL** ◉		
CONSENT No.	TBC	**DATE AND TIME**	20/07/2022 11.00am
H & S ISSUES ON SITE	-	**H & S 'TAKE 5'**	◉

Bridging road over fire tanks:

- Fire tanks with cantilever length <1.0m, reinforcing as per design. We have asked Clements to add some HD16 1.5m long @300 crs. perpendicular to the beam to get some reinforcing between the beam and the edge. OK

- Fire tanks with cantilever length <2.0m, reinforcing as per design. OK

OK to pour concrete.

SITE CONTACT	Ryan	**COUNCIL INSPECTOR**	
PASS ◉	**SIGNED**		
PENDING ◯			
FAIL ◯	**SIGNED**		

SITE INSPECTION RECORD

CORE ENGINEERING SOLUTIONS
Consulting Engineers

CES JOB No. & REV.	20-0078.	INSPECTION No.	✓
ADDRESS	Te Maire Road.		
INSPECTOR	Steve Gemmell		
TYPE OF INSPECTION			
	CIVIL ☑ GEOTECHNICAL ☑ STRUCTURAL ○		
CONSENT No.	✓	DATE AND TIME	21/04/21 2.00
H & S ISSUES ON SITE	✓	H & S 'TAKE 5'	☑

Progressing on western side of the stream.
Geogrid at entrance. Not much happening on site.
Very wet on site.
Drone Flyover.

SITE CONTACT	✓	COUNCIL INSPECTOR	✓
PASS ☑	SIGNED		
PENDING ○			
FAIL ○	SIGNED		

SITE INSPECTION RECORD

CORE
ENGINEERING SOLUTIONS
Consulting Engineers

CES JOB No. & REV.	20-0078.	INSPECTION No.	✓
ADDRESS	Te Maiha Rd. Ngunguru.		
INSPECTOR	Stuart Gemmell.		
TYPE OF INSPECTION			
	CIVIL ☑ GEOTECHNICAL ☑ STRUCTURAL ☐		
CONSENT No.	—	DATE AND TIME	25/2/22 9.30.
H & S ISSUES ON SITE	—	H & S 'TAKE 5'	☑

On site for DPSH Testing of slopes for stability.
Good progress - digger tidying hill top section + pile of topsoil present ready for spreading.
Spreading of topsoil progressing in valley.

SITE CONTACT		COUNCIL INSPECTOR	✓
PASS ☑	SIGNED		
PENDING ☐			
FAIL ☐	SIGNED		

SITE INSPECTION RECORD

CORE ENGINEERING SOLUTIONS
Consulting Engineers

CES JOB No. & REV.	20-0078.	INSPECTION No.	✓
ADDRESS	Te Maiha Rd Ngunguru.		
INSPECTOR	Stuart Gemmell.		
TYPE OF INSPECTION			
	CIVIL ☐ GEOTECHNICAL ☑ STRUCTURAL ☐		
CONSENT No.	✓	DATE AND TIME	22/2/22 10.30
H & S ISSUES ON SITE	✓	H & S 'TAKE 5'	☑

Dropped out new settlement pads to replace the damaged pads.
Pads to be installed today.

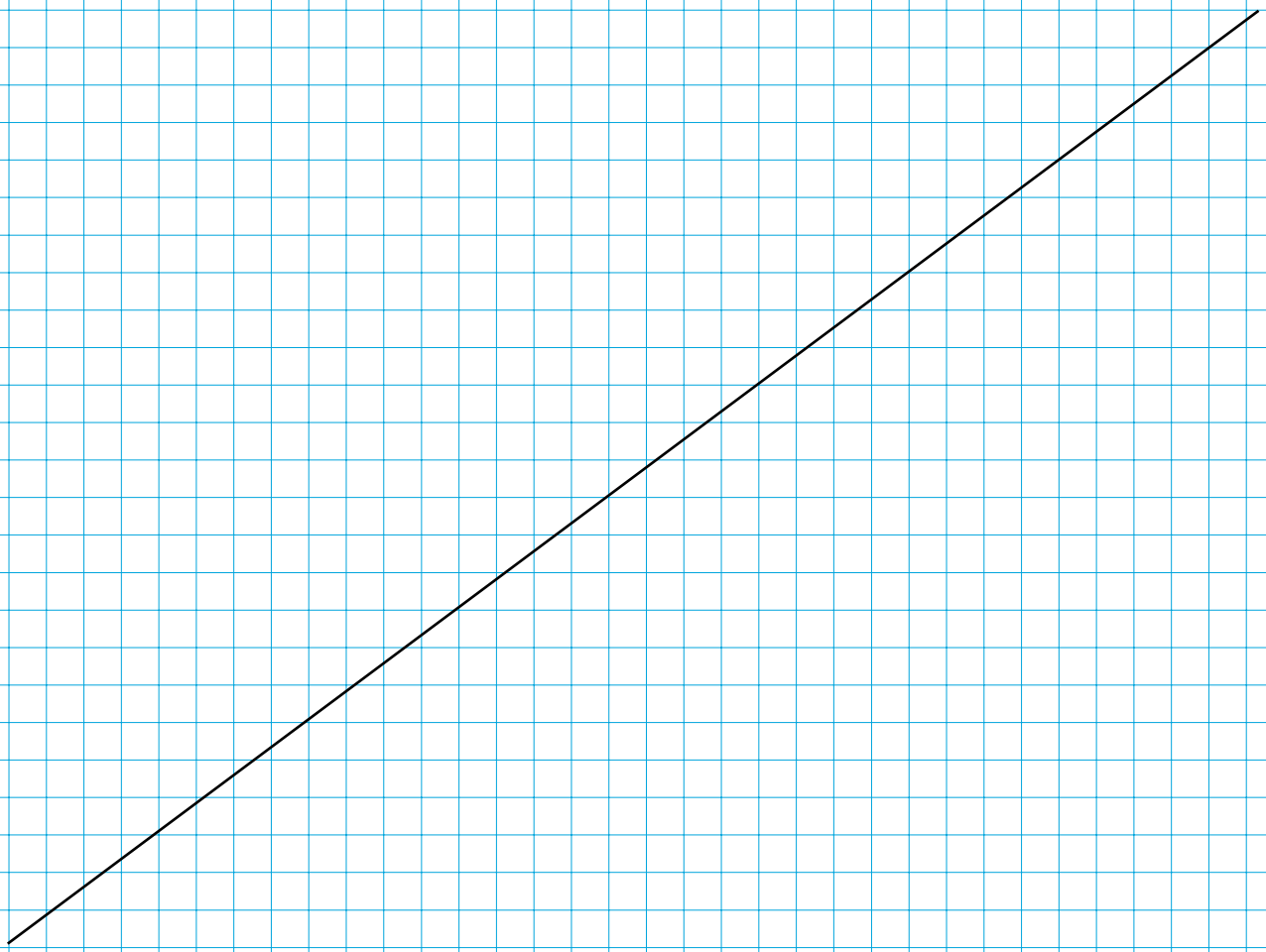
SITE CONTACT	Bryan	COUNCIL INSPECTOR	✓
PASS ☑	SIGNED		
PENDING ☐			
FAIL ☐	SIGNED		

SITE INSPECTION RECORD

ENGINEERING SOLUTIONS
Consulting Engineers

CES JOB No. & REV.		**INSPECTION No.**	RET-003
ADDRESS			
INSPECTOR			
TYPE OF INSPECTION			
	CIVIL ◯ **GEOTECHNICAL** ◯ **STRUCTURAL** ◯		
CONSENT No.		**DATE AND TIME**	25 Nov 21 2.30pm
H & S ISSUES ON SITE		**H & S 'TAKE 5'**	◯

Site continues to dry out - some cracking now obvious in soil that has been exposed for a length of time, although even vertical slopes remain stable.
Walls are progressing faster with additional people on site.
Material remains highly consistent and shear vanes were generally in excess of 95kPa uncorrected.



SITE CONTACT		**COUNCIL INSPECTOR**	
PASS ◯	**SIGNED**		
PENDING ◯			
FAIL ◯	**SIGNED**		

SITE INSPECTION RECORD

CORE
ENGINEERING SOLUTIONS
Consulting Engineers

CES JOB No. & REV.	20-0078.	INSPECTION No.	✓
ADDRESS	51 Te Maika Rd Ngunguru.		
INSPECTOR	Stuart Cornwell.		
TYPE OF INSPECTION			
	CIVIL ☑ GEOTECHNICAL ☑ STRUCTURAL ☐		
CONSENT No.		DATE AND TIME	25/05/22 3.00
H & S ISSUES ON SITE	✓	H & S 'TAKE 5'	☑

Some Progress being made on roading. Area of roading extending past cul de sac has been pavered in two directions. Footpath from entrance has been poured.
I note that Clements have further damaged two more settlement pads.

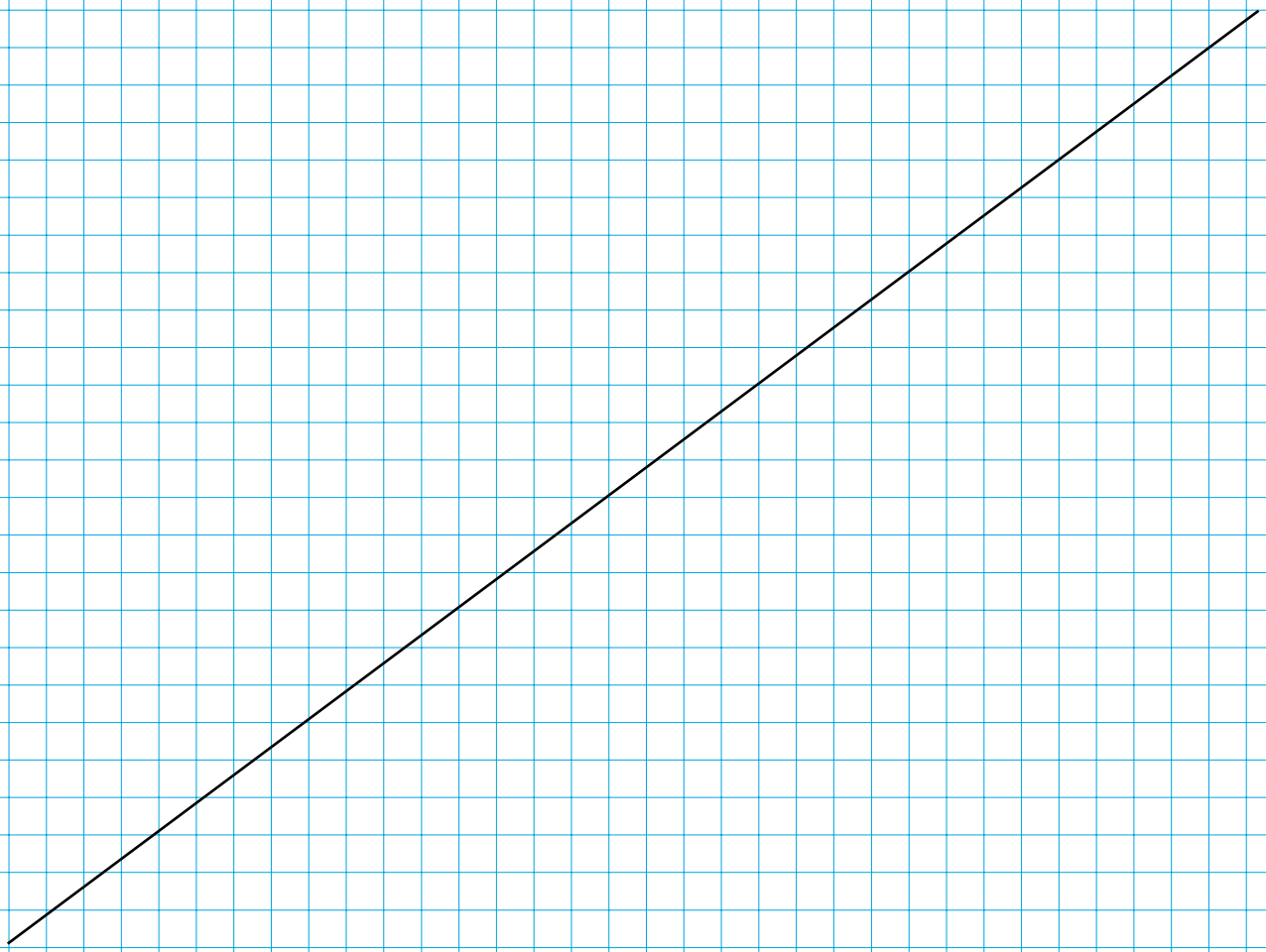
SITE CONTACT		COUNCIL INSPECTOR	✓
PASS ☑	SIGNED		
PENDING ☐			
FAIL ☐	SIGNED		

SITE INSPECTION RECORD

ENGINEERING SOLUTIONS
Consulting Engineers

CES JOB No. & REV.	20-0078	**INSPECTION No.**	RET-003
ADDRESS	51 Te Maika Road, Ngunguru		
INSPECTOR	Stuart Gemmell		
TYPE OF INSPECTION	Retaining Walls		
	CIVIL ◯ **GEOTECHNICAL** ◯ **STRUCTURAL** ◯		
CONSENT No.	TBC	**DATE AND TIME**	25 Nov 21 2.30pm
H & S ISSUES ON SITE	Heavy Machinery	**H & S 'TAKE 5'**	◯

Site continues to dry out - some cracking now obvious in soil that has been exposed for a length of time, although even vertical slopes remain stable.
Walls are progressing faster with additional people on site.
Material remains highly consistent and shear vanes were generally in excess of 95kPa uncorrected.



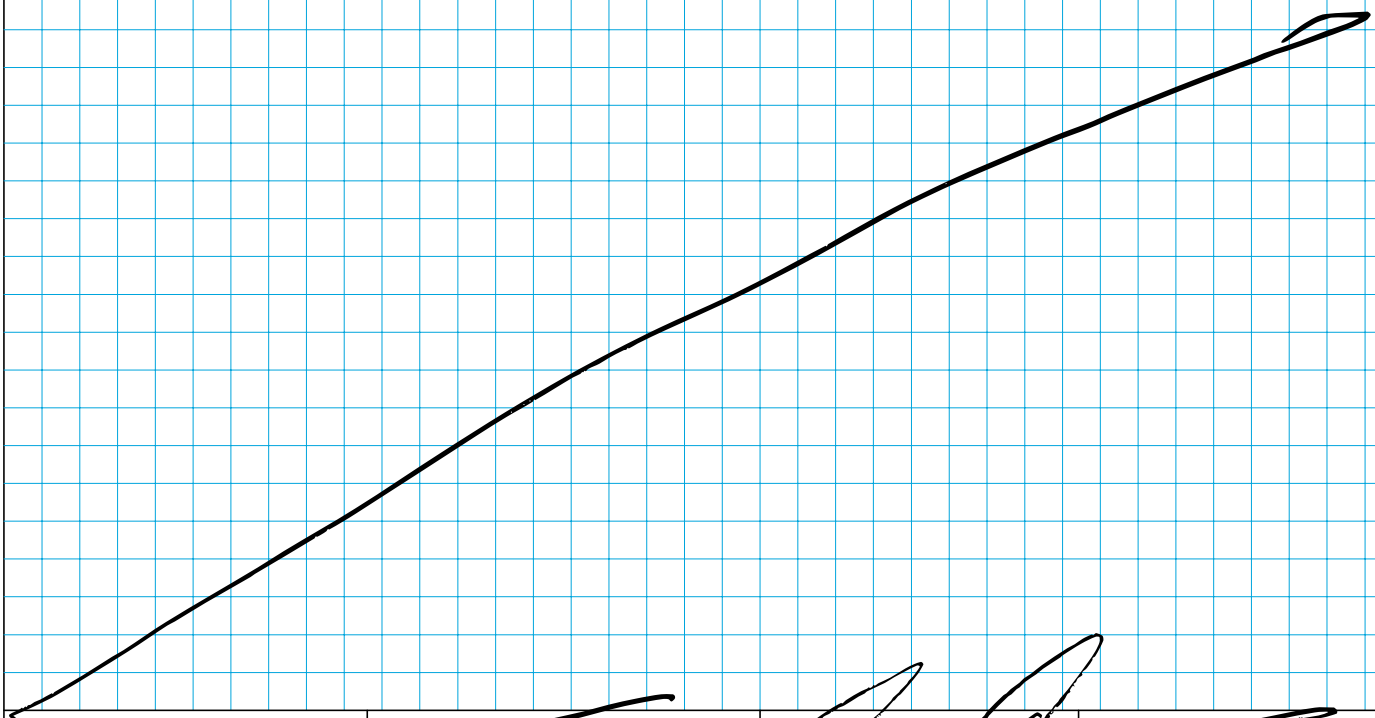
SITE CONTACT		**COUNCIL INSPECTOR**	
PASS ◯	**SIGNED**		
PENDING ◯			
FAIL ◯	**SIGNED**		

SITE INSPECTION RECORD

CORE ENGINEERING SOLUTIONS
Consulting Engineers

CES JOB No. & REV.	20-0078	INSPECTION No.	✓
ADDRESS	Te Maika Rd Ngunguru.		
INSPECTOR	Stuart Gammell.		
TYPE OF INSPECTION			
	CIVIL ☑ GEOTECHNICAL ☑ STRUCTURAL ☐		
CONSENT No.	—	DATE AND TIME	30/4/21 11.00
H & S ISSUES ON SITE	—	H & S 'TAKE 5'	☑

Bulldozer with large Sheeps Foot working. Significant cuts started into hill. Good Shear Strengths (>140 kPa) being achieved with hill material. Good progress up western side of stream.



SITE CONTACT		COUNCIL INSPECTOR	
PASS ☑	SIGNED		
PENDING ☐			
FAIL ☐	SIGNED		

SITE INSPECTION RECORD

CORE ENGINEERING SOLUTIONS
Consulting Engineers

CES JOB No. & REV.	20-0078.	INSPECTION No.	✓
ADDRESS	Te Maika Rd.		
INSPECTOR	Stuart Gammell.		
TYPE OF INSPECTION			
	CIVIL ☐ GEOTECHNICAL ☑ STRUCTURAL ☐		
CONSENT No.	TBC.	DATE AND TIME	27 Apr 21. 11.00
H & S ISSUES ON SITE	✓	H & S 'TAKE 5'	☑

No significant action on site.
Sediment ponds installed.
Cleared along eastern boundary. Very wet below site.
Some clearing on the eastern side of the stream.
Vines western side of stream.

SITE CONTACT	✓	COUNCIL INSPECTOR	✓
PASS ☑	SIGNED		
PENDING ☐			
FAIL ☐	SIGNED		

SITE INSPECTION RECORD

CORE ENGINEERING SOLUTIONS
Consulting Engineers

CES JOB No. & REV.	20-0078	INSPECTION No.	
ADDRESS	Te Maika Rd Ngunguru.		
INSPECTOR	Stuart Gemmell		
TYPE OF INSPECTION	Progress		
	CIVIL ☑ GEOTECHNICAL ☐ STRUCTURAL ☐		
CONSENT No.	TBC.	DATE AND TIME	31/3/22 9.00
H & S ISSUES ON SITE	✓	H & S 'TAKE 5'	☑

Progress Inspection.
Pipes on site + culvert/crossing being placed on Te Maika Rd.

SITE CONTACT	✓	COUNCIL INSPECTOR	✓
PASS ☐	SIGNED		
PENDING ☐			
FAIL ☐	SIGNED		

APPENDIX 7 – PRODUCER STATEMENTS FOR CONSTRUCTION FROM CONTRACTOR

SIXTH SCHEDULE

FORM OF PRODUCER STATEMENT – CONSTRUCTION

ISSUED BY: **Webb Contracting Ltd**
(Contractor)

TO: **Traverse LTD - Clements Contractors**
(Principal)

TO BE SUPPLIED TO: **Whangarei District Council**
(Territorial authority)

IN RESPECT OF: **51 Te Maika Road DP374000**
(Description of Contract Works)

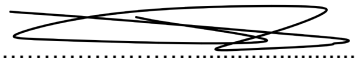
AT: **51 Te Maika Road, Ngunguru, Whangarei.**
(Address)

Webb Contracting Ltd *(Contractor)* has contracted to **Traverse Limited** *(Principal)* to carry out and complete certain building works in accordance with a contract, titled **Traverse - Lot 51 Te Maika Road** ("the contract")

I **Jake Pattison** *(Duly Authorized Agent)* a duly authorized representative of **Webb Contracting Ltd** *(Contractor)* believe on reasonable grounds that **Webb Contracting Ltd** *(Contractor)* has carried out and completed

☐ All

■ Part only as specified in the attached particulars of the building works in accordance with the contract.
Laying of Ø1350mm Stormwater line
Lance Smith - Certifying Drainlayer #20798



……..... Date 2nd August 2022
(Signature of Authorized Agent on behalf of)

Webb Contracting Ltd
(Contractor)

247 Three Mile Bush Road, Kamo, Whangarei 0145
(Address)

Schedule 6 – Form of Producer Statement – Construction

ISSUED BY	**Clements Contractors Ltd**	*(Contractor)*
TO	**Traverse Ltd**	*(Principal)*
IN RESPECT OF	**Traverse Ltd - Te Maika Road Development**	*(Description of Contract Works)*
AT	**51 Te Maika Rd, Ngunguru, Whangarei**	*(Address)*

Clements Contractors Ltd *(Contractor)* has contracted to **Traverse Ltd** *(Principal)* to carry out and complete certain building works in accordance with a Contract titled **Traverse Ltd – Te Maika Road Development** ('the Contract')

I **Ryan Hayward** *(Duly Authorised Agent)* a duly authorised representative of **Clements Contractors Ltd** *(Contractor)* believe on reasonable grounds that **Clements Contractors Ltd** *(Contractor)* has carried out and completed:

☐ All

☒ Part only as specified in the attached particulars of the contract works in accordance with the Contract

Earthworks

Date **3 August 2022**

(Signature of Authorised Agent on behalf of)

Clements Contractors Ltd

(Contractor)

32 Westwood Lane, Maunu

(Address)

Schedule 6 – Form of Producer Statement – Construction

ISSUED BY	**Clements Contractors Ltd**	*(Contractor)*
TO	**Traverse Ltd**	*(Principal)*
IN RESPECT OF	**Traverse Ltd - Te Maika Road Development**	*(Description of Contract Works)*
AT	**51 Te Maika Rd, Ngunguru, Whangarei**	*(Address)*

Clements Contractors Ltd *(Contractor)* has contracted to **Traverse Ltd** *(Principal)* to carry out and complete certain building works in accordance with a Contract titled **Traverse Ltd – Te Maika Road Development** ('the Contract')

I **Ryan Hayward** *(Duly Authorised Agent)* a duly authorised representative of **Clements Contractors Ltd** *(Contractor)* believe on reasonable grounds that **Clements Contractors Ltd** *(Contractor)* has carried out and completed:

☐ All

☒ Part only as specified in the attached particulars of the contract works in accordance with the Contract

Placement and overlapping of Geo Composite material, and reinstatement to manufacturers specification where material has been cut to install services

Date **3 August 2022**

(Signature of Authorised Agent on behalf of)

Clements Contractors Ltd

(Contractor)

32 Westwood Lane, Maunu

(Address)

Schedule 6 – Form of Producer Statement – Construction

ISSUED BY	**Clements Contractors Ltd**	*(Contractor)*
TO	**Traverse Ltd**	*(Principal)*
IN RESPECT OF	**Traverse Ltd - Te Maika Road Development**	*(Description of Contract Works)*
AT	**51 Te Maika Rd, Ngunguru, Whangarei**	*(Address)*

Clements Contractors Ltd *(Contractor)* has contracted to **Traverse Ltd** *(Principal)* to carry out and complete certain building works in accordance with a Contract titled **Traverse Ltd – Te Maika Road Development** ('the Contract')

I **Ryan Hayward** *(Duly Authorised Agent)* a duly authorised representative of **Clements Contractors Ltd** *(Contractor)* believe on reasonable grounds that **Clements Contractors Ltd** *(Contractor)* has carried out and completed:

☐ All

☒ Part only as specified in the attached particulars of the contract works in accordance with the Contract

Retaining Walls

Date **3 August 2022**

(Signature of Authorised Agent on behalf of)

Clements Contractors Ltd

(Contractor)

32 Westwood Lane, Maunu

(Address)

APPENDIX 8 – SETTLEMENT ANALYSIS

ENGINEERING SOLUTIONS

Te Maika Road
Core Engineering Solutions Ltd

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Settle3 Analysis Information

Te Maika Road

Project Settings

Document Name	Project 3
Project Title	Te Maika Road
Analysis	Riley CPT 1
Author	Stuart Gemmell
Company	Core Engineering Solutions Ltd
Date Created	18/10/2022, 12:25:44 pm
Last saved with Settle3 version	5.017
Stress Computation Method	Boussinesq
Stress Units	Metric, stress as kPa
Settlement Units	centimeters
Time-dependent Consolidation Analysis	
Time Units	years
Permeability Units	meters/year

Advanced Settings

Start of secondary consolidation (% of primary)	95
Min. stress for secondary consolidation (% of initial)	1
Reset time when load changes for secondary consolidation	No
Minimum settlement ratio for subgrade modulus	0.9
Use average poisson's ratio to calculate layered stresses	
Update Cv in each time step (improves consolidation accuracy)	
Ignore negative effective stresses in settlement calculations	
Add field points to load edges	

Soil Profile

Layer Option	Horizontal Soil Layers
Vertical Axis	Depth below ground surface

Stage Settings

Stage #	Name	Time [years]
1	Stage 1	0
2	Stage 2 - Load	0.1
3	Stage 3	0.5
4	Stage 4	1
5	Stage 5 - GCR Stage	1.5
6	Stage 6 - Build	2
7	Stage 7 - 10 Years	10
8	Stage 8 - 50 Years	50
9	Stage 9 - 100 Years	100

Results

Time taken to compute: 1.79143 seconds

Stage: Stage 1 = 0 y

Data Type	Minimum	Maximum
Total Settlement [cm]	0	0
Total Consolidation Settlement [cm]	0	0
Virgin Consolidation Settlement [cm]	0	0
Recompression Consolidation Settlement [cm]	0	0
Immediate Settlement [cm]	0	0
Secondary Settlement [cm]	0	0
Loading Stress ZZ [kPa]	0	0
Loading Stress XX [kPa]	0	0
Loading Stress YY [kPa]	0	0
Effective Stress ZZ [kPa]	0	165.624
Effective Stress XX [kPa]	0	165.624
Effective Stress YY [kPa]	0	165.624
Total Stress ZZ [kPa]	0	165.624
Total Stress XX [kPa]	0	165.624
Total Stress YY [kPa]	0	165.624
Modulus of Subgrade Reaction (Total) [kPa/m]	0	0
Modulus of Subgrade Reaction (Immediate) [kPa/m]	0	0
Modulus of Subgrade Reaction (Consolidation) [kPa/m]	0	0
Total Strain	0	0
Pore Water Pressure [kPa]	0	4.85595
Excess Pore Water Pressure [kPa]	0	0
Degree of Consolidation [%]	0	0
Pre-consolidation Stress [kPa]	0.2695	164.668
Over-consolidation Ratio	1	1
Void Ratio	0	0
Permeability [m/y]	0.002943	0.01962
Coefficient of Consolidation [m^2/y]	1	2
Hydroconsolidation Settlement [cm]	0	0
Average Degree of Consolidation [%]	0	100
Undrained Shear Strength	0	0

Stage: Stage 2 - Load = 0.1 y

Data Type	Minimum	Maximum
Total Settlement [cm]	0	5.22337
Total Consolidation Settlement [cm]	0	5.22337
Virgin Consolidation Settlement [cm]	0	5.22337
Recompression Consolidation Settlement [cm]	0	0
Immediate Settlement [cm]	0	0
Secondary Settlement [cm]	0	0
Loading Stress ZZ [kPa]	0	9.25
Loading Stress XX [kPa]	-2.05437	6.97776
Loading Stress YY [kPa]	-1.60152	7.5127
Effective Stress ZZ [kPa]	0	174.869
Effective Stress XX [kPa]	-2.05437	170.82
Effective Stress YY [kPa]	-1.60152	171.63
Total Stress ZZ [kPa]	0	174.869
Total Stress XX [kPa]	-2.05437	170.82
Total Stress YY [kPa]	-1.60152	171.63
Modulus of Subgrade Reaction (Total) [kPa/m]	0	244.935
Modulus of Subgrade Reaction (Immediate) [kPa/m]	0	0
Modulus of Subgrade Reaction (Consolidation) [kPa/m]	0	244.935
Total Strain	0	0.0074
Pore Water Pressure [kPa]	0	14.1059
Excess Pore Water Pressure [kPa]	0	9.25
Degree of Consolidation [%]	0	100
Pre-consolidation Stress [kPa]	0.2695	173.913
Over-consolidation Ratio	1	1
Void Ratio	0	0
Permeability [m/y]	0.002943	0.01962
Coefficient of Consolidation [m^2/y]	1	2
Hydroconsolidation Settlement [cm]	0	0
Average Degree of Consolidation [%]	0	90
Undrained Shear Strength	-1.11022e-16	0.361802

Stage: Stage 3 = 0.5 y

Data Type	Minimum	Maximum
Total Settlement [cm]	0	21.3768
Total Consolidation Settlement [cm]	0	21.3768
Virgin Consolidation Settlement [cm]	0	21.3768
Recompression Consolidation Settlement [cm]	0	0
Immediate Settlement [cm]	0	0
Secondary Settlement [cm]	0	0
Loading Stress ZZ [kPa]	0	37
Loading Stress XX [kPa]	-8.21746	27.9111
Loading Stress YY [kPa]	-6.40609	30.0508
Effective Stress ZZ [kPa]	0	202.603
Effective Stress XX [kPa]	-8.21746	186.408
Effective Stress YY [kPa]	-6.40609	189.648
Total Stress ZZ [kPa]	0	202.603
Total Stress XX [kPa]	-8.21746	186.408
Total Stress YY [kPa]	-6.40609	189.648
Modulus of Subgrade Reaction (Total) [kPa/m]	0	236.803
Modulus of Subgrade Reaction (Immediate) [kPa/m]	0	0
Modulus of Subgrade Reaction (Consolidation) [kPa/m]	0	236.803
Total Strain	0	0.0296
Pore Water Pressure [kPa]	0	32.606
Excess Pore Water Pressure [kPa]	0	27.75
Degree of Consolidation [%]	0	100
Pre-consolidation Stress [kPa]	0.2695	201.647
Over-consolidation Ratio	1	1
Void Ratio	0	0
Permeability [m/y]	0.002943	0.01962
Coefficient of Consolidation [m^2/y]	1	2
Hydroconsolidation Settlement [cm]	0	0
Average Degree of Consolidation [%]	0	90
Undrained Shear Strength	0	1.36239

Stage: Stage 4 = 1 y

Data Type	Minimum	Maximum
Total Settlement [cm]	0	22.8267
Total Consolidation Settlement [cm]	0	22.8267
Virgin Consolidation Settlement [cm]	0	22.8267
Recompression Consolidation Settlement [cm]	0	0
Immediate Settlement [cm]	0	0
Secondary Settlement [cm]	0	0
Loading Stress ZZ [kPa]	0	37
Loading Stress XX [kPa]	-8.21746	27.9111
Loading Stress YY [kPa]	-6.40609	30.0508
Effective Stress ZZ [kPa]	0	202.603
Effective Stress XX [kPa]	-8.21746	186.408
Effective Stress YY [kPa]	-6.40609	189.648
Total Stress ZZ [kPa]	0	202.603
Total Stress XX [kPa]	-8.21746	186.408
Total Stress YY [kPa]	-6.40609	189.648
Modulus of Subgrade Reaction (Total) [kPa/m]	0	221.229
Modulus of Subgrade Reaction (Immediate) [kPa/m]	0	0
Modulus of Subgrade Reaction (Consolidation) [kPa/m]	0	221.229
Total Strain	0	0.037
Pore Water Pressure [kPa]	0	4.85595
Excess Pore Water Pressure [kPa]	0	9.56706e-14
Degree of Consolidation [%]	0	100
Pre-consolidation Stress [kPa]	0.2695	201.647
Over-consolidation Ratio	1	1
Void Ratio	0	0
Permeability [m/y]	0.002943	0.01962
Coefficient of Consolidation [m^2/y]	1	2
Hydroconsolidation Settlement [cm]	0	0
Average Degree of Consolidation [%]	0	100
Undrained Shear Strength	0	1.36239

Stage: Stage 5 - GCR Stage = 1.5 y

Data Type	Minimum	Maximum
Total Settlement [cm]	0	22.8267
Total Consolidation Settlement [cm]	0	22.8267
Virgin Consolidation Settlement [cm]	0	22.8267
Recompression Consolidation Settlement [cm]	0	0
Immediate Settlement [cm]	0	0
Secondary Settlement [cm]	0	0
Loading Stress ZZ [kPa]	0	37
Loading Stress XX [kPa]	-8.21746	27.9111
Loading Stress YY [kPa]	-6.40609	30.0508
Effective Stress ZZ [kPa]	0	202.603
Effective Stress XX [kPa]	-8.21746	186.408
Effective Stress YY [kPa]	-6.40609	189.648
Total Stress ZZ [kPa]	0	202.603
Total Stress XX [kPa]	-8.21746	186.408
Total Stress YY [kPa]	-6.40609	189.648
Modulus of Subgrade Reaction (Total) [kPa/m]	0	221.229
Modulus of Subgrade Reaction (Immediate) [kPa/m]	0	0
Modulus of Subgrade Reaction (Consolidation) [kPa/m]	0	221.229
Total Strain	0	0.037
Pore Water Pressure [kPa]	0	4.85595
Excess Pore Water Pressure [kPa]	0	5.5633e-29
Degree of Consolidation [%]	0	100
Pre-consolidation Stress [kPa]	0.2695	201.647
Over-consolidation Ratio	1	1
Void Ratio	0	0
Permeability [m/y]	0.002943	0.01962
Coefficient of Consolidation [m^2/y]	1	2
Hydroconsolidation Settlement [cm]	0	0
Average Degree of Consolidation [%]	0	100
Undrained Shear Strength	0	1.36239

Stage: Stage 6 - Build = 2 y

Data Type	Minimum	Maximum
Total Settlement [cm]	0	28.4198
Total Consolidation Settlement [cm]	0	28.4198
Virgin Consolidation Settlement [cm]	0	28.4198
Recompression Consolidation Settlement [cm]	0	0
Immediate Settlement [cm]	0	0
Secondary Settlement [cm]	0	0
Loading Stress ZZ [kPa]	0	49
Loading Stress XX [kPa]	-8.23403	33.7253
Loading Stress YY [kPa]	-6.41964	36.4818
Effective Stress ZZ [kPa]	0	209.005
Effective Stress XX [kPa]	-8.23403	186.91
Effective Stress YY [kPa]	-6.41964	190.287
Total Stress ZZ [kPa]	0	209.005
Total Stress XX [kPa]	-8.23403	186.91
Total Stress YY [kPa]	-6.41964	190.287
Modulus of Subgrade Reaction (Total) [kPa/m]	0	221.229
Modulus of Subgrade Reaction (Immediate) [kPa/m]	0	0
Modulus of Subgrade Reaction (Consolidation) [kPa/m]	0	221.229
Total Strain	0	0.0410968
Pore Water Pressure [kPa]	0	16.8527
Excess Pore Water Pressure [kPa]	-4.72999e-34	12
Degree of Consolidation [%]	0	100
Pre-consolidation Stress [kPa]	0.2695	208.081
Over-consolidation Ratio	1	1
Void Ratio	0	0
Permeability [m/y]	0.002943	0.01962
Coefficient of Consolidation [m^2/y]	1	2
Hydroconsolidation Settlement [cm]	0	0
Average Degree of Consolidation [%]	0	100
Undrained Shear Strength	0	1.58598

Stage: Stage 7 - 10 Years = 10 y

Data Type	Minimum	Maximum
Total Settlement [cm]	0	29.0468
Total Consolidation Settlement [cm]	0	29.0468
Virgin Consolidation Settlement [cm]	0	29.0468
Recompression Consolidation Settlement [cm]	0	0
Immediate Settlement [cm]	0	0
Secondary Settlement [cm]	0	0
Loading Stress ZZ [kPa]	0	49
Loading Stress XX [kPa]	-8.23403	33.7253
Loading Stress YY [kPa]	-6.41964	36.4818
Effective Stress ZZ [kPa]	0	209.005
Effective Stress XX [kPa]	-8.23403	186.91
Effective Stress YY [kPa]	-6.41964	190.287
Total Stress ZZ [kPa]	0	209.005
Total Stress XX [kPa]	-8.23403	186.91
Total Stress YY [kPa]	-6.41964	190.287
Modulus of Subgrade Reaction (Total) [kPa/m]	0	221.229
Modulus of Subgrade Reaction (Immediate) [kPa/m]	0	0
Modulus of Subgrade Reaction (Consolidation) [kPa/m]	0	221.229
Total Strain	0	0.049
Pore Water Pressure [kPa]	0	4.85595
Excess Pore Water Pressure [kPa]	-6.39232e-13	1.95969e-13
Degree of Consolidation [%]	0	100
Pre-consolidation Stress [kPa]	0.2695	208.081
Over-consolidation Ratio	1	1
Void Ratio	0	0
Permeability [m/y]	0.002943	0.01962
Coefficient of Consolidation [m^2/y]	1	2
Hydroconsolidation Settlement [cm]	0	0
Average Degree of Consolidation [%]	0	100
Undrained Shear Strength	0	1.58598

Stage: Stage 8 - 50 Years = 50 y

Data Type	Minimum	Maximum
Total Settlement [cm]	0	29.0468
Total Consolidation Settlement [cm]	0	29.0468
Virgin Consolidation Settlement [cm]	0	29.0468
Recompression Consolidation Settlement [cm]	0	0
Immediate Settlement [cm]	0	0
Secondary Settlement [cm]	0	0
Loading Stress ZZ [kPa]	0	49
Loading Stress XX [kPa]	-8.23403	33.7253
Loading Stress YY [kPa]	-6.41964	36.4818
Effective Stress ZZ [kPa]	0	209.005
Effective Stress XX [kPa]	-8.23403	186.91
Effective Stress YY [kPa]	-6.41964	190.287
Total Stress ZZ [kPa]	0	209.005
Total Stress XX [kPa]	-8.23403	186.91
Total Stress YY [kPa]	-6.41964	190.287
Modulus of Subgrade Reaction (Total) [kPa/m]	0	221.229
Modulus of Subgrade Reaction (Immediate) [kPa/m]	0	0
Modulus of Subgrade Reaction (Consolidation) [kPa/m]	0	221.229
Total Strain	0	0.049
Pore Water Pressure [kPa]	0	4.85595
Excess Pore Water Pressure [kPa]	-8.75943e-14	2.85724e-13
Degree of Consolidation [%]	0	100
Pre-consolidation Stress [kPa]	0.2695	208.081
Over-consolidation Ratio	1	1
Void Ratio	0	0
Permeability [m/y]	0.002943	0.01962
Coefficient of Consolidation [m^2/y]	1	2
Hydroconsolidation Settlement [cm]	0	0
Average Degree of Consolidation [%]	0	100
Undrained Shear Strength	0	1.58598

Stage: Stage 9 - 100 Years = 100 y

Data Type	Minimum	Maximum
Total Settlement [cm]	0	29.0468
Total Consolidation Settlement [cm]	0	29.0468
Virgin Consolidation Settlement [cm]	0	29.0468
Recompression Consolidation Settlement [cm]	0	0
Immediate Settlement [cm]	0	0
Secondary Settlement [cm]	0	0
Loading Stress ZZ [kPa]	0	49
Loading Stress XX [kPa]	-8.23403	33.7253
Loading Stress YY [kPa]	-6.41964	36.4818
Effective Stress ZZ [kPa]	0	209.005
Effective Stress XX [kPa]	-8.23403	186.91
Effective Stress YY [kPa]	-6.41964	190.287
Total Stress ZZ [kPa]	0	209.005
Total Stress XX [kPa]	-8.23403	186.91
Total Stress YY [kPa]	-6.41964	190.287
Modulus of Subgrade Reaction (Total) [kPa/m]	0	221.229
Modulus of Subgrade Reaction (Immediate) [kPa/m]	0	0
Modulus of Subgrade Reaction (Consolidation) [kPa/m]	0	221.229
Total Strain	0	0.049
Pore Water Pressure [kPa]	0	4.85595
Excess Pore Water Pressure [kPa]	-2.57377e-13	7.89042e-14
Degree of Consolidation [%]	0	100
Pre-consolidation Stress [kPa]	0.2695	208.081
Over-consolidation Ratio	1	1
Void Ratio	0	0
Permeability [m/y]	0.002943	0.01962
Coefficient of Consolidation [m^2/y]	1	2
Hydroconsolidation Settlement [cm]	0	0
Average Degree of Consolidation [%]	0	100
Undrained Shear Strength	0	1.58598

Loads

1. Fill Load: "Fill Load 1"

Label	Fill Load 1
Load Type	Flexible
Area of Load	55000 m2
Load	37 kPa

Advanced Staging

Stage	Load Factor	Depth [m]
Stage 1 = 0 y	0	0
Stage 2 - Load = 0.1 y	0.25	0
Stage 3 = 0.5 y	1	0
Stage 4 = 1 y	1	0
Stage 5 - GCR Stage = 1.5 y	1	0
Stage 6 - Build = 2 y	1	0
Stage 7 - 10 Years = 10 y	1	0
Stage 8 - 50 Years = 50 y	1	0
Stage 9 - 100 Years = 100 y	1	0

Coordinates

X [m]	Y [m]
-100	0
175	0
175	200
-100	200

2. Rectangular Load: "Rectangular Load 2"

Length	12 m
Width	20 m
Rotation angle	0 degrees
Load Type	Flexible
Area of Load	240 m2
Load	12 kPa
Depth	0 m
Installation Stage	Stage 6 - Build = 2 y

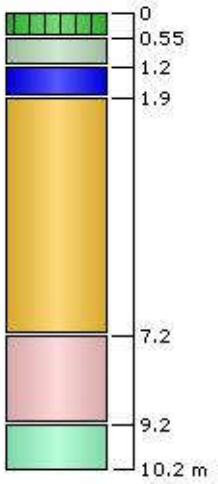
Coordinates

X [m]	Y [m]
14	95
26	95
26	115
14	115

Soil Layers

Ground Surface Drained: Yes

Layer #	Type	Thickness [m]	Depth [m]	Drained at Bottom
1	Silty sand and sandy silt	0.55	0	No
2	Clay & silty clay1	0.65	0.55	No
3	Clay	0.7	1.2	No
4	Clay & silty clay2	5.3	1.9	No
5	Clay & silty clay3	2	7.2	No
6	Very dense/stiff soil	1	9.2	No



Soil Properties

Property	Silty sand and sandy silt	Clay & silty clay1	Clay	Clay & silty clay2
Color				
Unit Weight [kN/m3]	15.69	15.69	15.69	15.69
Saturated Unit Weight [kN/m3]	19.61	19.61	19.61	19.61
K0	1	1	1	1
Primary Consolidation	Enabled	Enabled	Enabled	Enabled
Material Type	Linear	Linear	Linear	Linear
mv [m2/kN]	0.001	0.0008	0.0006	0.0006
mvur [m2/kN]	0.001	0.0008	0.0006	0.0006
Cv [m2/y]	2	1	1	1
Cvr [m2/y]	-	-	-	-
B-bar	1	1	1	1
Undrained Su A [kN/m2]	0	0	0	0
Undrained Su S	0.2	0.2	0.2	0.2
Undrained Su m	0.8	0.8	0.8	0.8
Piezo Line ID	1	0	0	0

Property	Clay & silty clay3	Very dense/stiff soil
Color		
Unit Weight [kN/m3]	15.69	19.12
Saturated Unit Weight [kN/m3]	21.57	21.57
K0	1	1
Primary Consolidation	Enabled	Enabled
Material Type	Linear	Linear
mv [m2/kN]	0.0006	0.0003
mvur [m2/kN]	0.0006	0.0003
Cv [m2/y]	1	1
Cvr [m2/y]	-	-
B-bar	1	1
Undrained Su A [kN/m2]	0	0
Undrained Su S	0.2	0.2
Undrained Su m	0.8	0.8
Piezo Line ID	0	0

Groundwater

Groundwater method	Piezometric Lines
Water Unit Weight	9.81 kN/m3

Piezometric Line Entities

ID	Depth (m)
1	0 m

Query

Query Lines

Line #	Query Line Name	Start Location	End Location	Horizontal Divisions	Vertical Divisions
1	Query Line 1	2.284, 105.076	37.284, 105.076	20	Auto: 53

Field Point Grid

Number of points	362
Expansion Factor	2

Grid Coordinates

X [m]	Y [m]
312.5	337.5
312.5	-137.5
-237.5	-137.5
-237.5	337.5