Site Suitability Report for Civil Design

174 Lamb Road, Pukenui, Northland
Moekoraha Papakāinga Development

Prepared For:
Realm Property Group Limited

Job No.: 15657

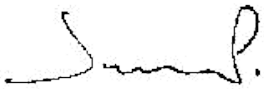
Rev: 0 **Date:** 29 July 2024

CHESTER

Revision History

Revision No	Description/comments	Prepared By	Date
0	For Resource Consent	P. Liebenberg	29/07/2024

Document Control

Action	Name	Signed	Date
Prepared by	P. Liebenberg Senior Civil Engineer		29/07/2024
Reviewed by	J. Philips Technical Manager		29/07/2024

Distribution

Business/company	Attention	Role
Realm Property Group Limited	Alex Hitchcock	Client

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1 Introduction

Chester Consultants Ltd (Chester) has been engaged by client, Realm Property Group Limited, to provide a Site Suitability Report with respect to proposed residential dwellings on their Papakāinga at 174 Lamb Road, Pukenui, Northland.

This report has been prepared solely for the benefit of this specific project, and the Far North District Council (FNDC). Chester accepts no liability for inaccuracies in third party information used as part of this report. The reliance by other parties on the information or opinions contained in the report shall, without our prior review and agreement in writing, be at such parties' sole risk.

This report is based on development data obtained from the FNDC and Northland Regional Council (NRC) maps current to the site at the time of this document's production. Should alterations be made which impact upon the development not otherwise authorised by this report then the design / comments / recommendations contained within this report may no longer be valid.

In the event of the above, the property owner should immediately notify Chester to enable the impact to be assessed and, if required, the design and or recommendations shall be amended accordingly and as necessary.

2 Existing Site Description

The subject properties are legally described as Section 8 SO 65943, Section 9 SO 65943, these will be referred to as the northern site (Section 9 SO 65943) and southern site (Section 8 SO 65943) respectively in this report.

The property on the southern side is currently vacant. A broad ridgeline traversing from east to west in a zig-zag fashion is present within the northern section of the property. The ridge side slope inclinations range from 20° to 30°. A wetland is present within the northeastern section of the property, between the ridge and the road. The wetland appeared to be dry at time of our site visit. Land to the south of the ridgeline is covered with dense native bush. The eastern section of the ridgeline has been cleared of vegetation and five building platforms and associated accessways have been created.

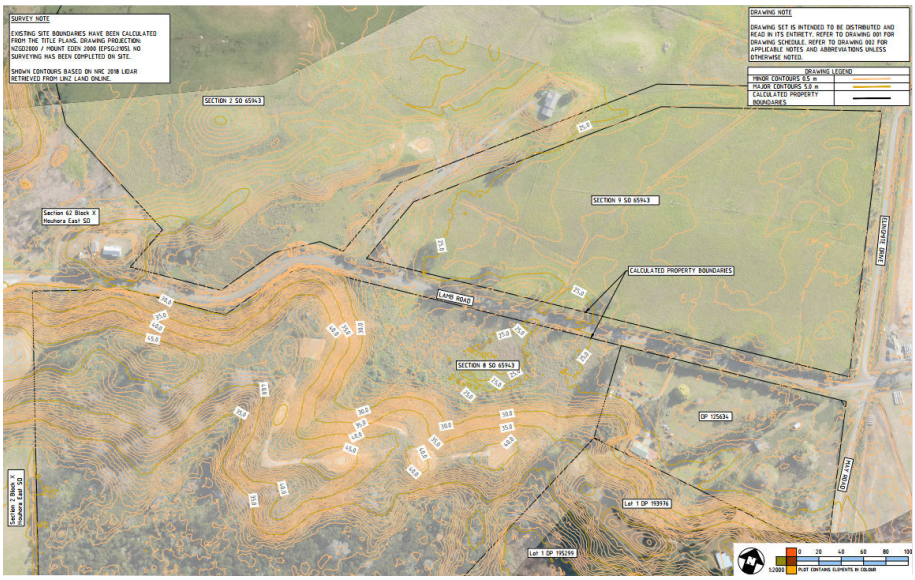

Figure 1: Aerial Image of Development Sites

The property on the northern side is situated to the north and west of the property on the southern side. A dwelling serviced by a gravel driveway is present near the southeast boundary. Isolated elevated areas are present, including the location of the dwelling platform. The general area is currently used as grazing land.

Refer to Figure 1 above for details of the site and its surrounding features.

3 Proposed Site Development

It is proposed to construct 24 new dwellings across the two sites with associated access roadways, a community centre, and servicing as shown in Figure 2 below and in Appendix A. This report is intended to support a Resource Consent application for Land Use.

Figure 2: Proposed Site Plan by BDG (Dated 23 July 2024)

4 Natural Hazards – Flooding

To assess the flooding risk, we have reviewed the available council flood data and visited the site. Additional Rain-on-Grid (ROG) flood modelling has been undertaken to better determine site specific flooding and overland flowpath extents.

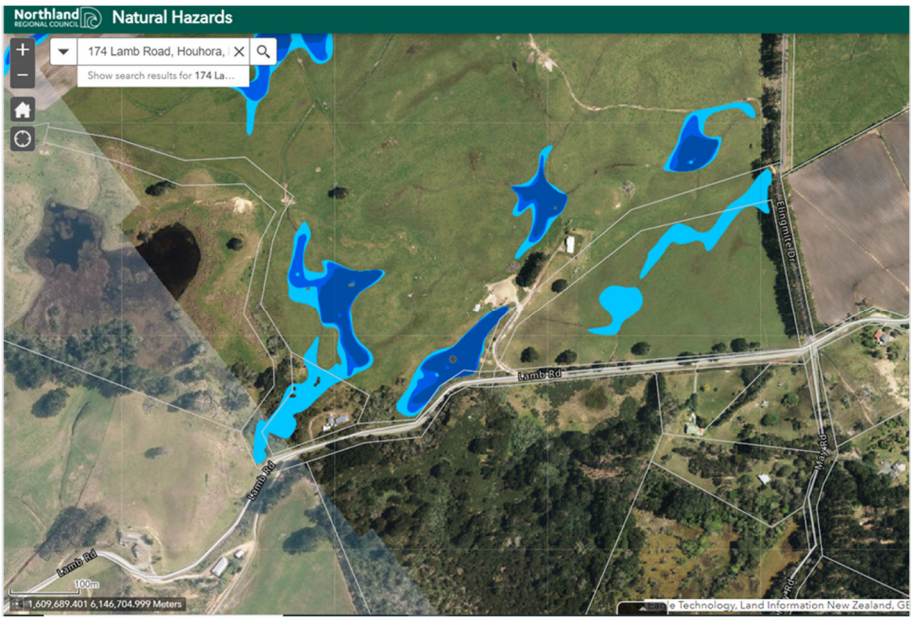

Figure 3: NRC Site Flood Hazard (NRC Priority Rivers Maps, 10/06/2024)

4.1 Council Data – Natural Hazards Mapping & Flood Mapping

As per Figure 3 above, the NRC Natural Hazards Priority Rivers Flood mapping for 10-year, 50 year and 100 year events indicate that there is flooding on the site. However, it is not expected to significantly affect the proposed development as the proposed dwellings will be raised on pile foundations to a level sufficient to provide the minimum freeboard required by Council.

The NRC modelling shows the proposed site is unlikely to be affected by river or coastal inundation flooding but has some localised ponding areas that require additional consideration in our site specific flood modelling.

4.2 Flood Risk Discussion

4.2.1 Site Walkover

From our site walkover we can confirm that the site topography and surrounding catchment is consistent with what is shown on the council flooding maps and from our modelling.

With respect to flooding in the proposed building locations, our site walkover observed no localised depressions or channels of concern given the proposed dwellings will be placed on piled foundations.

4.2.2 Flood Modelling

A 2D Rain-on-Grid (ROG) flood model was created using InfoWorks ICM software to better understand site specific conditions for a typical 1% AEP climate change adjusted storm event. This flood model provided likely extents of localised flooding due to depressions and overland flowpaths within the development area.

Table 1: Flood Model Inputs

Model Input	Value
Rainfall Depth (1% AEP, 24hr NIWA Historic)	190mm
Climate Change Factor	20%
Climate Change Rainfall Depth	228mm
Rainfall Hyetograph/Distribution	SCS Type 1A
Terrain Data	NRC LiDAR, 1m DEM
Mannings Roughness	0.035

The flood modelling suggested there are localised area of ponding in excess of 300mm (red zones in Figure 42 below). These local depressions have been identified for earthworks/drainage improvement works during design, to ensure stormwater is drained to the main identified flow channel on site.

The results from the stormwater modelling has identified overland flowpaths (that corresponds to the data from NRC Priority Rivers Maps, 10/06/2024) that need consideration during design and construction. Additionally, the deepest ponding areas identified in red (Figure 42) are caused by low lying land as identified within publicly available LiDAR topographical data. These areas should be avoided for buildings unless specifically designed drainage works are completed, most notably required immediately south of Lamb Road (drain to the stream/pond) and on the western side of Korakanui O Rua Road on the most easterly site boundary.

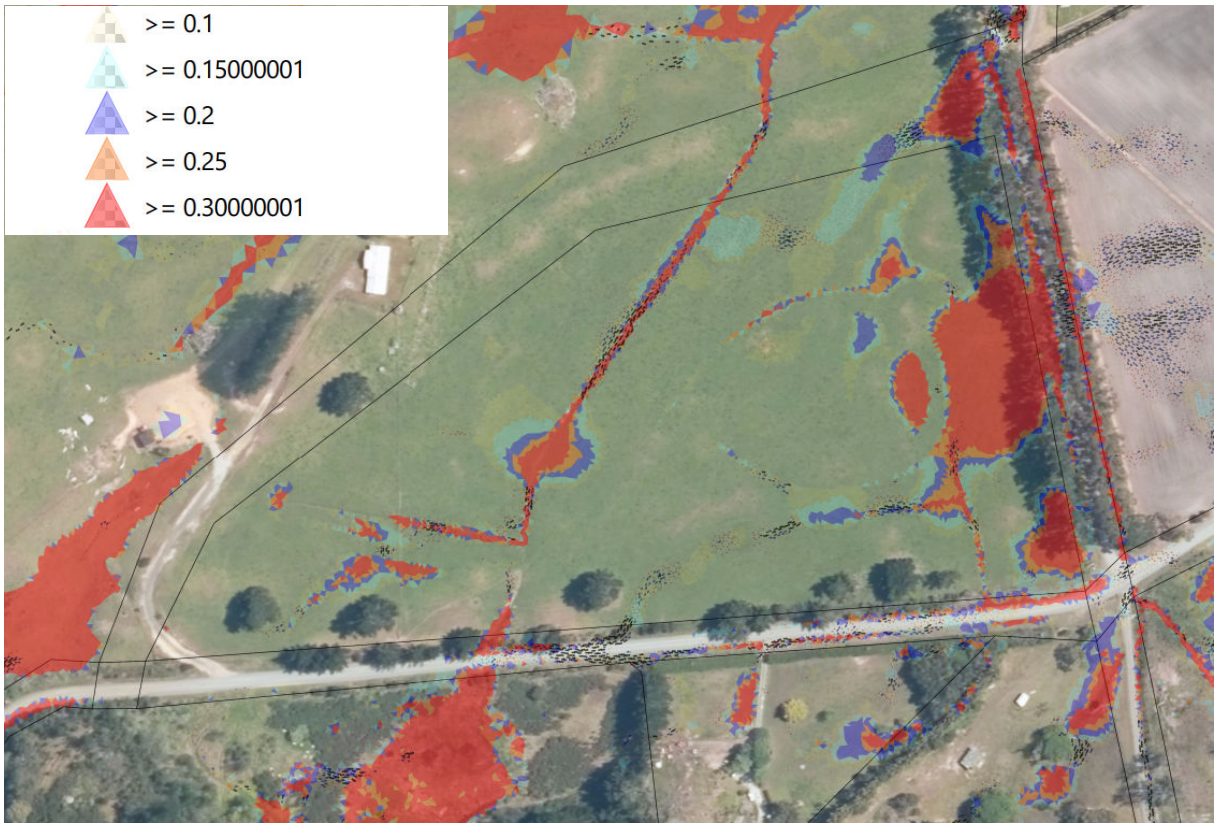

Figure 4: 100-Year Rain-on-Grid Flood map (ICM 26/07/2024)

Given the above, we conclude that NRC priority rivers flood data, complimented with our own stormwater modelling analysis provides a fair representation of the flooding risk on the site which must be considered during design and construction stages of this project.

4.3 Development Controls

Given the nature of the flooding within the development site, we recommend the following building controls.

4.3.1 Dwelling Finished Floor Levels

Proposed dwellings are to maintain a 0.5m (minimum) freeboard above the 1% AEP climate change flood water level perpendicular to the direction of flow at the upstream boundary of a given dwelling as per Far North District Council Engineering Standard 2023, Section 4.3.10.7 Freeboard Requirements.

4.3.2 Foundations and Subfloor Cladding

The proposed dwellings which are to be situated within overland flow path and flood extents are not to impede the overland flow or flooding. As such, the proposed dwellings are required to be situated on pile foundations.

If subfloor cladding is used, then the subfloor cladding is required to allow water to flow through. It is recommended that the cladding is designed so that at least 70% of the surface area is not solid to allow water to flow through. Maintenance hatches are required to be incorporated into the design of the subfloor cladding to provide access to the area underneath the dwellings.

4.3.3 Fencing

New fences proposed within the overland flow path an flooding extents are to comply with the one of the following fence designs:

- Post-and-wire or wire mesh type fences;

- Railing type fences where at least 70% of the surface area of the fence is open to allow water to flow through.

4.3.4 Earthworks

Additional earthworks within the development area, beyond what is shown in this proposal, must be designed by a suitably qualified engineer with respect to the flood data presented within this report and the governing standards at the time of future assessment.

4.3.5 Structures and Utility Servicing

Structures, including foundations, are to be made out of water-resistant construction materials and are to be structurally designed to withstand flood forces during the 1% AEP flooding event.

Utility service connections are to be constructed to ensure flood-proofing should they become submerged within the overland flow or flood extents.

5 Earthworks, Erosion and Sediment Control

5.1 Earthworks

Earthworks are required to upgrade the private accessway and provide services for the site. The proposed works will not be within the permitted activity requirements as per the FNDC District Plan section 12.3.6.1.1 and the Proposed Regional Plan for Northland C.8.3.1.

5.1.1 Expected Earthwork Volumes

Table 2 below outlines the estimated earthworks volumes.

Table 2: Estimated Earthwork Volumes

Earthwork	Value
Disturbed Area	20,350 sq-m
Cut Volume	2700 cu-m
Fill Volume	5650 cu-m
Net Earthworks	2950 cu-m (Fill)

5.1.2 FNDC Operative District Plan Earthwork Assessment

We have prepared an assessment as per the Far North District Council Operative Plan. Table 3 below sets out the relevant rules and assessments under Section 3, Chapter 12 of the Plan.

Table 3: FNDC Operative Plan - Permitted Activity Assessment

Rule 12.3.6.1.1	Assessment/Comment
12.3.6.1.1 Land use Activities Involving Excavation and/or filling, excluding mining and quarrying, in the Rural Production Zone or Kauri Cliffs Zone. *Excavation and/or filling, excluding mining and quarrying, on any site in the Rural Production Zone or Kauri Cliffs Zone is permitted, provided that:* a. *It does not exceed 5,000m^3 in any 12-month period per site; and* b. *It does not involve a continuous cut or filled face exceeding an average of 1.5m in height over the length of the face i.e., the maximum permitted average cut and fill height may be 3m.*	The estimated earthwork volume exceeds 5,000 cubic metres with 2700 cu-m of Cut and 5650 cu-m of Fill. Thus the earthwork activities in this proposal are not a permitted activity.

5.1.3 NRC Proposed Regional Plan Earthwork Assessment

We have prepared an assessment as per the Proposed Regional Plan for Northland, February 2024. Table 4 below sets out our assessment against section C.8.3.1 Earthworks.

Rule C.8.3.1: *the area and volume of earthworks at a particular location or associated with a project complies with the thresholds in* [NRC Regional Plan] *Table 15: Permitted activity earthworks thresholds.*

Table 4: Proposed Regional Plan for Northland - Permitted Activity Assessment

Location	Earthworks Thresholds	Assessment/Comment
Within 10m of a natural wetland, the bed of a continually or intermittently flowing river or lake	*200 square metres of exposed earth at any time, and 50 cubic metres of moved or placed earth in any 12-month period.*	No earthworks are proposed within 10m of a natural wetland.
Within 10m of an īnanga spawning site	*200 square metres of exposed earth at any time, and 50 cubic metres of moved or placed earth in any 12-month period.*	The development site is not within 10m of an īnanga spawning site.
Catchment of an Outstanding Lake	*2500 square metres of exposed earth at any time.*	The development site is not within a catchment of an outstanding lake.
Erosion-prone Land	*2500 square metres of exposed earth at any time.*	The development site is not within the Erosion Prone Land overlay.
High-risk flood hazard area	*50 cubic metres of moved or placed earth in any 12-month period.*	Not applicable.
Coastal riparian and foredune management area	*Excluding for coastal dune restoration, 200 square metres of exposed earth at any time.*	The development site is not in a coastal area.
Flood hazard area	*100 cubic metres of moved or place earth in any 12-month period.*	Earthworks of ±90 cu-m related to the roadway construction are proposed within a flood hazard area.
Other areas	*5,000 square metres of exposed earth at any time.*	The proposed earthworks area for the site more than 5,000m^2.

5.2 Erosion and Sediment Control (ESC)

Erosion and sediment control (ESC) measures can be implemented to reduce the amount of sediment generated, prior to the commencement of vegetation clearance and earthworks. Specific management and implementation of erosion and sediment control may be used including:

- Undertaking earthworks and construction during the drier summer months to minimise likelihood of heavy rainfall and extended periods of rainfall.
- Minimising duration and amount of exposed earth.
- Installation of sediment control bunds to divert clean water around the exposed earth site.
- Installation of silt fences/super silt fences in accordance with section F1.3/F1.4 of Auckland Council Guidance Document 005 (GD05).
- Installation of silt socks in accordance with section F1.5 of GD05.

Therefore, we can conclude that the minor earthworks required to complete the development enabling works are a permitted activity under the FNDC District Plan. Sediment control bunds and/or silt fences and/or silt socks are to be implemented prior to physical earthworks being undertaken.

6 Access

6.1 Vehicle Crossing

Vehicle crossings provide a means of vehicular access to a property as a vehicle moves from the roadway, across the berm, and into a property.

6.1.1 Existing Crossing

The project site shares a legal boundary with the Lamb Road reserve and thus has a legal means of access to and from the property, however, the northern site and southern site are currently not provided with vehicle crossings.

6.1.1 Proposed Crossings

It is proposed to construct three new vehicle crossings to provide access to the new development off Lamb Road.

One crossing for the common access way for the northern site.

One crossing for the common access way for the southern site.

One crossing for access to the community centre on the northern site, located on the shared boundary between Section 9 SO 65943, Section 8 SO 65943 & Lamb Road (Par ID 5209513).

The vehicle crossings are proposed to be in general accordance with FNDC Engineering Standards (Sheet 21 Type - 1B).

The existing environment at the proposed location of the community centre's access fails to provide adequate sightlines to the east of the proposed vehicle crossing along Lamb Road because of vegetation—refer to Figure 5 below. Clearing of vegetation will be necessary to achieve suitable sightlines.

Refer to the Civil Design 700 plans prepared by Chester for more information.

Figure 5: Lamb Road looking east from location of proposed vehicle crossing for community centre

6.2 Private Accessway

It is proposed to construct two new shared accessways within the sites to provide access to the twenty four new dwellings. The accessways are proposed to be in general accordance with FNDC District Plan standards for private access.

Refer to the Civil Design 700 plans prepared by Chester Consultants for more information.

7 Water Supply

There is no public reticulated water supply available to the site.

7.1 Potable Water Supply

It is proposed to install on-site water tanks to service the proposed development in terms of potable water supply, which is typical in the surrounding rural area. At the time of the building consent application for the proposed new dwellings, the rainwater tanks will be designed to meet the demands of each dwelling and its occupants.

Refer to the Civil Design 600 plans prepared by Chester Consultants for more information.

7.2 Firefighting Water Supply

It is proposed to provide on-site firefighting water supply in accordance with SNZ PAS 4509:2008. Fire water supply will be provided from on-site water storage tanks.

7.2.1 Fire Water Demand

As per Standard New Zealand Publicly Available Specification 4509 (SNZ PAS 4509:2008), non-sprinklered single family and multi-unit dwellings (excluding multi-story apartments) require fire water supplies classified as FW2.

To meet the requirement of FW2, on-site fire water storage tanks must meet the following requirements:

- Storage of 45 cubic metres to provide firefighting water supply for 30 minutes not more than 90 metres and no closer than 6 metres from the fire hazard;
- Unimpeded vehicular access to the storage location with roading able to support a 20 tonne vehicle;
- Storage to be vertically and horizontally located even with and adjacent to the vehicular hardstand to limit suction lift and friction losses for the firefighting pump;
- Means to automatically keep the tank topped up and manually refilled after emptying;
- Lengths listed above shall generally be considered as the length of hose as it lies on the ground;
- Refer to SNZ PAS 4509:2008 for additional requirements and information.

7.2.2 Fire Water Supply Locations

On-site water storage, in compliance with SNZ PAS 4509:2008, will consist of two 25m^3 water tanks to be located at various locations to meet the maximum distance requirement of 90m from the proposed properties. It will be topped up and have water circulated from the roof of nearby dwelling(s) and be fitted with a screw coupling adaptor and shut off valve at the base.

Refer to the Civil Design 600 plan prepared by Chester Consultants for a layout of the proposed locations.

8 Stormwater

There is no public stormwater network available to the site. Currently stormwater appears to discharge to the natural ground and sheet flow towards the northeast corner of the northern site.

Stormwater runoff from the dwelling roofs are proposed to be collected into re-use water tanks and used for potable water supply. Overflow from the tanks will be discharged to the surrounding area. The outlet of the overflow will have rip rap to provide suitable erosion protection where required.

To collect stormwater surface runoff from the private accessway on the southern site, privately owned and maintained catchpits will be provided at the low points of the accessways to capture sediment prior to discharge at the base of the hillsides. At the base of the hillsides, erosion protection/energy dissipation will be provided prior to the runoff flowing across the ground and following historic drainage patterns.

Stormwater surface runoff from the private accessway on the northern site will be collected and diverted within an open drain adjacent to the road where sediment will be captured before discharging to the natural ground surface and following historic drainage patterns.

The impervious area of the proposed development is less than the maximum allowable impervious area of 15%.

Refer to the Civil Design 400 plans prepared by Chester for more information.

8.1 Planning Assessment

8.1.1 NRC Proposed Regional Plan Stormwater Assessment

Table 5 below sets out our assessment against section C.6.4.2 Other stormwater discharges – permitted activity of the Proposed Regional Plan for Northland, February 2024. In our opinion, the diversion and discharge of stormwater appears to comply with the Permitted activity status.

Table 5: Proposed Regional Plan for Northland - Permitted Activity Assessment

Rule C.6.4.2	Assessment/Comment
1. *The discharge or diversion is not from:* *a. a public stormwater network, or* *b. a high-risk industrial or trade premises, and*	The discharge is not from a public stormwater network or high-risk industrial or trade premises.
2. *The diversion and discharge does not cause or increase flooding of land on another property in a storm event of up to and including a 10 percent annual exceedance probability, or flooding of buildings on another property in a storm event of up to and including a one percent annual exceedance probability, and*	In our opinion, the discharge will not cause or increase flooding on another property. Although the post-development impervious area is larger than the pre-development, the runoff is being discharged to the same catchment.
3. *where the diversion or discharge is from a hazardous substance storage or handling area:* *a. the stormwater collection system is designed and operated to prevent hazardous substances stored or used on the site from entering the stormwater system, or* *b. there is a secondary containment system in place to intercept any spillage of hazardous substances and either discharges that spillage to a trade waste system or stores it for removal and treatment, or*	The discharge is not from a hazardous substance storage or handling area.

c. *if the stormwater contains oil contaminants, the stormwater is passed through a stormwater treatment system designed in accordance with the Environmental Guidelines for Water Discharges from Petroleum Industry Sites in New Zealand (Ministry for the Environment, 1998) prior to discharge, and*	
4. *Where the diversion or discharge is from an industrial or trade premises:* a. *the stormwater collection system is designed and operated to prevent any contaminants stored or used on the site, other than those already controlled by condition 3) above, from entering stormwater unless the stormwater is discharged through a stormwater treatment system, and* b. *any process water or liquid waste stream on the site is bunded, or otherwise contained, within an area of sufficient capacity to provide secondary containment equivalent to 100 percent of the quantity of any process water or liquid waste that has the potential to spill into a stormwater collection system, in order to prevent trade waste entering the stormwater collection system, and*	The discharge is not from an industrial or trade premises.
5. *The diversion or discharge is not into potentially contaminated land, or onto potentially contaminated land that is not covered by an impervious area, and*	The discharge is not into potentially contaminated land, or onto potentially contaminated land that is not covered by an impervious area.
6. *The diversion and discharge does not cause permanent scouring or erosion of the bed of a water body at the point of discharge, and*	Erosion and scour protection is proposed at the point of discharge.
7. *The discharge does not contain more than 15 milligrams per litre of total petroleum hydrocarbons, and*	The proposed impermeable areas are all low contaminant yielding and are very unlikely to pick up petroleum hydrocarbon contaminants of more than 5 milligrams per litre.
8. *The discharge does not cause any of the following effects in the receiving waters beyond the zone of reasonable mixing:* a. *the production of conspicuous oil or grease films, scums or foams, of floatable or suspended materials, or* b. *a conspicuous change in the colour or visual clarity, or* c. *an emission of objectionable odour, or* d. *the rendering of freshwater unsuitable for consumption by farm animals, or* e. *the rendering of freshwater taken from a mapped priority drinking water*	None of these effects are anticipated on the receiving waters.

abstraction point (refer I Maps | Ngā mahere matawhenua) unsuitable for human consumption after existing treatment.

9 Wastewater

The development site does not have a connection to the existing public network. As such, on-site wastewater treatment and disposal is proposed. A site assessment has been undertaken by Soil and Rock Consultants which has been used to develop an indicative design for an on-site dispersal field in accordance with ASNZS 1547:2012 and the Proposed Regional Plan for Northland. The following sections summarises our assessment and indicative design which will be further developed at the detailed design stage.

9.1 Site Assessment

A desktop study and geotechnical investigations of the development site were completed by Soil and Rock Consultants. Reference to the GNS New Zealand Geological Web Map 1:250,000 Geology map indicates the site is underlain by dune sand deposits of the Karioitahi Group (See Figure 3). Karioitahi Group soils are described as weakly cemented sand in fixed parabolic dunes with intermixed sand, mud, and peat in interdune deposits.

Loose to cemented sands were encountered during the investigation, with no mud or peat deposits encountered (apart from one auger hole, which showed organic-stained sand, drilled within the wetland area).

The near-surface soils can be classified as Soil Category 3 (medium-fine and loamy sand – good drainage) as per Auckland Council Technical Publication 58 (TP58). However, for conservativity, it is recommended that Soil Category 4 (sandy loam – moderate drainage), with a maximum dispersal rate of 5mm/day, be adopted for wastewater design. Given the dense, less permeable soil at shallow depth, dispersal via conventional in-ground soakage trenches should be avoided - dispersal of treated wastewater would best be achieved via Pressure-Compensated Dripline Irrigation (PCDI) on a raised bed to ensure separation from seasonal high groundwater.

Please refer to the Geotechnical Investigation Report prepared on the 5th of April 2024 by Soil and Rock Consultants for further details.

9.1.1 Groundwater

Groundwater was not encountered in most of the auger holes on the day of drilling, with the exception of one auger hole where groundwater was measured at 1.1m bpgl. Groundwater measurements taken during drilling are not always an accurate portrayal of the actual long-term groundwater table as groundwater levels can take time to stabilise within the auger hole following drilling.

It is therefore recommended that the dispersal beds be raised to ensure separation from seasonal high groundwater.

9.1.2 Design Flow Volume

The following section sets out the design flow volume for the proposed wastewater disposal system based on the proposed development shown in Figure 2 above.

Table 6: Design Occupation (Interpreted from ASNZS 1547:2012, Table J1

No. of Bedrooms	No. of Dwellings	Population Equivalent	Design Occupancy
Northern Site			
2	4	4	16
3	6	5	30
4	9	6	54
Community Centre	1	50	50
Kohanga Reo	1	35	35
		Total:	185
No. of Bedrooms	No. of Dwellings	Population Equivalent	Design Occupancy
Southern Site			
2	8	4	32
3	3	5	15
		Total:	47

Table 7: Design flow volume for proposed development

Four Bedroom Dwelling:	
Design Occupancy:	185 (North) and 47 (South) (Table 6 above)
Design Flow Allowance per Person:	145 L/person/day (ASNZS 1547:2012, Table H3, Standard Water Reduction Fixtures, Water Tank Supply) 20 L/person/day for community centre (ASNZS 1547:2012, Table H4, Standard Water Fixtures, Water Tank Supply)
Design Flow Volume:	16,200 L/day (North) and 6815L/day (South)

9.2 Wastewater System

9.2.1 Treatment System

The treatment system required for this design is proposed to be for secondary wastewater treatment and treat a design flows of 16200 L/day (North) and 6815L/day (South), outlined in Table 7 above. The system supplier is to be determined at the detailed design stage.

9.2.2 Land Disposal System

Table 8: Land Disposal System Details

Land Disposal	
Disposal Method:	Pressure-Compensated Dripline Irrigation
Selected Loading Rate:	5 mm/day (Category 4 soils, ASNZS 1547:2012, Table L1)
Disposal Field Area:	16,200/5 = 3,240m^2 north and 6,815/5 = 1,363 m^2 south
Reserve Area:	972m^2 for north and 409 for south (30%, NRC Regional Plan. Section C.6.1.1)
Total Area Required:	4212m^2 for north and 1,772 m^2 for south
Bed depth:	0.6m min.
Topsoil Depth:	100-150mm (to be designed by others)
Servicing Requirement:	As per manufacturers specifications

Refer to Chester Drawing 520 and 521 for the proposed location of the treatment and disposal system.

9.3 Planning Assessment

This section of the report sets out our assessment of the proposed activity against the relevant planning rules.

9.3.1 Far North District Council Operative Plan

Chester Consultants believe that the proposal is a permitted activity under Far North District Council Operative Plan. Table 9 below sets out the relevant rule under Section 7, Chapter 12:

Table 9: FNDC Operative Plan - Permitted Activity Assessment

Rule 12.7.6.1.4	Assessment/Comment
Land use activities which produce human sewage effluent (including grey water) are permitted provided that: a. *the effluent discharges to a lawfully established reticulated sewerage system; or* b. *the effluent is treated and disposed of on-site such that each site has its own treatment and disposal system no part of which shall be located closer than 30m from the boundary of any river, lake, wetland or the boundary of the coastal marine area.*	The waste created by the development is proposed to be treated and disposed of by a system which has no part closer than 30 m from the bank of any river, lake, wetland, or the boundary of the coastal marine area.

9.3.2 Proposed Regional Plan for Northland

Table 10 below sets out our assessment against section C.6.1.3 Other on-site treated domestic wastewater discharge – permitted activity of the Proposed Regional Plan for Northland, February 2024.

Table 10: Proposed Regional Plan for Northland - Permitted Activity Assessment

Rule C.6.1.3	Assessment/Comment
1. *The on-site system is designed and constructed in accordance with the Australian/New Zealand Standard. On-site Domestic Wastewater Management (AS/NZS 1547:2012), and*	The on-site wastewater system has been designed in accordance with AS/NZS 1547:2012.
2. *The volume of wastewater discharged does not exceed two cubic metres per day, and*	The maximum daily design flow volume is 23 cubic metres per day which is more than 2 cubic metres.
3. *The discharge is not via a spray irrigation system or deep soakage system, and*	The discharge is via a drip irrigation system.
4. *The slope of the disposal area is not greater than 25 degrees, and*	The max slope is approximately 0.5% (north) and 2.5% (south).
5. *For wastewater that has received secondary or tertiary treatment, it is discharged via:* a. *a trench or bed system in soil categories 3 to 5 that is designed in accordance with Appendix L of Australian/New Zealand Standard On-Site Domestic Wastewater Management (AS/NZS 1547:2012); or* b. *an irrigation line system that is dose loaded and covered by a minimum of 50 millimetres of topsoil, mulch, or bark, and*	The wastewater will receive secondary treatment and is disposed of into Category 4 equivalent soils via a Pressure-Compensated Dripline Irrigation system.
6. *For the discharge of wastewater onto the surface of slopes greater than 10 degrees:* a. *the wastewater, excluding greywater, has received at least secondary treatment, and* b. *the irrigation lines are firmly attached to the disposal area, and* c. *where there is an up-slope catchment that generates stormwater runoff, a diversion system is installed and maintained to divert surface water runoff from the up-slope catchment away from the disposal area, and*	The proposed disposal system discharges onto a slope shallower than 10 degrees, so this does not apply.

d. a minimum 10 metre buffer area down-slope of the lowest irrigation line is included as part of the disposal area, and *e. the disposal area is located within existing established vegetation that has at least 80 percent canopy cover, or* *f. the irrigation lines are covered by a minimum of 100 millimetres of topsoil, mulch, or bark, and*	
7. *The disposal area and reserve disposal area are situated outside the relevant exclusion areas and setbacks in Table 9: Exclusion areas and setback distances for on-site domestic wastewater systems, and*	The proposal complies with all exclusion areas and setback distances set out in [FNDC District Plan] Table 9.
8. *For septic tank treatment systems, a filter that retains solids greater than 3.5 millimetres in size is fitted on the outlet, and*	The proposed system will have a filter that meets this requirement.
9. *The following reserve disposal areas are available at all times:* *a. 100 percent of the existing effluent disposal area where the wastewater has received primary treatment or is only comprised of greywater, or* *b. 30 percent of the existing effluent disposal area where the wastewater has received secondary treatment or tertiary treatment, and*	The wastewater receives secondary treatment system and a 30% reserve area is proposed.
10. *The on-site system is maintained so that it operates effectively at all times and maintenance is undertaken in accordance with the manufacturer's specifications, and*	A maintenance agreement between the applicant and supplier (or other suitably qualified contractor) is to be entered in to.
11. *The discharge does not contaminate any groundwater water supply or surface water, and*	Noted.
12. *There is no surface runoff or ponding of wastewater, and*	Noted.
13. *There is no offensive or objectionable odour beyond the property boundary.*	Noted.

9.3.3 Water Conservation Condition

Chester Consultants recommends that it be a condition of consent that the houses are fitted with standard water reduction fittings to ensure that fact is not lost upon home builders with respect to on-site wastewater disposal system.

10 Conclusions

10.1 Natural Hazards – Flooding

The proposed dwellings will be placed on pile foundations with minimum freeboard of 500mm from finished floor to flood water level.

10.2 Earthworks, Erosion and Sediment Control

Earthworks are proposed to in relation to the road construction within the site. Sediment control measures (bunds, silt fences and or silt socks) are to be implemented prior to physical earthworks being undertaken.

10.3 Access

The existing properties don't have access to the public road reserve and three new vehicle crossings are proposed (two for the northern site and one for the southern site). Two common access ways are required to provide access to the proposed dwellings.

10.4 Water Supply

The existing property does not have access to the public water supply service. On-site rainwater tanks are proposed to service the new development for potable water supply.

10.5 Firefighting Water Supply

The existing property requires fire water supplies sufficient to satisfy the FW2 requirements. It is proposed to provide the new development with on-site water storage for firefighting purposes no more than 90m from a given dwelling.

10.6 Stormwater

The existing property does not have access to the public stormwater service. Roof runoff will be collected and used for potable water supply. Runoff from the accessways will be collected via private catchpits or swales to capture sediment prior to discharge to ground so it may follow historic drainage patterns.

10.7 Wastewater

The existing property does not have access to the public wastewater service. It is proposed to service the development via an on-site wastewater treatment and land disposal system in accordance with ASNZS1547:2012. The design flow volume is less than $2m^3$/day.

11 Limitations

This assessment contains the professional opinion of Chester Consultants as to the matters set out herein, in light of the information available to it during the preparation, using its professional judgement and acting in accordance with the standard of care and skill normally exercised by professional engineers providing similar services in similar circumstances. No other express or implied warranty is made as to the professional advice contained in this report.

We have prepared this report in accordance with the brief as provided and our terms of engagement. The information contained in this report has been prepared by Chester Consultants at the request of Realm Property Group Limited and is exclusively for its client use and reliance. It is not possible to make a proper assessment of this assessment without a clear understanding of the terms of engagement under which it has been prepared, including the scope of the instructions and directions given to and the assumptions made by Chester Consultants. The assessment will not address issues which would need to be considered for another party if that party's particular circumstances, requirements and experience were known and, further, may make assumptions about matters of which a third party is not aware. No responsibility or liability to any third party is accepted for any loss or damage whatsoever arising out of the use of or reliance on this assessment by any third party.

The assessment is also based on information that has been provided to Chester Consultants from other sources or by other parties. The assessment has been prepared strictly on the basis that the information that has been provided is accurate, completed, and adequate. To the extent that any information is inaccurate, incomplete or inadequate, Chester takes no responsibility and disclaims all liability whatsoever for any loss or damage that results from any conclusions based on information that has been provided to Chester Consultants.

12 Appendices

Appendix A – Architectural Site Plan by BDG

Site Area - Overall

Zone Name	Area
Section 1	1,457,531.2
Section 2	13,715,037.0
Section 3	215,392.5
Section 4	948,667.1
Section 5	1,564,083.3
Section 6	75,041.4
Section 7	190,291.4
SECTION 8	193,515.7
SECTION 9	70,585.2
	18,430,144.8 m²

Building Coverage - All Buildings

Type	Area	Supplier	
Rest of farm			
Farm House	2,234.2	N/A	
	2,234.2 m²		
Section 8			
Type B	380.9	Bode	
Type A	492.2	Bode	
	873.1 m²		
Section 9			
Type E	382.8	Laminata	
Type D	255.2	Laminata	
Type C	957.6	Bode	
Type B	504.7	Bode	
Type A	246.0	Bode	
Kohanga reo	467.7	N/A	
Community Center	231.3	N/A	
Covered Walkway	66.6	N/A	
	3,111.9 m²		
	6,219.2 m²		

Impermeable surfaces

	Area
Rest of farm	
	13,123.8
	13,123.8 m²
Section 8	
	8,725.8
	8,725.8 m²
Section 9	
	14,904.9
	14,904.9 m²
	36,754.5 m²

Building Coverage		
Rest of Farm	2234.20	0.012%
Section 8	873.10	0.451%
Section 9	3111.90	4.405%
8 + 9 only	**3985.00**	**1.509%**
TOTAL FARM	**6219.20**	**0.034%**
		Max. 12.5%

Impervious Coverage (Buildings + Roads etc)		
Rest of Farm	16358.00	0.08%
Section 8	9598.90	4.96%
Section 9	18016.80	25.52%
8 + 9 only	**27615.70**	**10.46%**
TOTAL FARM	**42973.70**	**0.23%**
		Max. 15%

Site Boundary

10m setback from site boundary

Machaerina sedgeland (WL11) 10m setback required.

River Flood Hazard Zones - 100 Year extent (NRC Open Source Data)

Existing Overland Flow Path

EOF EOF

Mixed exotic-native scrub (TL.2)

Kanuka dune forest (WF5 variation)

20m setback from scrub & forest

Proposed footpath to road

Sealed Road

Indicative Pathways

Proposed Fenced Play Area

Proposed Sports Court

Proposed Community Garden

Proposed 'Feature Paving'

Proposed Wastewater Dispersal & Treatment - Refer Civil Engineer

ALL LANDSCAPING REFER TO Joseph McCready (Barker & Associates)

FOR COUNCIL USE ONLY

GENERAL NOTES:
SITE ADDRESS: 174 Lamb Road, Houhora
LEGAL DESCRIPTION of Site: Section 8 and 9 Survey Office Plan, 65943 held in NA80D/748
SECT. 8+9 AREA: 26,4 ha (264100,9m2)
FARM **TOTAL** AREA: 1843 ha (18430144,8m2) m²
TERRITORIAL AUTHORITY Northland Regional Council
PLANNING ZONE Rural Production Zone

Section 8 (South of Lamb Road)	Section 9 (north of Lamb Road)
Climate Zone: 1	Climate Zone: 1
Earthquake Zone: Zone 1	Earthquake Zone: Zone 1
Exposure Zone: Zone C	Exposure Zone: Zone C
Lee Zone: No	Lee Zone: No
Rainfall Range: 90 - 100	Rainfall Range: 90 - 100
Wind Region: A	Wind Region: A
Wind Zone: Very High	Wind Zone: High

HIRB
2m + 45° on all **site** boundaries

BUILDING HEIGHT
• 12m maximum height

BUILDING COVERAGE
• 12.5% maximum gross site area

BUILDING SETBACK FROM BOUNDARIES
• 10m from all **site** boundaries
• 30m from any wetland of 1ha or more in area (includes impermeable surfaces)
Noting that all earthworks and structures must be setback a minimum of 10m from wetlands under the NES Freshwater. Ie surfaces.
• 20m From Forest & Bush

STORMWATER MANAGEMENT
• Maximum 15% of gross site area covered by buildings and other impermeable surfaces
• 1 x stormwater drain per access

TRANSPORTATION
Vehicle Access 5 or more dwellings
• Legal Width - 7.5m
• Carriageway Width - 5m
• Maximum Gradient:
o Unsealed - 1:5
o Sealed - 1:4

Parking:
• Standard Residential Dwelling
o 2 car parks
• Pensioner / Kaumatua / Kuia Housing
o 2 per unit

N

ALL LANDSCAPING BY Joseph McCready (Barker & Associates)

Rev.	Transmittal Set Name	Date
A	RESOURCE CONSENT	29/07/2024

Resource Consent

BDG ARCHITECTS
Level 3, 117 Saint Georges Bay Road, Parnell, Auckland, 1052
PO Box 8577
www.bdgarchitects.co.nz

Proposed Site Plan - Overall

Moekoraha Papakāinga Development

29/07/2024 Job # 2636 10-01

Scale:1:2000 @A1 Rev: A

Appendix B – Chester Civil Design Drawings

CIVIL ENGINEERING DRAWING SCHEDULE

REVISION DATE	29/07/2024									
SHEET	TITLE	REVISION									
001	DRAWING SCHEDULE	0									
002	NOTES AND ABBREVIATIONS	0									
100	EXISTING SITE PLAN	0									
110	PROPOSED SITE PLAN	0									
200	EARTHWORKS PLAN	0									
210	EROSION AND SEDIMENT CONTROL PLAN	0									
420	STORMWATER LAYOUT PLAN - PRIVATE NORTH	0									
421	STORMWATER LAYOUT PLAN - PRIVATE SOUTH	0									
520	WASTEWATER LAYOUT PLAN - PRIVATE NORTH	0									
521	WASTEWATER LAYOUT PLAN - PRIVATE SOUTH	0									
600	WATER SUPPLY LAYOUT PLAN - NORTH	0									
601	WATER SUPPLY LAYOUT PLAN - SOUTH	0									
700	ROAD LAYOUT PLAN - ROAD 1A	0									
701	ROAD LAYOUT PLAN - ROAD 1B	0									
702	ROAD LAYOUT PLAN - ROAD 2A AND COMMUNITY CENTRE	0									
703	ROAD LAYOUT PLAN - ROAD 2B	0									
720	TYPICAL PAVEMENT CROSS SECTIONS - SHEET 1	0									
721	TYPICAL PAVEMENT CROSS SECTIONS - SHEET 2	0									

SCHEDULE LEGEND	
ORIGINAL ISSUE	0
NOT REVISED	
REVISED	1
NOT INCLUDED IN SET	-
DELETED FROM SET	~~TITLE~~

CIVIL DESIGN

MOEKORAHA PAPAKĀINGA DEVELOPMENT

174 LAMB ROAD, HOUHORA

Rev	Date	Amendments	By
0	29/07/24	FOR CONSENT	PL

Drafter: P LIEBENBERG
Designer: P LIEBENBERG
Checker: N JULL
Date: 29/07/2024

Job Title: PROPOSED DEVELOPMENT AT 174 LAMB ROAD, PUKENUI
Client: REALM PROPERTY GROUP LTD
Address: 174 LAMB ROAD, PUKENUI
Drawing Title: DRAWING SCHEDULE

Drawing: 001 Rev: 0
Scale: NTS
Project: 15657
Issue: FOR CONSENT

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COMMON ACCESS WAY NOTES:

1. DETAIL BASED ON STANDARD ISSUED BY AC REGULATORY ENGINEERING (DRIVEWAYS, RE 01, MARCH 2019).
2. CONCRETE CONSTRUCTION IS TO BE IN ACCORDANCE WITH NZS 3109 AND NZS 3114.
   (NZS 3109 – CONCRETE CONSTRUCTION)
   (NZS 3114 – SPECIFICATIONS FOR CONCRETE SURFACE FINISHES)
3. DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
4. SURFACE FINISH OF CONCRETE PAVEMENT TO BE U5 PER NZS 3114.
5. CONTRACTION (SAWCUT) JOINTS AT 4m INTERVALS. JOINT DEPTH TO BE 1/4 OF CONCRETE DEPTH.

UNDERGROUND UTILITIES NOTES

1. UNDERGROUND UTILITIES SHOWN IN PLANS ARE BASED ON VARIOUS SOURCES OF DIFFERING QUALITY AND SHALL BE CONSIDERED INDICATIVE.
2. CONTRACTOR IS RESPONSIBLE FOR LOCATING UNDERGROUND UTILITIES TO CONFIRM LOCATIONS OF SHOWN UTILITIES OR IDENTIFY UTILITIES NOT SHOWN ON PLANS ALONG PATHS OF EXCAVATION.
3. IF UTILITY CLASHES ARE FOUND, THE CONTRACTOR SHALL NOTIFY THE ENGINEER.

SEDIMENT AND EROSION CONTROL NOTES

1. ALL WORKS ARE TO BE IN ACCORDANCE WITH AUCKLAND COUNCIL GUIDANCE DOCUMENT 2016/05 (GD05), EROSION AND SEDIMENT CONTROL GUIDE.
2. THESE PLANS DETAIL THE GENERAL SEDIMENT AND EROSION CONTROL MEASURES. ACTUAL CONTROLS ARE TO BE THE RESPONSIBILITY OF THE CONTRACTOR AND ARE TO BE ADAPTED TO SUIT THE CURRENT STAGE OF WORKS.

PRIVATE WASTEWATER NOTES

1. PRIVATE WASTEWATER TO COMPLY WITH NEW ZEALAND BUILDING CODE G13-FOUL WATER AND, G13/AS2.
2. DRAINAGE PIPES TO BE 100mmØ uPVC SN8 UNLESS OTHERWISE NOTED.
3. MINIMUM GRADIENTS FOR 100mmØ DRAINS TO BE NO LESS THAN 1 IN 120 (0.8%).
4. INSPECTION POINTS TO BE LOCATED AT CHANGES IN DIRECTION GREATER THAN 45° UNLESS OTHERWISE NOTED.
5. INSPECTION POINTS TO BE LOCATED AT JUNCTIONS OF DRAINS, UNLESS DRAIN SERVES A GULLY TRAP LESS THAN 2m AWAY, OR UNLESS OTHERWISE NOTED.
6. DRAINS LAID UNDER BUILDINGS SHALL BE RUN IN A STRAIGHT LINE FROM ONE SIDE TO THE OTHER WITH A RODDING POINT LOCATED WITHIN 2 METRES FROM THE DOWNSTREAM EXTERIOR BUILDING FACE.
7. WHERE TRENCH GRADIENTS ARE 1 IN 8 (12.5%0 OR STEEPER, ANTI-SCOUR BLOCKS SHALL BE REQUIRED.
8. TRENCHES SHALL BE OPEN FOR NO MORE THAN 48 HOURS WITHOUT SPECIFIC APPROVAL FROM ENGINEER.
9. TRENCHES SHALL REMAIN OUTSIDE THE ZONE-OF-INFLUENCE OF BUILDING FOUNDATIONS AS DEFINED BY NZBC EA/AS1, SECTION 3.9.7.

PRIVATE STORMWATER NOTES

1. PRIVATE STORMWATER TO COMPLY WITH NEW ZEALAND BUILDING CODE E1-SURFACE WATER AND, E1/AS1.
2. DRAINAGE PIPES TO BE 100mmØ uPVC SN8 UNLESS OTHERWISE NOTED.
3. MINIMUM GRADIENTS FOR 100mmØ DRAINS TO BE NO LESS THAN 1 IN 120 (0.8%).
4. TYPE 2 CATCHPIT LEADS TO BE 150mmØ uPVC SN8 UNLESS OTHERWISE NOTED.
3. MINIMUM GRADIENTS FOR 150mmØ DRAINS TO BE NO LESS THAN 1 IN 200 (0.5%).
4. SUB-SOIL DRAINAGE, INCLUDING RETAINING WALL DRAINAGE, TO BE 110mmØ NOVACOIL UNLESS OTHERWISE NOTED.
5. SUB-SOIL DRAINS TO DISCHARGE TO PRIVATE CATCHPITS WITHIN THE SITE BOUNDARY.
6. INSPECTION POINTS TO BE LOCATED AT CHANGES IN DIRECTION GREATER THAN 45° UNLESS OTHERWISE NOTED.
7. INSPECTION POINTS TO BE LOCATED AT JUNCTIONS OF DRAINS, UNLESS DRAIN SERVES A SINGLE DOWNPIPE LESS THAN 2m AWAY, OR UNLESS OTHERWISE NOTED.
8. INSPECTION CHAMBERS OR NON-ACCESS CHAMBERS TO BE LOCATED AT CHANGES TO BOTH GRADIENT AND DIRECTION OCCUR AND WHERE EITHER IS GREATER THAN 22.5° UNLESS OTHERWISE NOTED.
9. DRAINS LAID UNDER BUILDINGS SHALL BE RUN IN A STRAIGHT LINE FROM ONE SIDE TO THE OTHER WITH A RODDING POINT LOCATED WITHIN 2 METRES FROM EXTERIOR BUILDING FACE.
10. WHERE TRENCH GRADIENTS ARE 1 IN 8 (12.5%0 OR STEEPER, ANTI-SCOUR BLOCKS SHALL BE REQUIRED.
11. TRENCHES SHALL BE OPEN FOR NO MORE THAN 48 HOURS WITHOUT SPECIFIC APPROVAL FROM ENGINEER.
12. TRENCHES SHALL REMAIN OUTSIDE THE ZONE-OF-INFLUENCE OF BUILDING FOUNDATIONS AS DEFINED BY NZBC EA/AS1, SECTION 3.9.7.
13. PRIVATE DRAIN OUTFALLS MAY REQUIRE A RESOURCE CONSENT.

GENERAL NOTES

1. ALL DIMENSIONS AND LEVELS ARE TO BE CHECKED AGAINST THE SITE DRAWINGS PRIOR TO COMMENCING WORK.
2. DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
3. ANY VARIATIONS OR DISCREPANCIES ARE TO BE REFERRED TO CHESTER CONSULTANTS LTD FOR RESOLUTION.
4. ALL SERVICES ARE TO BE LOCATED AND FLAGGED PRIOR TO COMMENCING WORK ON SITE.
5. WORKS TO BE IN ACCORDANCE WITH WSL STANDARDS, AUCKLAND COUNCIL STANDARDS, AND THE NEW ZEALAND BUILDING CODE.
6. THE CONTRACTOR IS TO OBTAIN ALL NECESSARY CONSENTS AND PERMITS FOR WORKS ON, IN, AND AROUND EXISTING SERVICES, ASSETS, AND THE ROAD AND ROAD RESERVE.
7. ELECTRONIC FILES PROVIDED AS SUPPLEMENTAL INFORMATION TO DRAWINGS AND REPORTS. IF DISCREPANCIES ARE FOUND BETWEEN ELECTRONIC FILES AND DRAWINGS, CONTRACTOR TO NOTIFY ENGINEER. DRAWINGS SHALL TAKE PRECEDENT OVER ELECTRONIC FILES UNLESS OTHERWISE NOTED OR DIRECTED BY ENGINEER.

SURVEY NOTES

1. EXISTING SITE BOUNDARIES HAVE BEEN CALCULATED FROM THE TITLE PLANS. DRAWING PROJECTION: NZGD2000 / MOUNT EDEN 2000 (EPSG:2105). NO SURVEYING HAS BEEN COMPLETED ON SITE.
2. SHOWN CONTOURS BASED ON NRC 2018 LIDAR RETRIEVED FROM LINZ LAND ONLINE.

CONTRACTOR CONSENT NOTES

1. IT IS THE CONTRACTOR'S RESPONSIBILITY TO BE FAMILIAR WITH THE RELEVANT STANDARDS, PROCESSES, AND APPROVALS REQUIRED TO EXECUTE WORK AS APPROVED BY RESOURCE CONSENT, BUILDING CONSENT, AND/OR ENGINEERING APPROVAL.
2. IT IS THE CONTRACTOR'S RESPONSIBILITY TO BE FAMILIAR WITH THE RELEVANT STANDARDS, PROCESSES, AND APPROVALS REQUIRED TO WORK ON OR IN CLOSE PROXIMITY TO PUBLIC AND PRIVATE UTILITIES.
7. NOTES RELATING TO SPECIFIC APPROVALS AND/OR CONSENTS WITHIN THESE PLANS, OR IN RELATED REPORTS PREPARED BY CHESTER, ARE NOT INCLUSIVE OF ALL APPROVALS AND/OR CONSENTS REQUIRED TO EXECUTE THE WORK.
11. IT IS THE CONTRACTOR'S RESPONSIBILITY TO INFORM THE ENGINEER IF THE CONTRACTOR HAS DETERMINED THAT THE WORK CAN NOT BE EXECUTED IN ACCORDANCE WITH THE APPLICABLE STANDARDS, APPROVALS, AND/OR CONSENTS.
12. CONTRACTOR TO SECURE APPROVAL WHEN EXECUTING WORK WITHIN THE ROAD CORRIDOR FROM THE TERRITORIAL AUTHORITY AND/OR THE ROAD CONTROLLING AUTHORITY.
13. CONTRACTOR TO SECURE APPROVAL WHEN WORKING IN CLOSE PROXIMITY TO PUBLIC STORMWATER, WASTEWATER, WATER SERVICE ASSETS FROM THE TERRITORIAL AUTHORITY AND/OR ASSET OWNER/OPERATOR.
14. CONTRACTOR TO SECURE APPROVAL WHEN WORKING ON OR IN CLOSE PROXIMITY TO ELECTRICAL POWER, TELECOMMUNICATIONS, FIBRE, NATURAL GAS OR OTHER SERVICES FROM THE SERVICE OWNER/OPERATOR.

GENERAL ABBREVIATIONS

EX	EXISTING
PROP	PROPOSED
BNDY	BOUNDARY
RL	REDUCED LEVEL
FFL	FINISH FLOOR LEVEL
GFL	GARAGE FLOOR LEVEL
RW	RETAINING WALL
TOW	TOP OF WALL
BOW	BOTTOM OF WALL

GEOMETRY ABBREVIATIONS

L	LEFT
R	RIGHT
CL	CENTRE LINE
HP	HIGH POINT
LP	LOW POINT
CH	CHAINAGE
BOA	BEGIN OF ALIGNMENT
EOA	END OF ALIGNMENT
BP	BEGIN POINT
EP	END POINT
MID	MIDDLE POINT
PC	POINT OF CURVATURE
PCC	POINT OF COMPOUND CURVATURE
PRC	POINT OF REVERSE CURVATURE
PT	POINT OF TANGENCY
I.P.	INTERSECTION POINT
BLS	BEGIN LONGSECTION
ELS	END LONGSECTION
VPC	VERTICAL POINT OF CURVATURE
VPT	VERTICAL POINT OF TANGENCY
BRK	GRADE BREAK
K	CURVE COEFFICIENT

UTILITY ABBREVIATIONS

SW	STORMWATER
WW	WASTEWATER
PUB.	PUBLIC
PRIV.	PRIVATE
IC	INSPECTION CHAMBER (675mmØ AND LARGER)
IP	INSPECTION POINT (100/150mmØ)
CP	CATCH PIT
SP	SPLAY PIT
LL	LID LEVEL
INV	INVERT LEVEL
RCRRJ	REINFORCED CONCRETE RUBBER RING JOINT
CLn	CLASS n CONCRETE
PE	POLYETHYLENE
uPVC	UNPLASTICIZED POLYVINYL CHLORIDE
AC	ASBESTOS CONCRETE

UTILITY ABBREVIATIONS

VC	VITRIFIED CLAY
EW	EARTHENWARE
CONC	CONCRETE
CLS	CEMENT LINED STEEL
DI	DUCTILE IRON
WS	WATER SERVICE
SV	SLUICE VALVE
GV	GATE VALVE
FH	FIRE HYDRANT
EC	END CAP
FP	FLUSHING POINT
IV	ISOLATION VALVE
AB	ANCHOR BLOCK
E	ELECTRICAL POWER
G	NATURAL GAS
T	TELECOMMUNICATIONS
CS	COMBINED SERVICES

Rev	Date	Amendments	By
0	29/07/24	FOR CONSENT	PL

Drafter: P LIEBENBERG
Designer: P LIEBENBERG
Checker: N JULL
Date: 29/07/2024

Job Title: PROPOSED DEVELOPMENT AT 174 LAMB ROAD, PUKENUI
Client: REALM PROPERTY GROUP LTD
Address: 174 LAMB ROAD, PUKENUI
Drawing Title: NOTES AND ABBREVIATIONS

Drawing: 002 Rev: 0
Scale: NTS
Project: 15657
Issue: FOR CONSENT

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SURVEY NOTE

EXISTING SITE BOUNDARIES HAVE BEEN CALCULATED FROM THE TITLE PLANS. DRAWING PROJECTION: NZGD2000 / MOUNT EDEN 2000 (EPSG:2105). NO SURVEYING HAS BEEN COMPLETED ON SITE.

SHOWN CONTOURS BASED ON NRC 2018 LIDAR RETRIEVED FROM LINZ LAND ONLINE.

AERIAL IMAGE FROM DRONE SURVEY TAKEN ON 31 MAY 2024

DRAWING NOTE

DRAWING SET IS INTENDED TO BE DISTRIBUTED AND READ IN ITS ENTIRETY. REFER TO DRAWING 001 FOR DRAWING SCHEDULE. REFER TO DRAWING 002 FOR APPLICABLE NOTES AND ABBREVIATIONS UNLESS OTHERWISE NOTED.

DRAWING LEGEND	
MINOR CONTOURS 0.5 m	
MAJOR CONTOURS 5.0 m	
CALCULATED PROPERTY BOUNDARIES	

SECTION 2 SO 65943

SECTION 62 BLOCK X HOUHORA EAST SD

SECTION 9 SO 65943

ELINGMITE DRIVE

CALCULATED PROPERTY BOUNDARIES

LAMB ROAD

SECTION 8 SO 65943

DP 125634

MAY ROAD

LOT 1 DP 193976

LOT 1 DP 195299

SECTION 2 BLOCK X HOUHORA EAST SD

25.0 30.0 35.0 40.0 45.0

1:2000 0 20 40 60 80 100 PLOT CONTAINS ELEMENTS IN COLOUR

Rev	Date	Amendments	By
0	29/07/24	FOR CONSENT	PL

Drafter:	P LIEBENBERG	Job Title:	PROPOSED DEVELOPMENT AT 174 LAMB ROAD, PUKENUI
Designer:	P LIEBENBERG	Client:	REALM PROPERTY GROUP LTD
Checker:	N JULL	Address:	174 LAMB ROAD, PUKENUI
Date:	29/07/2024	Drawing Title:	EXISTING SITE PLAN

Drawing:	100	Rev:	0
Scale:	1:2000 @ A3		
Project:	15657		
Issue:	FOR CONSENT		

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DRAWING NOTE

DRAWING SET IS INTENDED TO BE DISTRIBUTED AND READ IN ITS ENTIRETY. REFER TO DRAWING 001 FOR DRAWING SCHEDULE. REFER TO DRAWING 002 FOR APPLICABLE NOTES AND ABBREVIATIONS UNLESS OTHERWISE NOTED.

THREE WATERS LEGEND	
EX / PROP PRIV. SW PIPE	/
EX / PROP PRIV. WW PIPE	/
EX / PROP PUBLIC SW PIPE	/
EX / PROP PUBLIC WW PIPE	/
EX / PROP SWIC	/
EX / PROP SWCP	/
EX / PROP WWIC	/
CONNECTION DIRECTION	N,NE,E,SE,S,SW,W,NW
EX / PROP WS PIPE	/
ALL MEASUREMENTS IN METRES	

SW SWALE - SEE 400 DRAWING SERIES FOR MORE INFORMATION REGARDING PROPOSED STORMWATER

PROPOSED WASTEWATER TREATMENT PLANT - SEE 500 DRAWING SERIES FOR MORE INFORMATION REGARDING PROPOSED WASTEWATER

PROPOSED WASTEWATER DISPERSAL FIELD

PROPOSED WASTEWATER DISPERSAL FIELD

EXISTING WETLAND

PROPOSED ACCESS ROADS - SEE 700 DRAWING SERIES FOR MORE INFORMATION REGARDING PROPOSED ROADS

WATER SUPPLY TANKS FOR FIREFIGHTING - SEE 600 DRAWING SERIES FOR INFORMATION REGARDING WATER SUPPLY

KORAKANUI A RUA ROAD

KORAKANUI O RUA ROAD

LAMB ROAD

LAMB ROAD

LAMB ROAD

MAY ROAD

Mānuka, tanoa fern scrub

0 20 40 60 80 100

1:2000 PLOT CONTAINS ELEMENTS IN COLOUR

Rev	Date	Amendments	By
0	29/07/24	FOR CONSENT	PL

Drafter:	P LIEBENBERG	Job Title:	PROPOSED DEVELOPMENT AT 174 LAMB ROAD, PUKENUI
Designer:	P LIEBENBERG	Client:	REALM PROPERTY GROUP LTD
Checker:	N JULL	Address:	174 LAMB ROAD, PUKENUI
Date:	29/07/2024	Drawing Title:	PROPOSED SITE PLAN

Drawing:	110	Rev:	0
Scale:	1:2000 @ A3		
Project:	15657		
Issue:	FOR CONSENT		

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AREA OF EARTHWORKS: 20,350m^2

EARTHWORK VOLUMES (m^3)		
CUT	FILL	NET (FILL)
-2700	5650	2950

CUT/FILL VOLUMES TABLE		
LOWER RANGE (DEPTH IN m)	UPPER RANGE (DEPTH IN m)	COLOUR
-3.00	-2.00	
-2.00	-1.00	
-1.00	0.00	
0.00	1.00	
1.00	2.00	
2.00	3.00	

DRAWING NOTE

DRAWING SET IS INTENDED TO BE DISTRIBUTED AND READ IN ITS ENTIRETY. REFER TO DRAWING 001 FOR DRAWING SCHEDULE. REFER TO DRAWING 002 FOR APPLICABLE NOTES AND ABBREVIATIONS UNLESS OTHERWISE NOTED.

KORAKANUI A RUA ROAD

KORAKANUI O RUA ROAD

LAMB ROAD

LAMB ROAD

MAY ROAD

10m WETLANDS OFFSET

EXISTING WETLANDS

30.0 35.0 40.0

Mānuka, tangle fern scrub/fernland (WL12)

31.0

N

1:2000 0 20 40 60 80 100 PLOT CONTAINS ELEMENTS IN COLOUR

Rev	Date	Amendments	By
0	29/07/24	FOR CONSENT	PL

Drafter:	P LIEBENBERG	Job Title:	PROPOSED DEVELOPMENT AT 174 LAMB ROAD, PUKENUI
Designer:	P LIEBENBERG	Client:	REALM PROPERTY GROUP LTD
Checker:	N JULL	Address:	174 LAMB ROAD, PUKENUI
Date:	29/07/2024	Drawing Title:	EARTHWORKS PLAN

Drawing:	200	Rev:	0
Scale:	1:2000 @ A3		
Project:	15657		
Issue:	FOR CONSENT		

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DRAWING NOTE

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SEDIMENT AND EROSION CONTROL NOTES

1. ALL WORKS ARE TO BE IN ACCORDANCE WITH AUCKLAND COUNCIL GUIDANCE DOCUMENT 2016/05 (GD05), EROSION AND SEDIMENT CONTROL GUIDE.
2. THESE PLANS DETAIL THE GENERAL SEDIMENT AND EROSION CONTROL MEASURES. ACTUAL CONTROLS ARE TO BE THE RESPONSIBILITY OF THE CONTRACTOR AND ARE TO BE ADAPTED TO SUIT THE CURRENT STAGE OF WORKS.

PROPOSED SILT FENCES FOR SEDIMENT AND EROSION CONTROL

PROPOSED SILT FENCES FOR SEDIMENT AND EROSION CONTROL

PROPOSED SILT FENCES FOR SEDIMENT AND EROSION CONTROL

STABALISED CONSTRUCTION ENTRANCE, 10m LONG AS PER AUCKLAND GD05

PROPOSED SUPER-SILT FENCES FOR SEDIMENT AND EROSION CONTROL

PROPOSED SUPER-SILT FENCES FOR SEDIMENT AND EROSION CONTROL

KORAKANUI A RUA ROAD

KORAKANUI ROAD

LAMB ROAD

LAMB ROAD

LAMB ROAD

MAY ROAD

Mānuka, tangle fern scrub/fernland (WL12)

N

0 20 40 60 80 100

1:2000 PLOT CONTAINS ELEMENTS IN COLOUR

C:\Users\PeetLiebenberg\Chester Consultants\Central Library - 15657 - Lamb 174\30 Design\32 Civil\321 ACAD\DWG Layouts\15657-C-DWG-210.dwg 7/29/2024 12:06 pm LAST SAVED BY: Peet Werk

Rev	Date	Amendments	By
0	29/07/24	FOR CONSENT	PL

Drafter:	P LIEBENBERG	Job Title:	PROPOSED DEVELOPMENT AT 174 LAMB ROAD, PUKENUI
Designer:	P LIEBENBERG	Client:	REALM PROPERTY GROUP LTD
Checker:	N JULL	Address:	174 LAMB ROAD, PUKENUI
Date:	29/07/2024	Drawing Title:	EROSION AND SEDIMENT CONTROL PLAN

Drawing:	210	Rev:	0
Scale:	1:2000 @ A3		
Project:	15657		
Issue:	FOR CONSENT		

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THREE WATERS LEGEND	
EX / PROP PRIV. SW PIPE	/
EX / PROP PRIV. WW PIPE	/
EX / PROP PUBLIC SW PIPE	/
EX / PROP PUBLIC WW PIPE	/
EX / PROP SWIC	/
EX / PROP SWCP	/
EX / PROP WWIC	/
CONNECTION DIRECTION	N,NE,E,SE,S,SW,W,NW
PROP SW SWALE	
ALL MEASUREMENTS IN METRES	

SW SWALE TO DIVERT STORMWATER RUNOFF
RIP RAP AT DISCHARGE POINT
SW SWALE TO CAPTURE ROAD RUNOFF
RIP RAP AT DISCHARGE POINT
SW SWALE TO CAPTURE ROAD RUNOFF
RIP RAP AT DISCHARGE POINT
RIP RAP AT DISCHARGE POINT
SW SWALE TO CAPTURE ROAD RUNOFF
PROPOSED STORMWATER CULVERT
SW SWALE TO CAPTURE ROAD RUNOFF
RIP RAP AT DISCHARGE POINT
SW SWALE TO CAPTURE ROAD RUNOFF
PROPOSED STORMWATER CULVERT
RIP RAP AT DISCHARGE POINT
SW SWALE TO GUIDE STORMWATER RUNOFF
RIP RAP AT DISCHARGE POINT
EXISTING STORMWATER CULVERT
SW SWALE TO DIVERT STORMWATER RUNOFF
PROPOSED STORMWATER CULVERT UNDER PROPOSED VEHICLE CROSSING
KORAKANUI DRIVE
LAMB ROAD

0 10 20 30 40 50
1:1000 PLOT CONTAINS ELEMENTS IN COLOUR

Rev	Date	Amendments	By
0	29/07/24	FOR CONSENT	PL

Drafter:	P LIEBENBERG	Job Title:	PROPOSED DEVELOPMENT AT 174 LAMB ROAD, PUKENUI
Designer:	P LIEBENBERG	Client:	REALM PROPERTY GROUP LTD
Checker:	N JULL	Address:	174 LAMB ROAD, PUKENUI
Date:	29/07/2024	Drawing Title:	STORMWATER LAYOUT PLAN - PRIVATE NORTH

Drawing:	420	Rev:	0
Scale:	1:1000 @ A3		
Project:	15657		
Issue:	FOR CONSENT		

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DRAWING NOTE

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THREE WATERS LEGEND	
EX / PROP PRIV. SW PIPE	/
EX / PROP PRIV. WW PIPE	/
EX / PROP PUBLIC SW PIPE	/
EX / PROP PUBLIC WW PIPE	/
EX / PROP SWIC	/
EX / PROP SWCP	/
EX / PROP WWIC	/
CONNECTION DIRECTION	N,NE,E,SE,S,SW,W,NW
PROP SW SWALE	
ALL MEASUREMENTS IN METRES	

SW CP 05
SW MH 05
SW CP 04
SW MH 04
SW MH 03
SW MH 06
RIP RAP AT DISCHARGE POINT
SW SWALE
SW CP 03
SW SWALE TO CAPTURE ROAD RUNOFF
RIP RAP AT DISCHARGE POINT
SW CP 02
SW SWALE TO CAPTURE ROAD RUNOFF
SW SWALE TO CAPTURE ROAD RUNOFF
SW SWALE TO CAPTURE ROAD RUNOFF
SW MH 01
SW SWALE
RIP RAP AT DISCHARGE POINT
SW MH 02
SW CP 01
SW SWALE TO CAPTURE ROAD RUNOFF. BECAUSE OF STEEP GRADIENT, ROCK LINE SWALE TO PREVENT SCOUR
PROPOSED CULVERT CROSSING UNDER PROPOSED VEHICLE CROSSING
EXISTING CULVERT CROSSING UNDER LAMB ROAD
EXISTING WETLAND
PROPOSED CULVERT CROSSING UNDER PROPOSED VEHICLE CROSSING
RIP RAP AT DISCHARGE POINT
LAMB ROAD
KORAKA

1:1000 0 10 20 30 40 50 PLOT CONTAINS ELEMENTS IN COLOUR

Rev	Date	Amendments	By
0	29/07/24	FOR CONSENT	PL

Drafter:	P LIEBENBERG	Job Title:	PROPOSED DEVELOPMENT AT 174 LAMB ROAD, PUKENUI
Designer:	P LIEBENBERG	Client:	REALM PROPERTY GROUP LTD
Checker:	N JULL	Address:	174 LAMB ROAD, PUKENUI
Date:	29/07/2024	Drawing Title:	STORMWATER LAYOUT PLAN - PRIVATE SOUTH

Drawing:	421	Rev:	0
Scale:	1:1000 @ A3		
Project:	15657		
Issue:	FOR CONSENT		

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THREE WATERS LEGEND	
EX / PROP PRIV. SW PIPE	/
EX / PROP PRIV. WW PIPE	/
EX / PROP PUBLIC SW PIPE	/
EX / PROP PUBLIC WW PIPE	/
EX / PROP SWIC	/
EX / PROP SWCP	/
EX / PROP WWIC	/
CONNECTION DIRECTION	N,NE,E,SE,S,SW,W,NW
EX / PROP WS PIPE	/
ALL MEASUREMENTS IN METRES	

DWELLING TO CONNECT TO PROPOSED WASTEWATER NETWORK (TYPICAL)

WW01 ROAD 2A

WW04 ROAD 2A

WW02 ROAD 2A

PROPOSED GRAVITY WASTEWATER NETWORK TO TREATMENT PLANT(TYPICAL)

WW05 ROAD 2A

WW03 ROAD 2A

PROPOSED WASTEWATER PUMPSTATION (LIFT STATION) AS PER FNDC ENGINEERING STANDARDS SHEET 42

WUI O RUA ROAD

DWELLING TO CONNECT TO PROPOSED WASTEWATER NETWORK (TYPICAL)

WW02 ROAD 2B

PROPOSED GRAVITY WASTEWATER NETWORK TO TREATMENT PLANT(TYPICAL)

WW NORTH TREATMENT

PROPOSED WASTEWATER DISPERSAL FIELD 4248m² (972m² RESERVE). TO BE DESIGNED BY OTHERS

WW01 ROAD 2B

WW03 ROAD 2B

WW05 ROAD 2B

WW04 ROAD 2B

PROPOSED WASTEWATER TREATMENT PLANT. TO BE DESIGNED BY OTHERS

DWELLING TO CONNECT TO PROPOSED WASTEWATER NETWORK (TYPICAL)

N

1:1000 0 10 20 30 40 50 PLOT CONTAINS ELEMENTS IN COLOUR

Rev	Date	Amendments	By
0	29/07/24	FOR CONSENT	PL

Drafter:	P LIEBENBERG	Job Title:	PROPOSED DEVELOPMENT AT 174 LAMB ROAD, PUKENUI
Designer:	P LIEBENBERG	Client:	REALM PROPERTY GROUP LTD
Checker:	N JULL	Address:	174 LAMB ROAD, PUKENUI
Date:	29/07/2024	Drawing Title:	WASTEWATER LAYOUT PLAN - PRIVATE NORTH

Drawing:	520	Rev:	0
Scale:	1:1000 @ A3		
Project:	15657		
Issue:	FOR CONSENT		

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LAMB ROAD

PROPOSED WASTEWATER DISPERSAL FIELD 1772m² (409m² RESERVE). TO BE DESIGNED BY OTHERS.

PROPOSED WASTEWATER TREATMENT PLANT TO BE DESIGNED BY OTHERS

WW TREATMENT ROAD 1B

PROPOSED WASTEWATER PIPE TO BE DIRECTIONALLY DRILLED

WW05 ROAD 1B

WW04 ROAD 1B

WW01 ROAD 1B

WW03 ROAD 1B

WW02 ROAD 1B

PROPOSED GRAVITY WASTEWATER NETWORK TO TREATMENT PLANT(TYPICAL)

WW03 ROAD 1A

PROPOSED WASTEWATER PIPE TO BE DIRECTIONALLY DRILLED

WW02 ROAD 1A

WW01 ROAD 1A

DWELLING TO CONNECT TO PROPOSED WASTEWATER NETWORK (TYPICAL)

DRAWING NOTE

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THREE WATERS LEGEND	
EX / PROP PRIV. SW PIPE	/
EX / PROP PRIV. WW PIPE	/
EX / PROP PUBLIC SW PIPE	/
EX / PROP PUBLIC WW PIPE	/
EX / PROP SWIC	/
EX / PROP SWCP	/
EX / PROP WWIC	/
CONNECTION DIRECTION	N,NE,E,SE,S,SW,W,NW
EX / PROP WS PIPE	/
ALL MEASUREMENTS IN METRES	

N

0 10 20 30 40 50

1:1000 PLOT CONTAINS ELEMENTS IN COLOUR

Rev	Date	Amendments	By
0	29/07/24	FOR CONSENT	PL

Drafter:	P LIEBENBERG	Job Title:	PROPOSED DEVELOPMENT AT 174 LAMB ROAD, PUKENUI
Designer:	P LIEBENBERG	Client:	REALM PROPERTY GROUP LTD
Checker:	N JULL	Address:	174 LAMB ROAD, PUKENUI
Date:	29/07/2024	Drawing Title:	WASTEWATER LAYOUT PLAN - PRIVATE SOUTH

Drawing:	521	Rev:	0
Scale:	1:1000 @ A3		
Project:	15657		
Issue:	FOR CONSENT		

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THREE WATERS LEGEND	
EX / PROP PRIV. SW PIPE	/
EX / PROP PRIV. WW PIPE	/
EX / PROP PUBLIC SW PIPE	/
EX / PROP PUBLIC WW PIPE	/
EX / PROP SWIC	/
EX / PROP SWCP	/
EX / PROP WWIC	/
CONNECTION DIRECTION	N,NE,E,SE,S,SW,W,NW
EX / PROP WS PIPE	/
DRINKING WATER TANK (25 000l)	D
FIRE FIGHTING TANK (25 000l)	F
ALL MEASUREMENTS IN METRES	

R90.00 MAXIMUM FIRE FIGHTING RADIUS

R90.00 MAXIMUM FIRE FIGHTING RADIUS

ROOF RUNOFF TO DRAIN TO DRINKING WATER TANK (TYPICAL)

ROOF RUNOFF TO DRAIN TO DRINKING WATER TANK (TYPICAL)

R90.00 MAXIMUM FIRE FIGHTING RADIUS

ROOF RUNOFF TO DRAIN TO DRINKING WATER TANK (TYPICAL)

LAMB ROAD

N

1:1000 0 10 20 30 40 50 PLOT CONTAINS ELEMENTS IN COLOUR

Rev	Date	Amendments	By
0	29/07/24	FOR CONSENT	PL

Drafter:	P LIEBENBERG	Job Title:	PROPOSED DEVELOPMENT AT 174 LAMB ROAD, PUKENUI
Designer:	P LIEBENBERG	Client:	REALM PROPERTY GROUP LTD
Checker:	N JULL	Address:	174 LAMB ROAD, PUKENUI
Date:	29/07/2024	Drawing Title:	WATER SUPPLY LAYOUT PLAN - NORTH

Drawing:	600	Rev:	0
Scale:	1:1000 @ A3		
Project:	15657		
Issue:	FOR CONSENT		

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LAMB ROAD

R90.00 MAXIMUM FIRE FIGHTING RADIUS

R90.00 MAXIMUM FIRE FIGHTING RADIUS

R90.00 MAXIMUM FIRE FIGHTING RADIUS

ROOF RUNOFF TO DRAIN TO DRINKING WATER TANK (TYPICAL)

ROOF RUNOFF TO DRAIN TO DRINKING WATER TANK (TYPICAL)

DRAWING NOTE

DRAWING SET IS INTENDED TO BE DISTRIBUTED AND READ IN ITS ENTIRETY. REFER TO DRAWING 001 FOR DRAWING SCHEDULE. REFER TO DRAWING 002 FOR APPLICABLE NOTES AND ABBREVIATIONS UNLESS OTHERWISE NOTED.

THREE WATERS LEGEND	
EX / PROP PRIV. SW PIPE	/
EX / PROP PRIV. WW PIPE	/
EX / PROP PUBLIC SW PIPE	/
EX / PROP PUBLIC WW PIPE	/
EX / PROP SWIC	/
EX / PROP SWCP	/
EX / PROP WWIC	/
CONNECTION DIRECTION	N,NE,E,SE,S,SW,W,NW
EX / PROP WS PIPE	/
DRINKING WATER TANK (25 000l)	D
FIRE FIGHTING TANK (25 000l)	F
ALL MEASUREMENTS IN METRES	

N

1:1000 0 10 20 30 40 50 PLOT CONTAINS ELEMENTS IN COLOUR

Rev	Date	Amendments	By
0	29/07/24	FOR CONSENT	PL

Drafter:	P LIEBENBERG	Job Title:	PROPOSED DEVELOPMENT AT 174 LAMB ROAD, PUKENUI
Designer:	P LIEBENBERG	Client:	REALM PROPERTY GROUP LTD
Checker:	N JULL	Address:	174 LAMB ROAD, PUKENUI
Date:	29/07/2024	Drawing Title:	WATER SUPPLY LAYOUT PLAN - SOUTH

Drawing:	601	Rev:	0
Scale:	1:1000 @ A3		
Project:	15657		
Issue:	FOR CONSENT		

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THREE WATERS LEGEND	
EX / PROP PRIV. SW PIPE	/
EX / PROP PRIV. WW PIPE	/
EX / PROP PUBLIC SW PIPE	/
EX / PROP PUBLIC WW PIPE	/
EX / PROP SWIC	/
EX / PROP SWCP	/
EX / PROP WWIC	/
CONNECTION DIRECTION	N,NE,E,SE,S,SW,W,NW
EX / PROP WS PIPE	/
ALL MEASUREMENTS IN METRES	

REFER TO TYPICAL PAVEMENT CROSS SECTIONS ON DRAWINGS 720 AND 721

721 / 3

CH 0 CH 20 CH 40 CH 60 CH 80 CH 100 CH 120 CH 140 CH 160 CH 180 CH 200 CH 220 CH 240 CH 260 CH 280 CH 300 CH 320 CH 340 CH 360 CH 380

LAMB ROAD

35.0 30.0 40.0 25.0

1:750 0 7.5 15 22.5 30 37.5 PLOT CONTAINS ELEMENTS IN COLOUR

Rev	Date	Amendments	By
0	29/07/24	FOR CONSENT	PL

Drafter:	P LIEBENBERG	Job Title:	PROPOSED DEVELOPMENT AT 174 LAMB ROAD, PUKENUI
Designer:	P LIEBENBERG	Client:	REALM PROPERTY GROUP LTD
Checker:	N JULL	Address:	174 LAMB ROAD, PUKENUI
Date:	29/07/2024	Drawing Title:	ROAD LAYOUT PLAN - ROAD 1A

Drawing:	700	Rev:	0
Scale:	1:750 @ A3		
Project:	15657		
Issue:	FOR CONSENT		

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THREE WATERS LEGEND	
EX / PROP PRIV. SW PIPE	/
EX / PROP PRIV. WW PIPE	/
EX / PROP PUBLIC SW PIPE	/
EX / PROP PUBLIC WW PIPE	/
EX / PROP SWIC	/
EX / PROP SWCP	/
EX / PROP WWIC	/
CONNECTION DIRECTION	N,NE,E,SE,S,SW,W,NW
EX / PROP WS PIPE	/
ALL MEASUREMENTS IN METRES	

CH 0
CH 20
CH 40
CH 60
CH 80
CH 100
CH 120
CH 140
CH 160
CH 180
CH 200
CH 220
CH 240
CH 250

ONE-WAY TRAFFIC LANE
ONE-WAY TRAFFIC LANE
ONE-WAY TRAFFIC LANE

40.0
35.0
30.0
31.0

1:750 PLOT CONTAINS ELEMENTS IN COLOUR

Rev	Date	Amendments	By
0	29/07/24	FOR CONSENT	PL

Drafter:	P LIEBENBERG	Job Title:	PROPOSED DEVELOPMENT AT 174 LAMB ROAD, PUKENUI
Designer:	P LIEBENBERG	Client:	REALM PROPERTY GROUP LTD
Checker:	N JULL	Address:	174 LAMB ROAD, PUKENUI
Date:	29/07/2024	Drawing Title:	ROAD LAYOUT PLAN - ROAD 1B

Drawing:	701	Rev:	0
Scale:	1:750 @ A3		
Project:	15657		
Issue:	FOR CONSENT		

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THREE WATERS LEGEND	
EX / PROP PRIV. SW PIPE	/
EX / PROP PRIV. WW PIPE	/
EX / PROP PUBLIC SW PIPE	/
EX / PROP PUBLIC WW PIPE	/
EX / PROP SWIC	/
EX / PROP SWCP	/
EX / PROP WWIC	/
CONNECTION DIRECTION	N,NE,E,SE,S,SW,W,NW
EX / PROP WS PIPE	/
ALL MEASUREMENTS IN METRES	

REFER TO TYPICAL PAVEMENT CROSS SECTIONS ON DRAWINGS 720 AND 721

1 / 720

2 / 720

CH 0 CH 20 CH 40 CH 60 CH 80 CH 100 CH 120 CH 140 CH 160 CH 180 CH 200 CH 220 CH 240 CH 260 CH 280 CH 300 CH 320 CH 340 CH 360 CH 380 CH 400 CH 420 CH 440 CH 461 CH 159 CH 40 CH 60 CH 80 CH 97 CH 20 CH 0

RUA ROAD

0 7.5 15 22.5 30 37.5

1:750 PLOT CONTAINS ELEMENTS IN COLOUR

Rev	Date	Amendments	By
0	29/07/24	FOR CONSENT	PL

Drafter:	P LIEBENBERG	Job Title:	PROPOSED DEVELOPMENT AT 174 LAMB ROAD, PUKENUI
Designer:	P LIEBENBERG	Client:	REALM PROPERTY GROUP LTD
Checker:	N JULL	Address:	174 LAMB ROAD, PUKENUI
Date:	29/07/2024	Drawing Title:	ROAD LAYOUT PLAN - ROAD 2A AND COMMUNITY CENTER

Drawing:	702	Rev:	0
Scale:	1:750 @ A3		
Project:	15657		
Issue:	FOR CONSENT		

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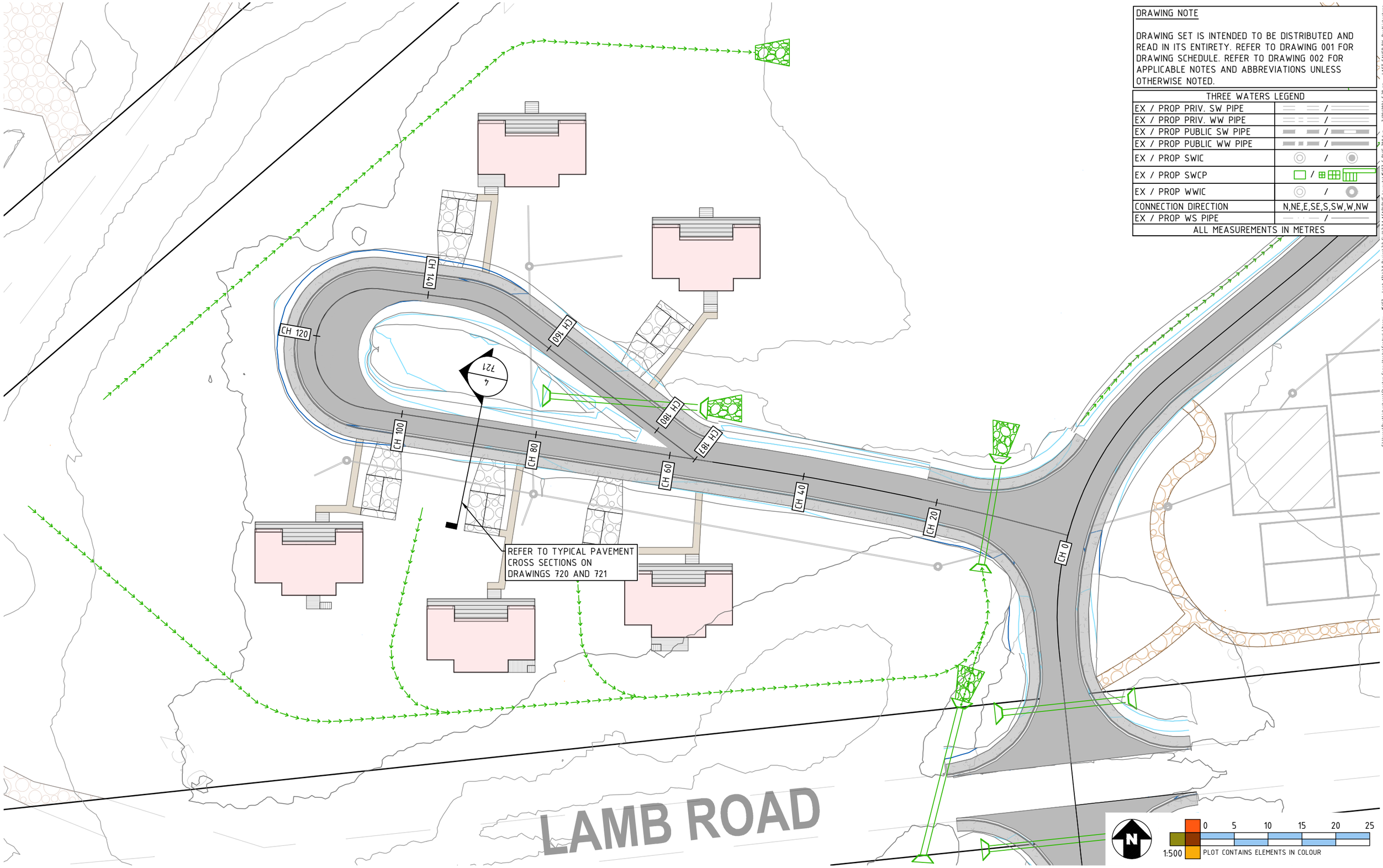

DRAWING NOTE

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THREE WATERS LEGEND	
EX / PROP PRIV. SW PIPE	/
EX / PROP PRIV. WW PIPE	/
EX / PROP PUBLIC SW PIPE	/
EX / PROP PUBLIC WW PIPE	/
EX / PROP SWIC	/
EX / PROP SWCP	/
EX / PROP WWIC	/
CONNECTION DIRECTION	N,NE,E,SE,S,SW,W,NW
EX / PROP WS PIPE	/
ALL MEASUREMENTS IN METRES	

Rev	Date	Amendments	By
0	29/07/24	FOR CONSENT	PL

Drafter:	P LIEBENBERG
Designer:	P LIEBENBERG
Checker:	N JULL
Date:	29/07/2024

Job Title:	PROPOSED DEVELOPMENT AT 174 LAMB ROAD, PUKENUI
Client:	REALM PROPERTY GROUP LTD
Address:	174 LAMB ROAD, PUKENUI
Drawing Title:	ROAD LAYOUT PLAN - ROAD 2B

Drawing:	703	Rev:	0
Scale:	1:500 @ A3		
Project:	15657		
Issue:	FOR CONSENT		

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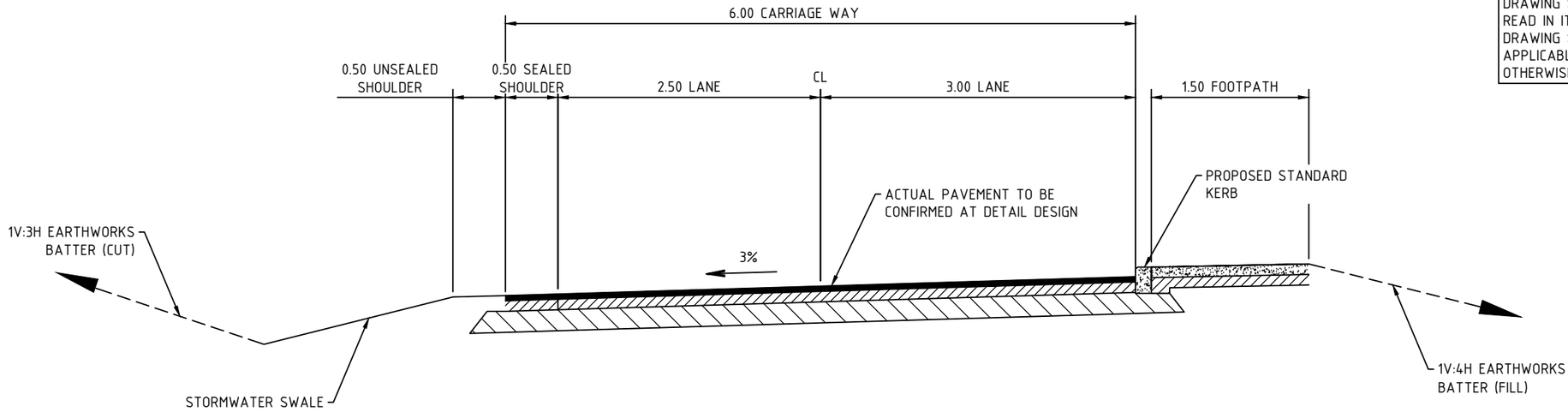
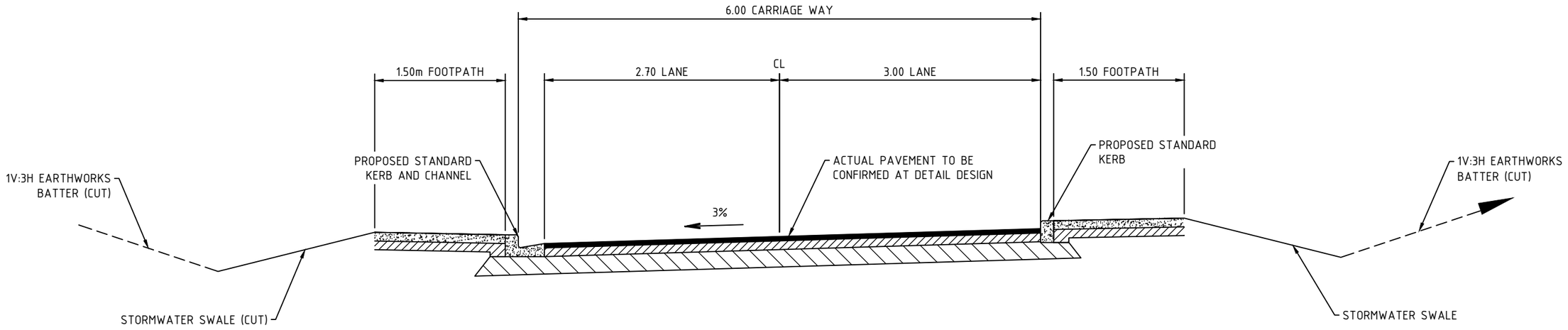


1 PROPOSED ROAD 2A TYPICAL CROSS SECTION

1:50 @ A3



2 PROPOSED TYPICAL CROSS SECTION SIDEWALK BOTH SIDES

1:50 @ A3

Rev	Date	Amendments	By
0	29/07/24	FOR CONSENT	PL

Drafter:	P LIEBENBERG	Job Title:	PROPOSED DEVELOPMENT AT 174 LAMB ROAD, PUKENUI
Designer:	P LIEBENBERG	Client:	REALM PROPERTY GROUP LTD
Checker:	N JULL	Address:	174 LAMB ROAD, PUKENUI
Date:	29/07/2024	Drawing Title:	TYPICAL PAVEMENT CROSS SECTIONS - SHEET 1

Drawing:	720	Rev:	0
Scale:	1:50 @ A3		
Project:	15657		
Issue:	FOR CONSENT		

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DRAWING NOTE

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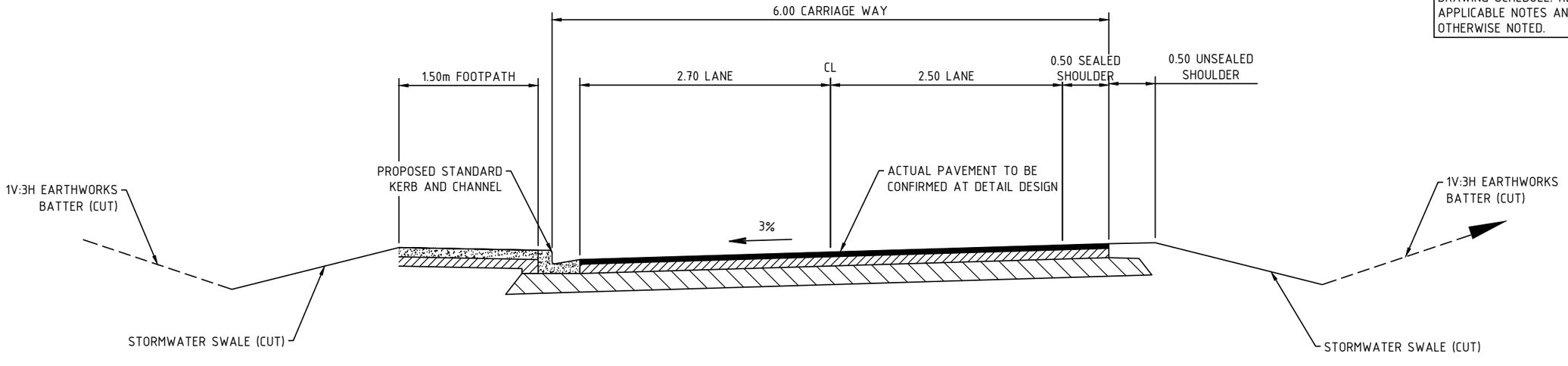
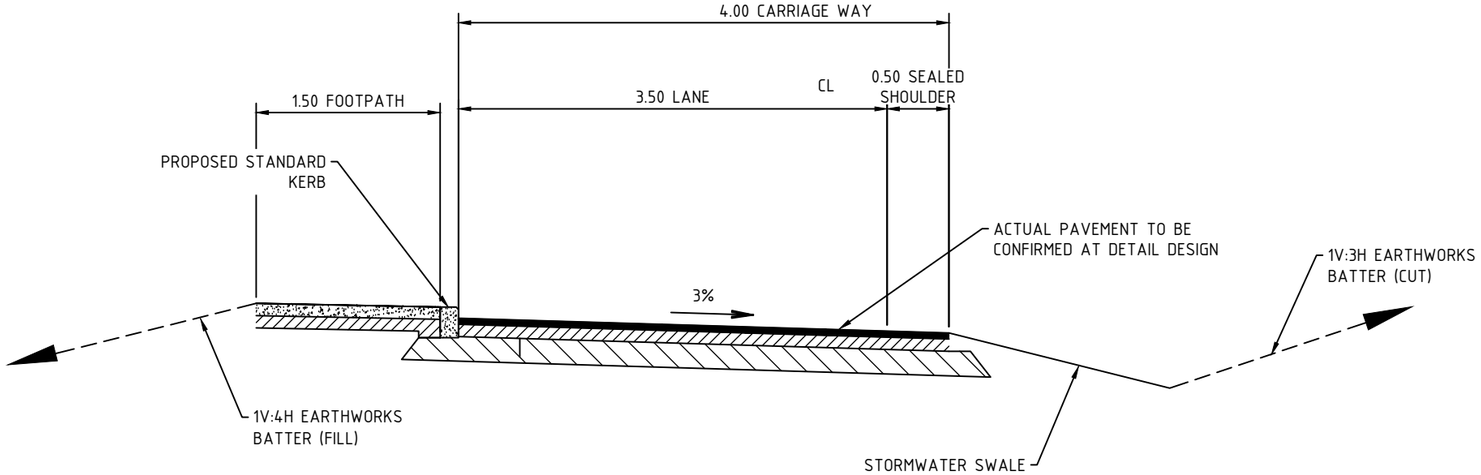


3 PROPOSED ROAD 1 TYPICAL CROSS SECTION

1:50 @ A3



4 PROPOSED ROAD 2B (ONE-WAY SECTION) TYPICAL CROSS SECTION

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Rev	Date	Amendments	By
0	29/07/24	FOR CONSENT	PL

Drafter: P LIEBENBERG
Designer: P LIEBENBERG
Checker: N JULL
Date: 29/07/2024

Job Title: PROPOSED DEVELOPMENT AT 174 LAMB ROAD, PUKENUI
Client: REALM PROPERTY GROUP LTD
Address: 174 LAMB ROAD, PUKENUI
Drawing Title: TYPICAL PAVEMENT CROSS SECTIONS - SHEET 2

Drawing: 721 Rev: 0
Scale: 1:50 @ A3
Project: 15657
Issue: FOR CONSENT

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Appendix D –Geotech Report By Soil and Rock Consultants

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Preliminary Geotechnical Investigation for Proposed Development at

174 Lamb Road, Pukenui

Rev A **5 April 2024** **Job No. NL230102**

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PRELIMINARY GEOTECHNICAL INVESTIGATION FOR PROPOSED DEVELOPMENT AT 174 LAMB ROAD, PUKENUI

Job Number:	NL230102
Name of Project:	174 Lamb Road, Pukenui
Client:	Realm Property Group Ltd
Author:	Randy Lineses, Senior Geotechnical Engineer, MEngNZ
Reviewer & Authoriser:	Bruce Green, Principal Geotechnical Engineer, CMEngNZ, CPEng
Document Version:	A
Published:	5 April 2024
Author Signature:	
Reviewer & Authoriser Signature:	

Table of Contents

Appendices:

Report Summary

The following summarises the findings of this report however is not to be taken in isolation. It is a requirement that any user of this report review the document in its entirety, including all appendices.

Feature	Commentary
Proposal	Option 1, 2 & 3 sites are being considered for potential rural residential subdivision. The main consideration is the Option 1 site.
Fill	Not encountered within the test holes however was observed at the edges of the form platform in Option 1 Area.
Natural Soils	Loose to dense Karioitahi Group soils
Unduly Weak, Sensitive, or Compressible Soils	Not Encountered
Groundwater	Not encountered in most of the augerholes on the day of drilling, with the exception of AH20 (drilled within wetland area) where groundwater was measured at 1.1m bpgl.
Seismic Site Class	Site Class C
Slope Stability	Option 1 site - We consider the ridgeline area to be suitable for the future development from a land stability point of view. Option 2 site – The general area comprises gently sloping ground hence no undue global instability concern.
Preliminary Geotechnical Recommendations	Preliminary geotechnical recommendations (e.g. cuts, retaining, pavement, foundations) are provided in Section 9.0 of this report.
Site Constraint	Refer to Section 12.0 of this report.
Pavement	For preliminary design a CBR value of 3% or a modulus of subgrade reaction of 20kPa/mm are considered appropriate for flexible and rigid pavements respectively.

1.0 Introduction

Soil & Rock Consultants (S&RC) were engaged by Realm Property Group Ltd to carry out a geotechnical investigation relating to master planning of a proposed development at 174 Lamb Road, Pukenui.

The findings and recommendations of our investigation and analyses will be presented in a Preliminary Geotechnical Investigation Report suitable for master planning for the development as described in Section 2.0 of this report.

Further geotechnical assessment will be required following completion the final scheme prior to Resource Consent Application.

1.1 Limitations

This report has been prepared by Soil & Rock Consultants for the sole benefit of Realm Property Group Ltd (the client) with respect to 174 Lamb Road, Pukenui and the brief given to us. The data and/or opinions contained in this report may not be used in other contexts, for any other purpose or by any other party without our prior review and agreement. This report may only be read or transmitted in its entirety, including the appendices.

The preliminary recommendations given in this report are based on data obtained from discrete locations and soil conditions between locations are inferred only. Our geotechnical models are based on those actual and inferred conditions however variations between test locations may occur and Soil & Rock Consultants should be contacted in this event to confirm or modify the validity of this report.

2.0 Site Description

The subject properties are legally described as Section 8 SO 65943, Section 9 SO 65943, and Section 2 SO 65943 designated as Options 1, 2 and 3 respectively in Figure 1. Option 3 property is 174 Lamb Road, Pukenui.

Option 1 - The property is currently vacant. A broad ridgeline traversing from east to west in a zig-zag fashion is present within the northern section of the property. The ridge side slope inclinations range from 20° to 30°. A wetland is present within the northeastern section of the property, between the ridge and the road. The wetland appeared to be dry at time of our site visit. Land to the south of the ridgeline is covered with dense native bush.

The eastern section of the ridgeline has been cleared of vegetation and five building platforms and associated accessways have been created.

Option 2 - The property is currently vacant and used as grazing land. The ground surface is inclined generally less than 8° with isolated low/depressed areas. Some trees are present along and near the southern boundary. Multiple man-made open channels are present within the property, including a main drainage channel (approximately 1.5m deep near Lamb Road) entering the Option 2 area from across the road (wetland in Option 1 site) extending towards north-northeast beyond the property boundary. Refer to attached site plan for drainage alignment.

Option 3 - The Option 3 property is situated to the north and west of the Option 2 land. A dwelling serviced by a gravel driveway is present near the southeast boundary. Isolated elevated areas are present, including the location of the dwelling platform. The general area is currently used as grazing land. A wetland is present to the south of the property, adjacent to the road.

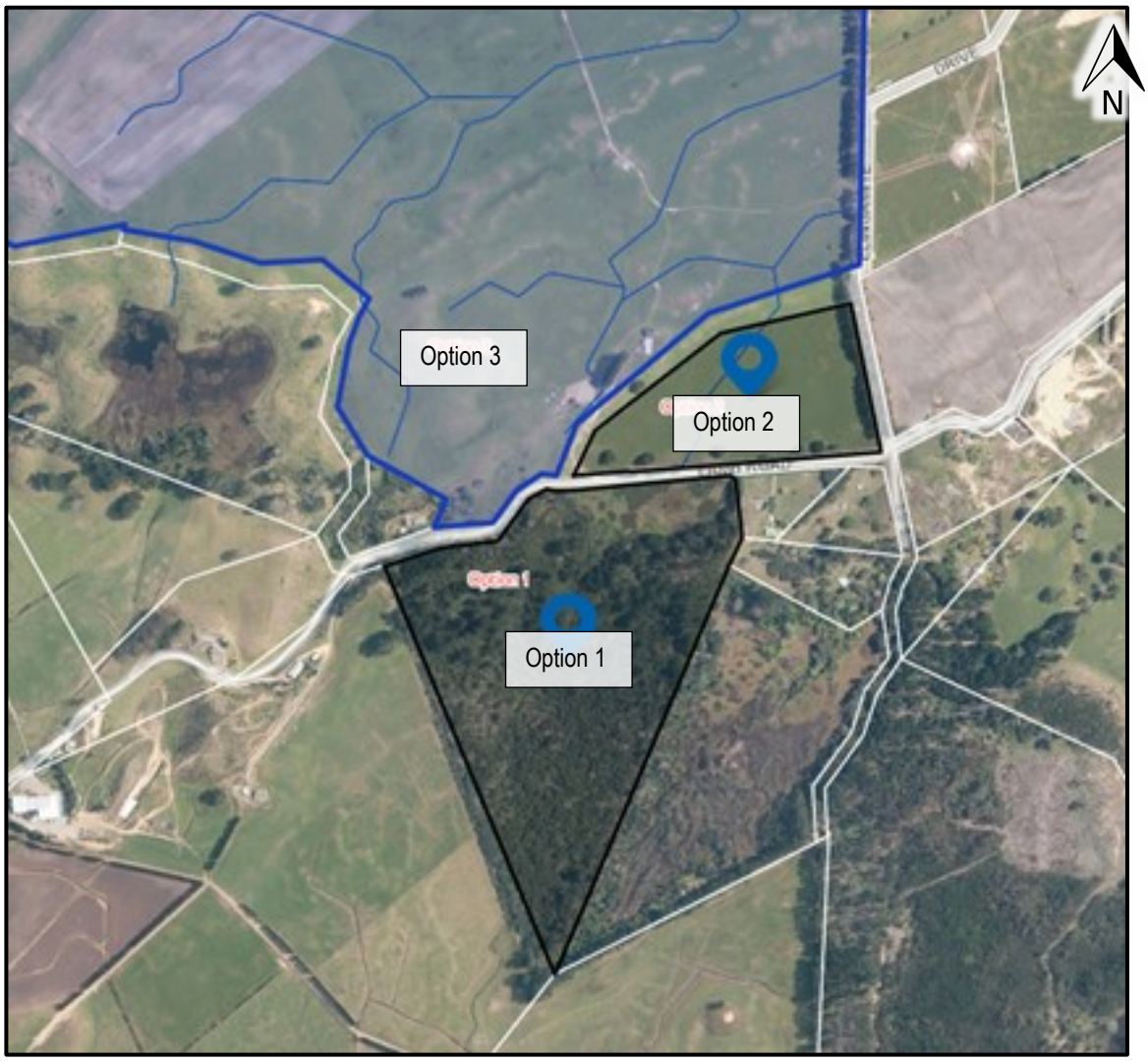

Figure 1: Aerial Image (*Source: Provided by Barker Associates*)

2.1 Proposed Development

A developed scheme plan was not available at the time of preparation of this report. The general proposal is a rural residential development however the final set-out and number of lots is yet to be finalised.

Hence, this report is intended to support master planning purposes, to aid in identifying potential building platforms and site constraints.

The sites (northern section of Option 1, Option 2 & Option 3) being considered for future development are shown in both Figure 1 above and Figure 2 below. The priority for the development is Option 1, in particular the ridgeline area. Depending on the number of lots, the development may extend to the Option 2 site.

Our scope is to investigate Option 3 site if Option 1 and 2 sites have large areas unsuitable for development. Based on our site walk-over inspection, Option 1 & 2 sites are considered to have sufficient areas to create multiple lots (e.g. >25, depending on lot size).

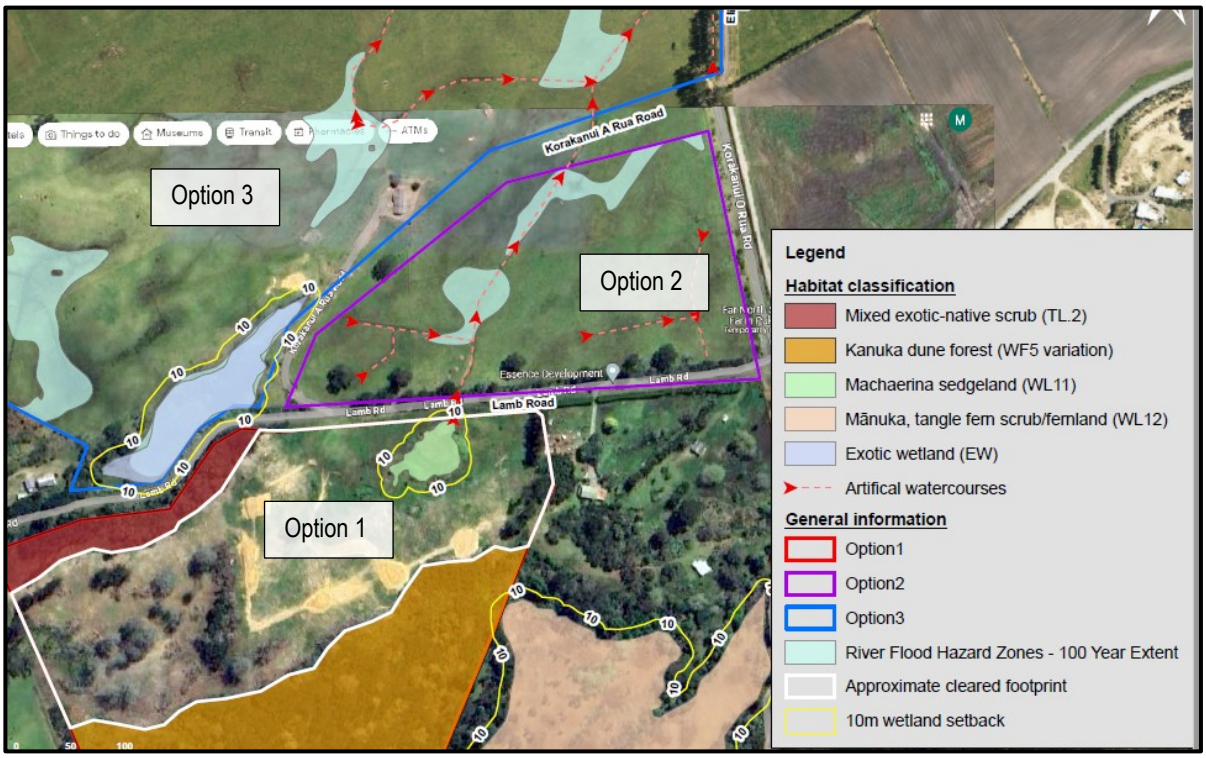

Figure 2: Ecological Plan (*Source: Wild Ecology*)

3.0 Geology

Reference to the GNS New Zealand Geological Web Map 1:250,000 Geology map indicates the site is underlain by dune sand deposits of the Karioitahi Group (See Figure 3). Karioitahi Group soils are described as weakly cemented sand in fixed parabolic dunes with intermixed sand, mud, and peat in interdune deposits.

Loose to cemented sands were encountered during our investigation, with no mud or peat deposits encountered (apart from augerhole AH20, which showed organic-stained sand, drilled within the wetland area).

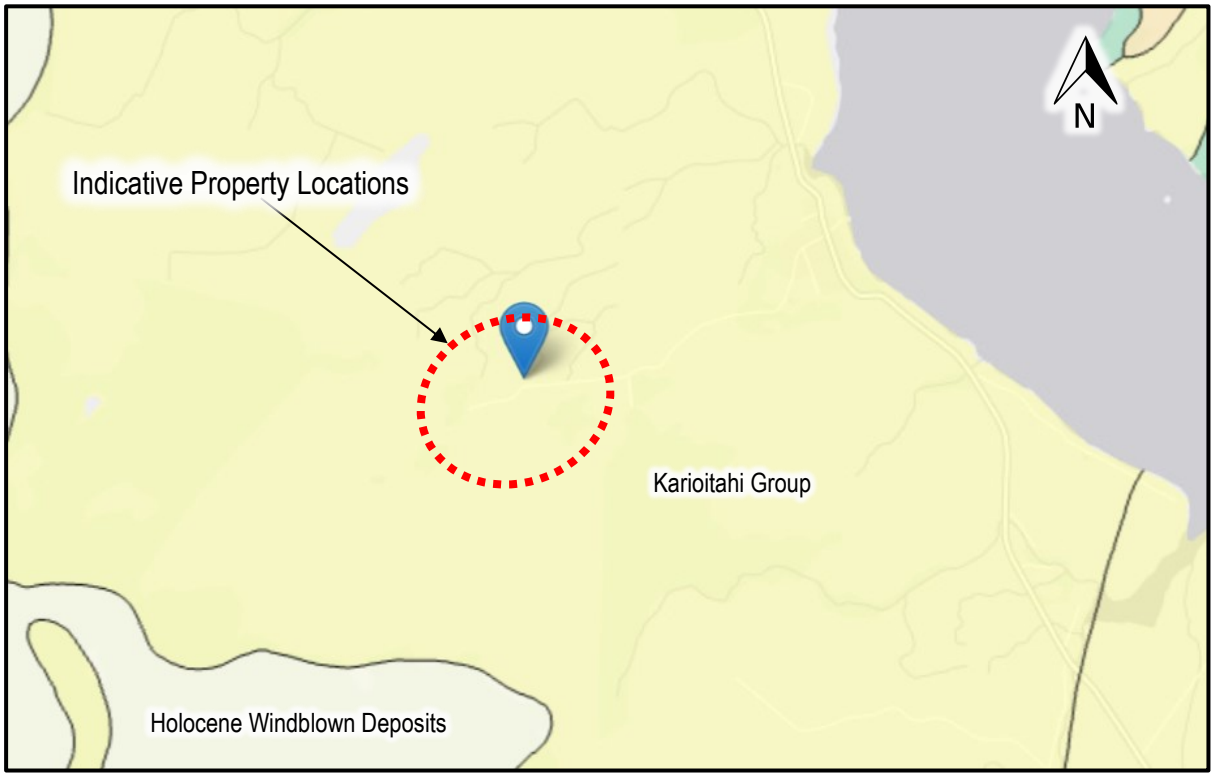

Figure 3: Geological Map *(Source: GNS WebMaps Website)*

4.0 Field Investigation

The field investigation carried out on 12 &13 March 2024 comprised the following components:

- Visual appraisal of the properties
- Drilling of twenty hand augerholes (AH01 – AH20 inclusive) – Appendix B
- Measurement of three cross section (A-A', B-B' and C-C') using measuring tape and clinometer – Appendix A

The test locations are shown on the Site Plan, Drawing No NL230102/1 (Appendix A). The locations were determined from hand-held GPS and are therefore approximate only.

A visual-tactile field classification of the soils encountered during drilling was carried out in accordance with “Guidelines for the Field Classification and Description of Soil and Rock for Engineering Purposes”, issued by the New Zealand Geotechnical Society Inc. (2005).

Measurements of undrained shear strength are normally undertaken in the augerholes at intervals of depth using a handheld shear vane in accordance with the New Zealand Geotechnical Society Guidelines for Handheld Shear Vane Tests, dated August 2001. Due to the nature of the underlying soil (sandy material), no vane shear testing was carried out in any test holes.

Dynamic Cone (Scala) Penetrometer testing was carried out in-lieu of shear vane testing where soils became sand-dominated and from the base of each augerholes until refusal or the maximum practical testing depth of the equipment was reached (i.e. AH03). Refusal is defined as five consecutive blow counts of 10 or greater per 50mm penetration or a blow count of 20 for a penetration of 50mm or less. The results are given on the attached sheet (Appendix B).

4.1 Subsurface Conditions

Subsurface conditions have been interpolated between the test locations and localised variations between and away from the test locations will exist.

In general, the soils encountered comprised Karioitahi Group soils. An outline of the soil conditions and investigation results is given below and summarised in Table 1, and detailed descriptions of the soils are given on the attached logs (Appendix B).

- **Topsoil.** Topsoil was not encountered in any augerholes however may be present away from the test holes.
- **Non-Engineered Fill.** Non-engineered fill was not encountered in any augerholes however we note that the material was observed to be present on the edges of the formed platforms in Option 1 site. This material is likely to be push-over debris from the formation of building platforms and is not suitable for support of permanent structures (e.g. dwelling, pavement, retaining wall, etc)
- **Karioitahi Group.** Karioitahi Group soils were encountered at each test locations to the termination depths of the augerholes. In general, Scala penetrometer testing carried out within the Karioitahi soils recorded blow counts between 2 and 15 per 100mm penetration, indicating ‘loose to dense’ sands.

To confirm the depth to dense sand within the wetland feature in Option 1 site, AH20 was drilled within the wetland area. Organic-stained sand was encountered between 0.3m and 1.0m depth and immediately below (1.1m below present ground level (bpgl)) dense sand was encountered.

Sandstone/heavily-cemented sand was observed within the excavation face of the main man-made drainage in Option 2 site, refer to Figure 4 below.

Figure 4: Exposed Sandstone/Heavily-Cemented Sand *(Source: S&RC Site Photo – 13 March 2024)*

- **Scala Penetrometer Testing.** In addition to the testing within hand augerholes, Scala penetrometer testing was carried out from the base of each augerhole. Refusal, inferred to represent contact with very dense or cemented sands, was generally encountered at depths ranging between 0.2m and 1.0m below present ground level (bpgl). In AH03 and AH04 refusal was encountered at 8.0m (the maximum practical testing depth of the equipment) and 2.3m bpgl respectively. In AH20 refusal was encountered at 1.3m bpgl.

  Based on the observation of the main drainage excavation, refusal in the Option 2 area is considered due to presence of the underlying sandstone/heavily-cemented sand.

- **Groundwater.** Groundwater was not encountered in most of the augerholes on the day of drilling, with the exception of AH20 where groundwater was measured at 1.1m bpgl.

Groundwater measurements taken during drilling are not always an accurate portrayal of the actual long-term groundwater table as groundwater levels can take time to stabilise within the augerhole following drilling.

Rushes were observed in places, particularly within low/depressed areas. These plants thrive in wet places and generally indicate persistently wet land. Sands generally have good drainage characteristics however due the shallow sandstone/cemented sand (low permeability) surface-water potentially ponds in low areas.

Table 1 – Summary of Subsurface Conditions

Test ID	Termination Depth	Scala Penetrometer Blow Counts (no. of blows / 100mm penetration)	Scala Penetrometer Termination
All depths measured in (m) below present ground level. (Rounded to 1 DP)			
AH01	0.2	4	0.2
AH02	0.7	2 – 7	1.0
AH03	5.0	2 – 8	8.0
AH04	1.8	2 – 12	2.3
AH05	0.3	9	1.0
AH06	0.7	3 – 8	0.7
AH07	0.7	3 – 6	0.7
AH08	0.8	1 – 6	0.9
AH09	0.7	1 – 6	0.8
AH10	0.6	2 – 5	0.8
AH11	0.6	2 – 4	0.6
AH12	0.5	3 – 4	0.6
AH13	0.6	2 – 3	0.7
AH14	0.7	2 – 5	0.8
AH15	0.5	2 – 4	0.6
AH16	0.6	2 – 3	0.6
AH17	0.7	2 – 5	0.8
AH18	0.5	3 – 4	0.6
AH19	0.9	3 - 15	0.7

Test ID	Termination Depth	Scala Penetrometer Blow Counts (no. of blows / 100mm penetration)	Scala Penetrometer Termination
AH20	1.1	2 – 4	1.3

5.0 Sensitive Soils

Sandy soils (e.g. loose sand above sandstone) are potentially susceptible to mechanical disturbance and/or exposure to the elements and soils that test well in-situ can perform poorly when construction is underway. Care is therefore required during construction to ensure the soils are protected to ensure favourable short and long-term subgrade and foundation performance.

6.0 Seismic Design Parameters

The site is considered a Class C – 'Shallow Soil Site' as defined by NZS 1170.5:2004.

The Peak Ground Acceleration (PGA) value for Importance Level 2, adopted for stability analysis of the site is 0.19g (ULS) with an effective earthquake magnitude of 6.5.

7.0 Slope Stability

Qualitative Assessment - Option 1 Site

The Option 1 site comprises a broad ridgeline with side slope inclinations ranging from 20° to 30°. The geology comprises cemented dune sands.

Soil Creep is likely to be operating on these slopes. Soil creep is the slow downslope movement of upper soil horizons, usually confined to the uppermost 1.0m of soil and generally in the order of millimetres per year (or more for un-cemented sands). Soil creep is exacerbated by slope length, slope angle, inundation, groundwater fluctuations, soil expansivity, vegetation, and various surcharge loads and occurs on virtually all ground slopes. It is a normal engineering consideration and does not preclude development.

Groundwater was not encountered in any augerhole (within the elevated land) hence is unlikely to be a contributing factor to soil creep. However, surface-water runoff during times of wet or prolonged rainfall may contribute to such ground movement. Ground cover in the form of vegetation will minimise the degree of soil creep.

Concentrated stormwater of the type collected from roofs and pavements requires controlled dispersal as it represents an erosion threat if not carefully addressed. This would normally be designed as part of future residential development however any pavement associated with subdivision development should include stormwater control as part of design.

We note that a near-vertical cut, approximately 2.0m high, is present to the north of the site, along the road. The near-vertical cut appears to have been created as part of the road development and exposes cemented sand. Cemented dune sands are generally stable at steep slopes (e.g. 70°), nevertheless any permanent structure should consider the presence of any steep slopes and appropriate instability measures (e.g setbacks, pile foundations, retaining wall, etc) should be included in planning and design stage.

At the time of our investigation no visual evidence of major, deep-seated instability was identified.

Qualitative Assessment - Option 2 Site

The Option 2 site comprises very gentle ground slopes hence global instability is considered to be of no threat within the site. In any case, for future development, an appropriate setback from the main drainage channel where depth is greater than 0.6m is recommended. This is a 'local' consideration and should unduly constrain subdivision development.

Quantitative Assessment Option - 1 Site

To quantitatively check the overall stability of the slopes within the Option 1 site, computer-based stability analyses have been undertaken for the existing topography through cross sections A-A', B-B' and D-D' as indicated on the Site Plan, Drawing No. NL230102/1. Cross sections A-A' and B-B' were developed using site measurements while cross section D-D' was derived from LINZ website contour data (Lidar). These sections represent the steepest slopes within the Option 1 site.

The computer program 'SLIDE', Version 2018, developed by RocScience Inc. was used for stability calculations. Stability of theoretical translational surfaces was assessed using the Morgenstern-Price method.

No groundwater table was encountered during our investigation and given the free-draining nature of the dune sands and the preferential sheet-flow shedding characteristics related to the slopes, we consider the likelihood of a shallow standing groundwater table development to be low. Therefore, our stability analyses have been undertaken without a modelled groundwater table for the 'normal' and seismic conditions.

Furthermore, the likelihood of an extreme groundwater condition is considered highly unlikely and has not been analysed (this will, however, be required by Council if a Subdivision Consent application is made for this land).

Peak Ground Acceleration (PGA) values for the Northland Region have been determined as per Section 7.0 of this report.

As discussed above, a near-vertical cut was observed along the road. We infer that the cut is of some age and indicates the ability of the dense/cemented sand to stand unsupported at near-vertical angles. The underlying geology is likely comprised on *dense* Karioitahi Group deposits however for conservatism we modelled the upper 1.5m to 2.0m as *weathered* Karioitahi Group Soils, with lesser effective stress shear strength parameters.

Lower-bound effective stress shear strength parameters used for our analyses are summarised in Table 2. These have been developed from the soil description, in-situ strength testing, and our experience with these soil types in both the immediate area and the wider region.

Table 2 – Effective Shear Stress Parameters

Soil Type	Estimated Unit Weight γ (kN/m^3)	Effective Cohesion on the Failure Plane c' (kPa)	Effective Angle of Internal Friction ø' (°)
Weathered Karioitahi Group Soils	18	3	32
Dense Karioitahi Group Soils	18	6	35

The ratio of resisting forces to disturbing forces is presented as a 'Factor of Safety' (FOS) against slope instability occurring. A FOS of 1 indicates a slope near or at equilibrium.

We have adopted the following for the purposes of our assessment:

- FoS of 1.5 or higher for long-term stability when modelling the existing site conditions (measured groundwater level).
- FoS of 1.0 or higher used for short-term stability to model the effect of seismic loading.

The values above were adopted from Section 2.6.8 of the 'Auckland Council Code of Practice for Land Development and Subdivision, Chapter 2, Earthworks and Geotechnical, Version 2.0, dated May 2023 which is considered a conservative reference. The results of our analyses are provided in Table 3 below.

Table 3 – Stability Analysis Results

Section	Modelled Conditions	Global Factor of Safety within platforms at the ridge top		Compliant
		Required	Calculated	
A-A'	Normal Groundwater	1.5	1.7	Yes
	Seismic Loading	1.0	1.1	Yes
B-B'	Normal Groundwater	1.5	1.6	Yes
	Seismic Loading	1.0	1.1	Yes
D-D'	Normal Groundwater	1.5	1.6	Yes
	Seismic Loading	1.0	>1.0	Yes

Stability Conclusions

The minimum factors of safety within the potential building areas (Option 1 area, ridge top platforms) were greater than the published Council requirements (see Appendix C).

We therefore consider the potential building areas (ridge top) to be suitable for future development from a global land stability point of view contingent upon the recommendations of this report being adopted in design and construction.

The general area within the Option 2 area is also suitable for residential development from a land stability point of view.

8.0 Geotechnical Discussion

The Option 1 area (ridge top) is geotechnically suitable for residential development however slope-setbacks and/or leading-edge piles may be required depending on actual residential development proposals. Pile foundations should be expected where future dwellings are within 5.0m of any slope steeper than 14°.

The investigation within the Option 2 site indicated sandstone/cemented sand (or a very dense stratum) to be present within 1.0m bpgl. We understand that flood-prone areas are present. Geotechnically, the general Option 2 site is suitable for residential development including the flood-prone areas provided

future building platform are formed above the anticipated flood level and appropriate drainage constructed to divert surface water away from residential development.

These are geotechnical considerations and other considerations may take precedence in the overall scoping of the development.

9.0 Preliminary Geotechnical Recommendations

9.1 Cuts and Fills

Formation of roading to service future subdivision is anticipated. Within the Option 1 site, additional accessways are likely to be cut into the slopes. As discussed in Section 9.0, cemented dunes sands are generally stable at steep slopes however some form of retaining will be required if future dwelling will be situated within the influence zone of the cut. Alternatively, the dwelling may be supported on pile foundations, to transfer load below the cut's influence zone.

All fills, regardless of depth, must be placed in accordance with NZS 4431:2022 with respect to subgrade preparation and standard of compaction.

Essentially, the height of any unsupported face and proximity to building platforms and consented structures will determine the need for retaining or lower-angle battering. Any proposal to create cuts or fills greater than 1.0m in height should be the subject of specific design advice.

9.2 Retaining Structures

The following is preliminary advice provided to assist with scoping of any retaining that may be required to develop the subdivision. We anticipate that that retaining would be limited to support of cuts and fills required to form accessways.

Factors of safety and surcharge loadings appropriate to the conditions should be in accordance with 'Limit State Design of Retaining Walls and Foundations for Geotechnical and Structural Engineers' SESOC Seminar Series 2005.

We recommend retaining systems be Engineer-designed and consider both the local and global stability of the site, and any surcharge applicable to the wall. Particular attention should be paid to the influence of building surcharges above, and sloping ground above and below, any retaining wall. Geotechnical retaining wall design parameters are provided in Table 4.

Table 4 – Preliminary Retaining Wall Design Parameters

Parameter	Value
Effective Cohesion c' (kPa)	0
Internal Friction Angle (Stiff Natural Ground / Engineered Fill Only)	30°
Bulk Density (kN/m^3)	18
C_u for Broms (kPa) (Stiff Natural Ground / Engineered Fill Only)	80

We have provided an 'equivalent' Cu for Broms design however 'Broms for Sand' may also be used by the designer.

For the design of 'stand-alone' timber pole retaining walls, soil pressures should be determined for active pressure conditions (K_a). For the design of rigid retaining walls or those that are integrated into any building structure, soil pressures should be determined for 'at-rest' pressure conditions (K_o).

Sliding resistance for a gravity wall may be calculated using a wall/ground (no plastic membrane) friction angle of 20° and the bulk density provided in Table 4.

No passive resistance should be inferred until the horizontal buttress of stiff natural soil at the downslope side of the retaining pole is at least 4D in width, where 'D' is the diameter of the bored hole. This discount recognises the lesser buttressing effect of inclined soil and also recognises the potential for soil creep and surface erosion to affect long-term pole performance,

9.3 Pavements

All topsoil, non-engineered fill, vegetation, organic or otherwise unsuitable material should be removed from under pavement areas prior to construction.

For preliminary design a CBR value of 3% or a modulus of subgrade reaction of 20kPa/mm are considered appropriate for flexible and rigid pavements respectively. These values should be confirmed by specific testing by S&RC following preparation of the subgrade.

Any pavement should be underlain by a basecourse of clean, free-draining granular fill as specified by the designer and should be subjected to compaction by a device of appropriate weight and energy. Silty or sandy subgrades are generally sensitive to disturbance and 'static' rolling only (no vibration) is recommended.

9.4 Foundation Design Recommendations – Indicative

The following is provided in order to inform likely foundation types. It is not to be used for design of foundations or support of a Building Consent.

9.4.1 Shallow Foundations

Shallow ('spread') foundations are considered suitable for the support of typical residential dwellings where within slopes flatter than 1V:4H (14°) or well clear of slopes steeper than the same.

The natural site soils are considered suitable for the use of shallow foundations which may comprise a 'waffle' or 'rib-raft' slab (surface-supported, no embedment) or traditional strip/pad/Senton footings embedded a minimum of 600mm into stiff natural ground or engineered fill.

A Design (Dependable) Bearing Capacity of 150kPa is available for Ultimate Limit State Design of shallow foundations carried out in accordance with B1/AS1 or AS2870:2011, B1/VM4 and AS/NZS 1170:2002. A Strength Reduction Factor ($Ø_{bc}$) of 0.5 has been applied to the Geotechnical Ultimate Bearing Capacity value to determine the Design Bearing Capacity.

The site soil within the general area is considered good ground in terms of NZS3604. Provided the recommended minimum foundation depth above is adopted, future dwellings may be designed using NZS3604:2011, B1/AS1 and the minimum embedment depth given above.

9.4.2 Pile Foundations

Depending on location and design of future dwellings, pile foundations may be required.

Preliminary soil strength parameters applicable to Ultimate Limit State Design in accordance with AS/NZS 1170:2002 are given in Table 5. These parameters may only be adopted for piles with a length-to-diameter ratio greater than five (L/D > 5), and that are embedded into stiff natural ground.

Table 5 – Ultimate Limit State Pile Design Parameters

Material	Ultimate End Bearing Capacity	Ultimate Skin Friction
Karioitahi Group Soils (+2.0m depth)	1,500Pa	30kPa

An 'equivalent' Cu for skin friction has been given however actual pile adhesion design should be in accordance with Section 4.1.4 (c) of B1/VM4.

A Strength Reduction Factor not greater than $Ø_{pc}$ = 0.5 should be applied to the Geotechnical Ultimate Capacity values to determine the Design (Dependable) Capacity values.

No passive resistance should be inferred until the horizontal buttress of stiff natural soil at the downslope side of the retaining pole is at least 4D in width, where 'D' is the diameter of the bored hole. Appropriate design parameters provided in Section 10.0 of this report may be adopted to mitigate lateral pressure.

10.0 Stormwater

Concentrated stormwater flows must not be allowed to run onto or over slopes or saturate the ground as this could adversely affect slope stability or foundation conditions. Flows from all impermeable areas must be collected and carried in sealed pipes to a disposal point approved by Council.

We expect this recommendation to apply to accessway construction only at this stge. Future (individual) residential development will carry with it its own design in this respect.

11.0 On-site Wastewater Treatment and Dispersal

The encountered soils are considered suitable for the on-site dispersal of treated wastewater.

We view the near-surface soils as meeting TP58 Soil Category 3 (medium-fine and loamy sand – good drainage). However, for conservativity, we recommend Soil Category 4 (sandy loam – moderate drainage) with maximum dispersal rate of 5mm/day be adopted for future wastewater design. Given the dense, less permeable, soil at shallow depth, dispersal via conventional in-ground soakage trenches should be avoided - dispersal of treated wastewater would best be achieved via Pressure-Compensated Dripline Irrigation (PCDI).

Designers should be cognisant of groundwater depth. This could be an issue within the low-lying areas as we expect the wet-season groundwater conditions to be onerous for wastewater design. Raised dispersal beds could be a requirement. Dispersal designs should also consider overland flow features and other water bodies.

Stormwater and wastewater discharges should not interfere with each other.

12.0 Site Constraints

Below is the summary of geotechnical site constraints that should be considered in master planning.

Option 1 Site

- Generally considered suited to further residential development in geotechnical terms.
- Depending on actual location and design of future dwellings, pile foundations may be required. Pile foundations should be expected where future dwellings are within 5.0m of any slope steeper than 14°.
- The formation of additional accessways is likely to cut into ground slopes. As discussed in Section 9.0, cemented dunes sands are generally stable at steep slopes however some form of retaining will be required if future dwelling will be situated within the influence zone of the cut.
- Any cut or fill in excess of 1.0m height requires specific consideration and may require retaining.
- Push-over non-engineered fill (from the formation of existing platform) are present in places.
- Safe stormwater disposal related to impermeable surfaces (accessways) is a likely subdivisional requirements.
- On-site wastewater and stormwater dispersal related to future residential development proposals are achievable.

Option 2 Site

- In geotechnical terms, there are no obvious constraints to subdivision for residential purposes.
- The site is low lying with areas prone to flooding. Development within the site should consider potential flood levels.
- There could be issues with wastewater disposal if the winter and spring groundwater levels are shallow.

13.0 Future Geotechnical Assessment

Further geotechnical assessment is required following completion the final scheme prior to Resource Consent Application. Depending on the development proposal, the assessment may comprise additional investigation, drawing review and/or desktop assessment.

End of Report Text – Appendices Follow

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Appendix A

Drawings

NOTES:

1. Locations of features approximate only.
2. Buried service locations to be verified on site.
3. Original sheet size A3.
4. Boundary data obtained from Council GIS.

Key:

- Site Boundary
- S&RC Cross Section Locations Feb 2024
- S&RC Hand Augerhole Locations Feb 2024
- S&RC Soil Expansivity Sample Locations Feb 2024

AMENDMENTS		
Date	Rev	Description

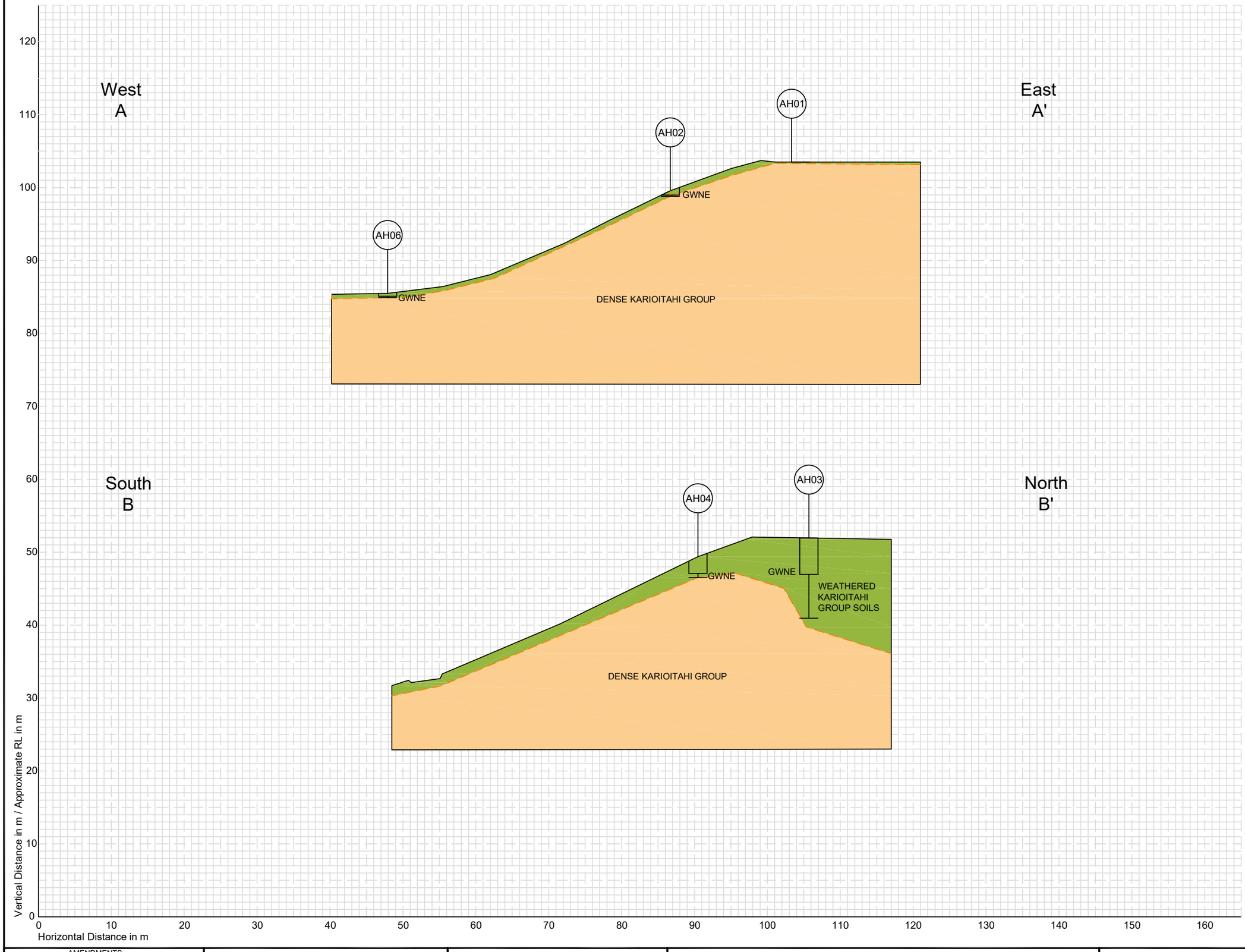
Soil&Rock Consultants
Your responsive & cost-effective engineers

289 Lincoln Road, Waitakere
PO Box 21-424 Henderson, 0650
Ph 09 835 1740 Fax 09 835 1847
www.soilandrock.co.nz

174 Lamb Road
Pukenui

Site Plan

Dwg. No.	240104/1		
Scale:	1:4000	Drawn By:	RL
Date:	28/03/2024	Rev.	A
Filename:	O:\Whangarei\NL23---10100 - 10199\NL230102\QGIS\NL230102 - Site Plan - March 2024.qgz		



KEY TO CROSS SECTION SYMBOLS

AH01 — Hand Drilled Augerhole

Groundwater Level

GWNE — Groundwater Not Encountered

Scala Penetrometer Test from base of Augerhole

KEY TO LITHOLOGY SHADES

Weathered Soil Shade

Dense Soil Shade

Karioitahi Group

KEY TO LITHOLOGY HATCHES

Clay
Silt
Sand
Gravel
Sandstone

NOTES:

1. Soil & Rock Consultants cross sections surveyed by tape and clinometer.
2. Soil descriptions shown approximate only, refer to borelogs for details.
3. Extrapolation of ground conditions away from test locations has been made but cannot be guaranteed.
4. Groundwater measurements were made 14 March 2024
5. Locations of features approximate only.

AMENDMENTS		
DATE	REV	DESCRIPTION

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174 LAMB ROAD
PUKENUI

CROSS SECTIONS
A-A' & B-B'

NL230102/2A	DRAWN: RL	DATE: 28-Mar-24	
SCALES: 1: 500 AT A3	CHECKED:		REV.
	DESIGNED:		
Filename: 2430102 - sections.dwg			

South
C

North
C'

AH05

AH19

GWNE

GWNE

WEATHERED KARIOITAHI GROUP SOILS

DENSE KARIOITAHI GROUP

Southeast
D

Northwest
D'

WEATHERED KARIOITAHI GROUP SOILS

DENSE KARIOITAHI GROUP

Vertical Distance in m / Approximate RL in m

Horizontal Distance in m

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160

0 10 20 30 40 50 60 70 80 90 100 110 120

KEY TO CROSS SECTION SYMBOLS

AH01 Hand Drilled Augerhole

Groundwater Level

GWNE Groundwater Not Encountered

Scala Penetrometer Test from base of Augerhole

KEY TO LITHOLOGY SHADES

Weathered Soil Shade

Dense Soil Shade

Karioitahi Group

KEY TO LITHOLOGY HATCHES

Clay
Silt
Sand
Gravel
Sandstone

NOTES:

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3. Extrapolation of ground conditions away from test locations has been made but cannot be guaranteed.
4. Groundwater measurements were made 14 March 2024
5. Locations of features approximate only.

AMENDMENTS		
DATE	REV	DESCRIPTION

Soil&Rock Consultants
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174 LAMB ROAD
PUKENUI

CROSS SECTIONS
C-C' & D-D'

NL230102 /2C

DRAWN: RL

DATE: 28-Mar-24

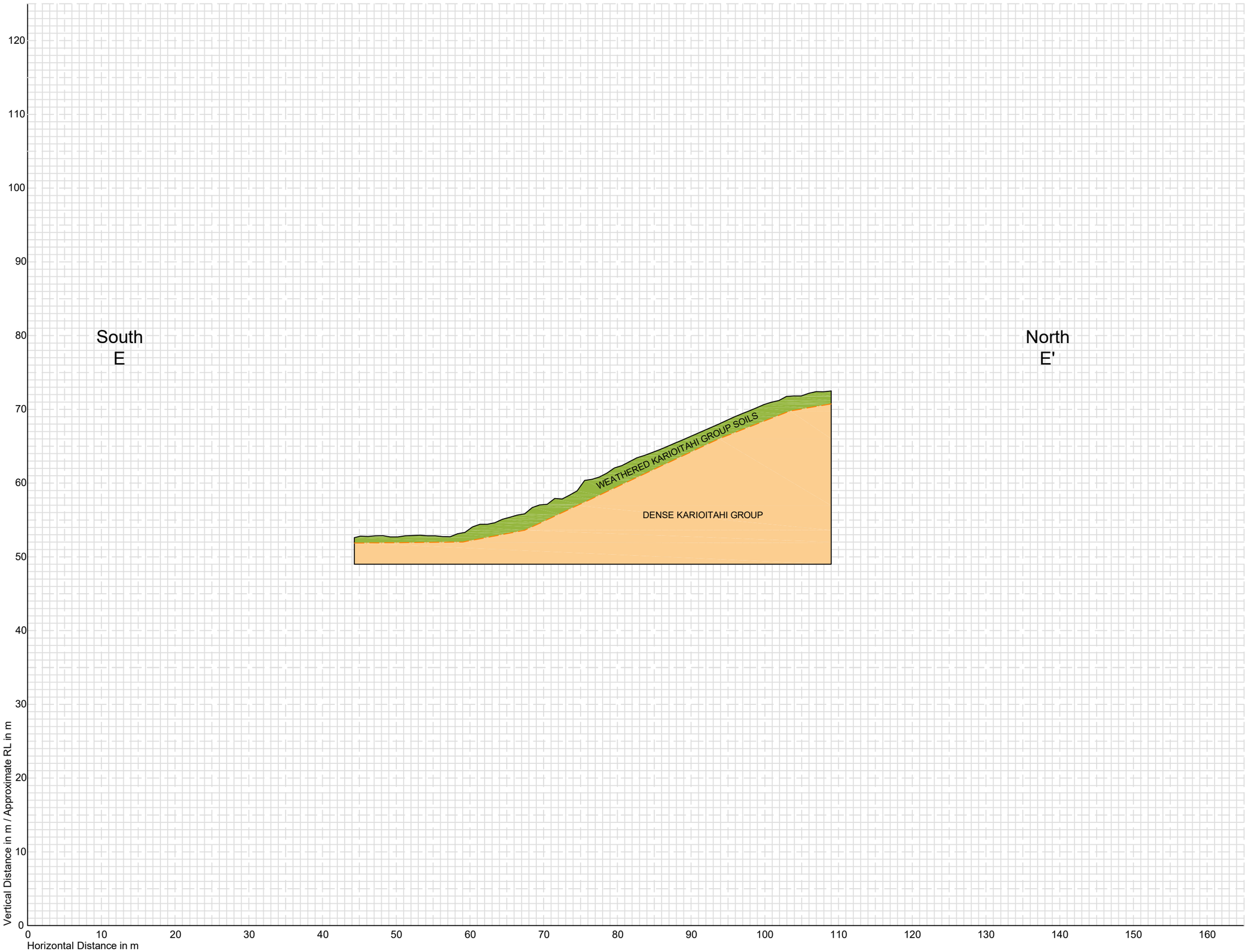
SCALES: 1: 500 AT A3

CHECKED:

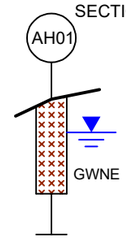
DESIGNED:

REV.

Filename: 2430102 - sections.dwg



KEY TO CROSS SECTION SYMBOLS



Hand Drilled Augerhole

Groundwater Level

Groundwater Not Encountered

Scala Penetrometer Test from base of Augerhole

KEY TO LITHOLOGY SHADES

Weathered Soil Shade

Dense Soil Shade

Karioitahi Group

KEY TO LITHOLOGY HATCHES

Clay

Silt

Sand

Gravel

Sandstone

NOTES:

1. Soil & Rock Consultants cross sections surveyed by tape and clinometer.
2. Soil descriptions shown approximate only, refer to borelogs for details.
3. Extrapolation of ground conditions away from test locations has been made but cannot be guaranteed.
4. Groundwater measurements were made 14 March 2024
5. Locations of features approximate only.

AMENDMENTS

DATE	REV	DESCRIPTION

Soil&Rock Consultants
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www.soilandrock.co.nz

174 LAMB ROAD
PUKENUI

CROSS SECTION E-E'

NL230102 /2

DRAWN: RL | DATE: 28-Mar-24

SCALES: 1: 500 AT A3 | CHECKED: | DESIGNED: | REV.

Filename: 2430102 - sections.dwg

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Appendix B

Investigation Logs

Soil&Rock Consultants
Your responsive & cost-effective engineers

CLIENT: Realm Property Group Ltd

PROJECT: Geotechnical Investigation, 174 Lam Road, Pukenui

Auger Hole No: AH01

Sheet 1 of 1

Drill Type:	50mm Hand Auger	Project No:	NL230102	Logged By:	JN
Drilled By:	KMAC	Coordinates:		Shear Vane No - Calibration Date:	
Date Started:	12/3/24	Ground Elevation:		Surface Conditions:	Near Level, Sand
Date Finished:	12/3/24	Water Level:	Groundwater Not Encountered		

STRATIGRAPHY	DEPTH (m)	GRAPHIC LOG	Soil description in accordance with the NZ Geotechnical Society Inc 2005 "Guidelines for Field Description of Soil and Rock in Engineering Use"	WATER LEVEL (m)	DEPTH (m)	SCALA PENETROMETER TEST NZS:4402:1986 test 6.5.2 (Blows per 100mm Increment) 10 20 30 (Blows) / SHEAR STRENGTH REMOULDED SHEAR ○ v ⊙ r 50 100 150 (kPa)	LABORATORY TESTS
K	0.0		fine to medium SAND, some silt, dark yellow grey, loose, moist (DUNE SAND) brown medium dense		0.0	4	
	0.5				0.5		
			END OF BORE. 0.15 METRES. (TOO DENSE TO AUGER)				
	1.0				1.0		
	1.5				1.5		
	2.0				2.0		
	2.5				2.5		
	3.0				3.0		
	3.5				3.5		
	4.0				4.0		
	4.5				4.5		
	5.0				5.0		

HAND AUGER LOG WITH SCALA NL230102 AH01 - AH20 174 LAMB ROAD 15MARCH24.GPJ S+R_2013.GDT 15/3/24

Soil&Rock Consultants
Your responsive & cost-effective engineers

CLIENT: Realm Property Group Ltd

PROJECT: Geotechnical Investigation, 174 Lam Road, Pukenui

Auger Hole No: AH02

Sheet 1 of 1

Drill Type:	50mm Hand Auger	Project No:	NL230102	Logged By:	JN
Drilled By:	KMAC	Coordinates:		Shear Vane No - Calibration Date:	
Date Started:	12/3/24	Ground Elevation:		Surface Conditions:	Moderate Slope, Soil
Date Finished:	12/3/24	Water Level:	Groundwater Not Encountered		

STRATIGRAPHY	DEPTH (m)	GRAPHIC LOG	Soil description in accordance with the NZ Geotechnical Society Inc 2005 "Guidelines for Field Description of Soil and Rock in Engineering Use"	WATER LEVEL (m)	DEPTH (m)	SCALA PENETROMETER TEST NZS:4402:1986 test 6.5.2 (Blows per 100mm Increment) 10 20 30 (Blows)	LABORATORY TESTS
	0.0				0.0	SHEAR STRENGTH REMOULDED SHEAR ○ v ⊙ r 50 100 150 (kPa)	
K. GROUP			fine SAND, some silt, light yellow brown, loose, moist (DUNE SAND)			2	
			dark orange, medium dense			4	
						6	
						5	
	0.5		dense		0.5	8	
						7	
	1.0				1.0		
			END OF BORE. 0.70 METRES. (TOO DENSE TO AUGER)				
	1.5				1.5		
	2.0				2.0		
	2.5				2.5		
	3.0				3.0		
	3.5				3.5		
	4.0				4.0		
	4.5				4.5		
	5.0				5.0		

HAND AUGER LOG WITH SCALA NL230102 AH01 - AH20 174 LAMB ROAD 15MARCH24.GPJ S+R_2013.GDT 15/3/24

Soil&Rock Consultants
Your responsive & cost-effective engineers

CLIENT: Realm Property Group Ltd

PROJECT: Geotechnical Investigation, 174 Lam Road, Pukenui

Auger Hole No: AH03

Sheet 1 of 1

Drill Type:	50mm Hand Auger	Project No:	NL230102	Logged By:	JN
Drilled By:	KMAC	Coordinates:		Shear Vane No - Calibration Date:	
Date Started:	12/3/24	Ground Elevation:		Surface Conditions:	Near Level, Sand
Date Finished:	12/3/24	Water Level:	Groundwater Not Encountered		

STRATIGRAPHY	DEPTH (m)	GRAPHIC LOG	Soil description in accordance with the NZ Geotechnical Society Inc 2005 "Guidelines for Field Description of Soil and Rock in Engineering Use"	WATER LEVEL (m)	DEPTH (m)	SCALA PENETROMETER TEST NZS:4402:1986 test 6.5.2 (Blows per 100mm Increment) 10 20 30 (Blows) / SHEAR STRENGTH REMOULDED SHEAR v r 50 100 150 (kPa)	LABORATORY TESTS
KARIOITAHI GROUP	0.0		fine to medium SAND, some silt, grey, loose, moist (DUNE SAND)		0.0	2 4 6 6	
	0.5		yellow orange, yellow grey, medium dense		0.5	2 4 3 3 3 2	
	1.0		loose		1.0	3 2 2 2 2	
			medium dense				
			loose				
	1.5		medium dense		1.5	2 4 4 4 4 3	
	2.0				2.0	3 3 3 4 6 5	
	2.5				2.5	6 6 5 5 6	
	3.0		silty, fine to medium SAND, yellow orange, medium dense, moist		3.0	3 3 3 4 4	
	3.5		dense		3.5	5 7 8 8 5	
	4.0		medium dense		4.0	7 7 8 6 6	
			dense				
	4.5		medium dense		4.5	5 7 7 7 7	
			dense				
	5.0				5.0		

HAND AUGER LOG WITH SCALA NL230102 AH01 - AH20 174 LAMB ROAD 15MARCH24.GPJ S+R_2013.GDT 15/3/24

Soil&Rock Consultants
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CLIENT: Realm Property Group Ltd

PROJECT: Geotechnical Investigation, 174 Lam Road, Pukenui

Auger Hole No: AH04

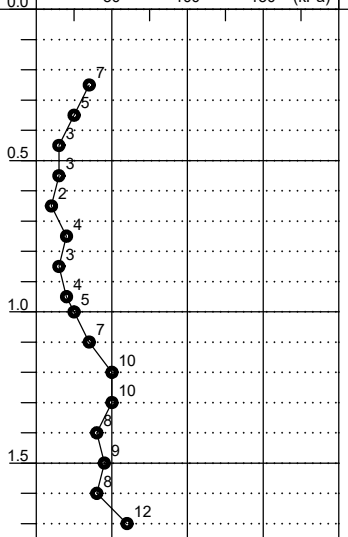
Sheet 1 of 1

Drill Type:	50mm Hand Auger	Project No:	NL230102	Logged By:	JN
Drilled By:	KMAC	Coordinates:		Shear Vane No - Calibration Date:	
Date Started:	13/3/24	Ground Elevation:		Surface Conditions:	Moderate Slope, Sand
Date Finished:	13/3/24	Water Level:	Groundwater Not Encountered		

STRATIGRAPHY	DEPTH (m)	GRAPHIC LOG	Soil description in accordance with the NZ Geotechnical Society Inc 2005 "Guidelines for Field Description of Soil and Rock in Engineering Use"	WATER LEVEL (m)
KARIOITAHI GROUP	0.0		fine SAND, minor silt, yellow orange, medium dense, moist (DUNE SAND)	
			yellow orange, some black speckles	
	0.5		light brown orange, loose	
			some silt, medium dense	
	1.0		dense	
	1.5		silty SAND, orange brown, yellow orange speckles, dense, moist	
	2.0		END OF BORE. 1.80 METRES. (TOO DENSE TO AUGER)	
	2.5			
	3.0			
	3.5			
	4.0			
	4.5			
	5.0			

SCALA PENETROMETER TEST
NZS:4402:1986 test 6.5.2
(Blows per 100mm Increment)
10 20 30 (Blows)

SHEAR STRENGTH ○ v
REMOULDED SHEAR ⊙ r
50 100 150 (kPa)



LABORATORY TESTS

HAND AUGER LOG WITH SCALA NL230102 AH01 - AH20 174 LAMB ROAD 15MARCH24.GPJ S+R_2013.GDT 15/3/24

Soil&Rock Consultants
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CLIENT: Realm Property Group Ltd

PROJECT: Geotechnical Investigation, 174 Lam Road, Pukenui

Auger Hole No: AH05

Sheet 1 of 1

Drill Type:	50mm Hand Auger	Project No:	NL230102	Logged By:	DEG
Drilled By:	SMB	Coordinates:		Shear Vane No - Calibration Date:	
Date Started:	12/3/24	Ground Elevation:		Surface Conditions:	Moderate Slope, Grass
Date Finished:	12/3/24	Water Level:	Groundwater Not Encountered		

STRATIGRAPHY	DEPTH (m)	GRAPHIC LOG	Soil description in accordance with the NZ Geotechnical Society Inc 2005 "Guidelines for Field Description of Soil and Rock in Engineering Use"	WATER LEVEL (m)	DEPTH (m)	SCALA PENETROMETER TEST NZS:4402:1986 test 6.5.2 (Blows per 100mm Increment) 10 20 30 (Blows) / SHEAR STRENGTH REMOULDED SHEAR ○ v ⊙ r 50 100 150 (kPa)	LABORATORY TESTS
K	0.0		fine to medium SAND, trace silt, some fine to coarse subrounded gravel, orange, yellow, red brown, loose, dry (DUNE SAND)		0.0	9	
			no gravel, dark orange, orange red, dense				
	0.5				0.5		
			END OF BORE. 0.30 METRES. (TOO DENSE TO AUGER)				
	1.0				1.0		
	1.5				1.5		
	2.0				2.0		
	2.5				2.5		
	3.0				3.0		
	3.5				3.5		
	4.0				4.0		
	4.5				4.5		
	5.0				5.0		

HAND AUGER LOG WITH SCALA NL230102 AH01 - AH20 174 LAMB ROAD 15MARCH24.GPJ S+R_2013.GDT 15/3/24

Soil&Rock Consultants
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CLIENT: Realm Property Group Ltd

PROJECT: Geotechnical Investigation, 174 Lam Road, Pukenui

Auger Hole No: AH06

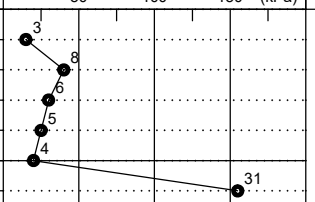
Sheet 1 of 1

Drill Type:	50mm Hand Auger	Project No:	NL230102	Logged By:	JN
Drilled By:	KMAC	Coordinates:		Shear Vane No - Calibration Date:	
Date Started:	12/3/24	Ground Elevation:		Surface Conditions:	Near Level, Grass
Date Finished:	12/3/24	Water Level:	Groundwater Not Encountered		

STRATIGRAPHY	DEPTH (m)	GRAPHIC LOG	Soil description in accordance with the NZ Geotechnical Society Inc 2005 "Guidelines for Field Description of Soil and Rock in Engineering Use"	WATER LEVEL (m)
K. GROUP	0.0		fine to medium SAND, some silt, dark yellow, loose, moist (DUNE SAND)	
	0.5		brown, grey brown, medium dense	
			dense	
			medium dense	
			trace tree roots, dark brown	
	1.0		END OF BORE. 0.65 METRES. (TOO DENSE TO AUGER)	
	1.5			
	2.0			
	2.5			
	3.0			
	3.5			
	4.0			
	4.5			
	5.0			

SCALA PENETROMETER TEST
NZS:4402:1986 test 6.5.2
(Blows per 100mm Increment)
10 20 30 (Blows)

SHEAR STRENGTH ○ v
REMOULDED SHEAR ⊙ r
50 100 150 (kPa)



LABORATORY TESTS

HAND AUGER LOG WITH SCALA NL230102 AH01 - AH20 174 LAMB ROAD 15MARCH24.GPJ S+R_2013.GDT 15/3/24

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CLIENT: Realm Property Group Ltd

PROJECT: Geotechnical Investigation, 174 Lam Road, Pukenui

Auger Hole No: AH07

Sheet 1 of 1

Drill Type:	50mm Hand Auger	Project No:	NL230102	Logged By:	DEG
Drilled By:	SMB	Coordinates:		Shear Vane No - Calibration Date:	
Date Started:	13/3/24	Ground Elevation:		Surface Conditions:	Slight Slope, Grass
Date Finished:	13/3/24	Water Level:	Groundwater Not Encountered		

STRATIGRAPHY	DEPTH (m)	GRAPHIC LOG	Soil description in accordance with the NZ Geotechnical Society Inc 2005 "Guidelines for Field Description of Soil and Rock in Engineering Use"	WATER LEVEL (m)	DEPTH (m)	SCALA PENETROMETER TEST NZS:4402:1986 test 6.5.2 (Blows per 100mm Increment) 10 20 30 (Blows) / SHEAR STRENGTH REMOULDED SHEAR v r 50 100 150 (kPa)	LABORATORY TESTS
K. GROUP	0.0		fine SAND, minor silt, brown, grey, loose, moist (DUNE SAND)		0.0	3	
	0.5		medium dense trace silt		0.5	4 5 4 3 6	
			dark red brown				
	1.0		END OF BORE. 0.65 METRES. (TOO DENSE TO AUGER)		1.0		
	1.5				1.5		
	2.0				2.0		
	2.5				2.5		
	3.0				3.0		
	3.5				3.5		
	4.0				4.0		
	4.5				4.5		
	5.0				5.0		

HAND AUGER LOG WITH SCALA NL230102 AH01 - AH20 174 LAMB ROAD 15MARCH24.GPJ S+R_2013.GDT 15/3/24

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CLIENT: Realm Property Group Ltd

PROJECT: Geotechnical Investigation, 174 Lam Road, Pukenui

Auger Hole No: AH08

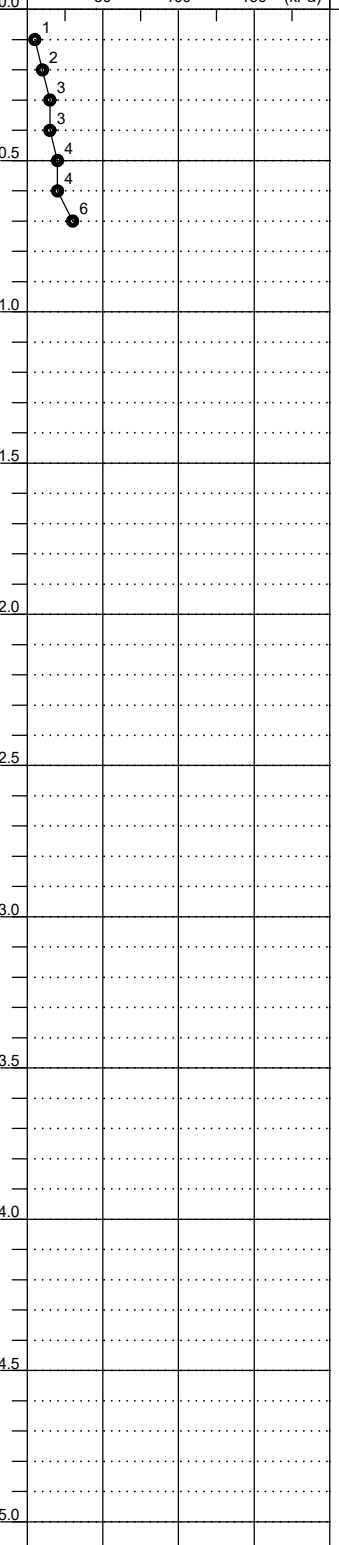
Sheet 1 of 1

Drill Type:	50mm Hand Auger	Project No:	NL230102	Logged By:	DEG
Drilled By:	SMB	Coordinates:		Shear Vane No - Calibration Date:	
Date Started:	13/3/24	Ground Elevation:		Surface Conditions:	Slight Slope, Grass
Date Finished:	13/3/24	Water Level:	Groundwater Not Encountered		

STRATIGRAPHY	DEPTH (m)	GRAPHIC LOG	Soil description in accordance with the NZ Geotechnical Society Inc 2005 "Guidelines for Field Description of Soil and Rock in Engineering Use"	WATER LEVEL (m)
KARIOITAHI G	0.0		fine SAND, minor silt, brown, light brown, very loose, moist (DUNE SAND)	
			brown, loose	
			trace silt, grey	
	0.5		medium dense	
			some silt, dark brown	
			dark brown, brown, red brown	
	1.0			
			END OF BORE. 0.80 METRES. (TOO DENSE TO AUGER)	
	1.5			
	2.0			
	2.5			
	3.0			
	3.5			
	4.0			
	4.5			
	5.0			

SCALA PENETROMETER TEST
NZS:4402:1986 test 6.5.2
(Blows per 100mm Increment)
10 20 30 (Blows)

SHEAR STRENGTH ○ v
REMOULDED SHEAR ⊙ r
50 100 150 (kPa)



LABORATORY TESTS

HAND AUGER LOG WITH SCALA NL230102 AH01 - AH20 174 LAMB ROAD 15MARCH24.GPJ S+R_2013.GDT 15/3/24

Soil&Rock Consultants
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CLIENT: Realm Property Group Ltd

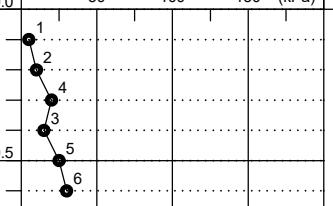
PROJECT: Geotechnical Investigation, 174 Lam Road, Pukenui

Auger Hole No: AH09

Sheet 1 of 1

Drill Type:	50mm Hand Auger	Project No:	NL230102	Logged By:	DEG
Drilled By:	SMB	Coordinates:		Shear Vane No - Calibration Date:	
Date Started:	13/3/24	Ground Elevation:		Surface Conditions:	Slight Slope, Grass
Date Finished:	13/3/24	Water Level:	Groundwater Not Encountered		

STRATIGRAPHY	DEPTH (m)	GRAPHIC LOG	Soil description in accordance with the NZ Geotechnical Society Inc 2005 "Guidelines for Field Description of Soil and Rock in Engineering Use"	WATER LEVEL (m)
KARIOITAHI G	0.0		fine SAND, trace silt, light brown, loose, moist (DUNE SAND)	
	0.5		trace silt, light grey, medium dense	
			light grey, grey brown	
			red brown	
	1.0		END OF BORE. 0.65 METRES. (TOO DENSE TO AUGER)	
	1.5			
	2.0			
	2.5			
	3.0			
	3.5			
	4.0			
	4.5			
	5.0			



LABORATORY TESTS

HAND AUGER LOG WITH SCALA NL230102 AH01 - AH20 174 LAMB ROAD 15MARCH24.GPJ S+R_2013.GDT 15/3/24

Soil&Rock Consultants
Your responsive & cost-effective engineers

CLIENT: Realm Property Group Ltd

PROJECT: Geotechnical Investigation, 174 Lam Road, Pukenui

Auger Hole No: AH10

Sheet 1 of 1

Drill Type:	50mm Hand Auger	Project No:	NL230102	Logged By:	DEG
Drilled By:	SMB	Coordinates:		Shear Vane No - Calibration Date:	
Date Started:	13/3/24	Ground Elevation:		Surface Conditions:	Slight Slope, Grass
Date Finished:	13/3/24	Water Level:	Groundwater Not Encountered		

STRATIGRAPHY	DEPTH (m)	GRAPHIC LOG	Soil description in accordance with the NZ Geotechnical Society Inc 2005 "Guidelines for Field Description of Soil and Rock in Engineering Use"	WATER LEVEL (m)	DEPTH (m)	SCALA PENETROMETER TEST NZS:4402:1986 test 6.5.2 (Blows per 100mm Increment) 10 20 30 (Blows) / SHEAR STRENGTH REMOULDED SHEAR v r 50 100 150 (kPa)	LABORATORY TESTS
K. GROUP	0.0		fine SAND, minor silt, brown, loose, moist		0.0	2	
			medium dense			4	
			trace silt, grey, brown			5	
	0.5		dark red brown		0.5	5 4	
	1.0		END OF BORE. 0.60 METRES. (TOO DENSE TO AUGER)		1.0		
	1.5				1.5		
	2.0				2.0		
	2.5				2.5		
	3.0				3.0		
	3.5				3.5		
	4.0				4.0		
	4.5				4.5		
	5.0				5.0		

HAND AUGER LOG WITH SCALA NL230102 AH01 - AH20 174 LAMB ROAD 15MARCH24.GPJ S+R_2013.GDT 15/3/24

Soil&Rock Consultants
Your responsive & cost-effective engineers

CLIENT: Realm Property Group Ltd

PROJECT: Geotechnical Investigation, 174 Lam Road, Pukenui

Auger Hole No: AH11

Sheet 1 of 1

Drill Type:	50mm Hand Auger	Project No:	NL230102	Logged By:	DEG
Drilled By:	SMB	Coordinates:		Shear Vane No - Calibration Date:	
Date Started:	13/3/24	Ground Elevation:		Surface Conditions:	Slight Slope, Grass
Date Finished:	13/3/24	Water Level:	Groundwater Not Encountered		

STRATIGRAPHY	DEPTH (m)	GRAPHIC LOG	Soil description in accordance with the NZ Geotechnical Society Inc 2005 "Guidelines for Field Description of Soil and Rock in Engineering Use"	WATER LEVEL (m)
K. GROUP	0.0		fine SAND, some silt, brown, loose, moist (DUNE SAND)	
			medium dense	
			trace silt, light grey, grey	
	0.5		red brown	
	1.0		END OF BORE. 0.55 METRES. (TOO DENSE TO AUGER)	
	1.5			
	2.0			
	2.5			
	3.0			
	3.5			
	4.0			
	4.5			
	5.0			

SCALA PENETROMETER TEST
NZS:4402:1986 test 6.5.2
(Blows per 100mm Increment)

DEPTH (m)	10	20	30 (Blows)
0.0			
0.5	2, 4, 3, 3, 3		
1.0			
1.5			
2.0			
2.5			
3.0			
3.5			
4.0			
4.5			
5.0			

SHEAR STRENGTH ○ v
REMOULDED SHEAR ⊙ r

DEPTH (m)	50	100	150 (kPa)
0.0			
0.5			
1.0			
1.5			
2.0			
2.5			
3.0			
3.5			
4.0			
4.5			
5.0			

LABORATORY TESTS

HAND AUGER LOG WITH SCALA NL230102 AH01 - AH20 174 LAMB ROAD 15MARCH24.GPJ S+R_2013.GDT 15/3/24

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CLIENT: Realm Property Group Ltd

PROJECT: Geotechnical Investigation, 174 Lam Road, Pukenui

Auger Hole No: AH12

Sheet 1 of 1

Drill Type:	50mm Hand Auger	Project No:	NL230102	Logged By:	DEG
Drilled By:	SMB	Coordinates:		Shear Vane No - Calibration Date:	
Date Started:	13/3/24	Ground Elevation:		Surface Conditions:	Slight Slope, Grass
Date Finished:	13/3/24	Water Level:	Groundwater Not Encountered		

STRATIGRAPHY	DEPTH (m)	GRAPHIC LOG	Soil description in accordance with the NZ Geotechnical Society Inc 2005 "Guidelines for Field Description of Soil and Rock in Engineering Use"	WATER LEVEL (m)	DEPTH (m)	SCALA PENETROMETER TEST NZS:4402:1986 test 6.5.2 (Blows per 100mm Increment) 10 20 30 (Blows) / SHEAR STRENGTH REMOULDED SHEAR ○ v ⊙ r 50 100 150 (kPa)	LABORATORY TESTS
K. GROUP	0.0		fine SAND, minor silt, brown, loose, moist (DUNE SAND)		0.0	3 4 3 4	
			trace silt, dark grey, brown, medium dense				
	0.5		brown, dark red brown		0.5		
			END OF BORE. 0.50 METRES. (TOO DENSE TO AUGER)				
	1.0				1.0		
	1.5				1.5		
	2.0				2.0		
	2.5				2.5		
	3.0				3.0		
	3.5				3.5		
	4.0				4.0		
	4.5				4.5		
	5.0				5.0		

HAND AUGER LOG WITH SCALA NL230102 AH01 - AH20 174 LAMB ROAD 15MARCH24.GPJ S+R_2013.GDT 15/3/24

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CLIENT: Realm Property Group Ltd

PROJECT: Geotechnical Investigation, 174 Lam Road, Pukenui

Auger Hole No: AH13

Sheet 1 of 1

Drill Type:	50mm Hand Auger	Project No:	NL230102	Logged By:	DEG
Drilled By:	SMB	Coordinates:		Shear Vane No - Calibration Date:	
Date Started:	13/3/24	Ground Elevation:		Surface Conditions:	Slight Slope, Grass
Date Finished:	13/3/24	Water Level:	Groundwater Not Encountered		

STRATIGRAPHY	DEPTH (m)	GRAPHIC LOG	Soil description in accordance with the NZ Geotechnical Society Inc 2005 "Guidelines for Field Description of Soil and Rock in Engineering Use"	WATER LEVEL (m)	DEPTH (m)	SCALA PENETROMETER TEST NZS:4402:1986 test 6.5.2 (Blows per 100mm Increment) 10 20 30 (Blows) / SHEAR STRENGTH REMOULDED SHEAR ○ v ⊙ r 50 100 150 (kPa)	LABORATORY TESTS
K. GROUP	0.0		fine SAND, minor silt, brown, dark brown, loose, moist (DUNE SAND)		0.0		
			dark grey, grey, medium dense			2	
			trace silt			3	
						3	
			loose			3	
	0.5		dark red brown		0.5	2	
	1.0		END OF BORE. 0.60 METRES. (TOO DENSE TO AUGER)		1.0		
	1.5				1.5		
	2.0				2.0		
	2.5				2.5		
	3.0				3.0		
	3.5				3.5		
	4.0				4.0		
	4.5				4.5		
	5.0				5.0		

HAND AUGER LOG WITH SCALA NL230102 AH01 - AH20 174 LAMB ROAD 15MARCH24.GPJ S+R_2013.GDT 15/3/24

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CLIENT: Realm Property Group Ltd

PROJECT: Geotechnical Investigation, 174 Lam Road, Pukenui

Auger Hole No: AH14

Sheet 1 of 1

Drill Type:	50mm Hand Auger	Project No:	NL230102	Logged By:	DEG
Drilled By:	SMB	Coordinates:		Shear Vane No - Calibration Date:	
Date Started:	13/3/24	Ground Elevation:		Surface Conditions:	Slight Slope, Grass
Date Finished:	13/3/24	Water Level:	Groundwater Not Encountered		

STRATIGRAPHY	DEPTH (m)	GRAPHIC LOG	Soil description in accordance with the NZ Geotechnical Society Inc 2005 "Guidelines for Field Description of Soil and Rock in Engineering Use"	WATER LEVEL (m)	DEPTH (m)	SCALA PENETROMETER TEST NZS:4402:1986 test 6.5.2 (Blows per 100mm Increment) 10 20 30 (Blows) / SHEAR STRENGTH REMOULDED SHEAR v r 50 100 150 (kPa)	LABORATORY TESTS
KARIOITAHI G	0.0		fine SAND, minor silt, brown, loose, moist (DUNE SAND)		0.0	2	
			light grey, brown, medium dense			3	
			trace silt			4	
	0.5				0.5	3	
			dark red brown			3	
						5	
	1.0		END OF BORE. 0.65 METRES. (TOO DENSE TO AUGER)		1.0		
	1.5				1.5		
	2.0				2.0		
	2.5				2.5		
	3.0				3.0		
	3.5				3.5		
	4.0				4.0		
	4.5				4.5		
	5.0				5.0		

HAND AUGER LOG WITH SCALA NL230102 AH01 - AH20 174 LAMB ROAD 15MARCH24.GPJ S+R_2013.GDT 15/3/24

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CLIENT: Realm Property Group Ltd

PROJECT: Geotechnical Investigation, 174 Lam Road, Pukenui

Auger Hole No: AH15

Sheet 1 of 1

Drill Type:	50mm Hand Auger	Project No:	NL230102	Logged By:	DEG
Drilled By:	SMB	Coordinates:		Shear Vane No - Calibration Date:	
Date Started:	13/3/24	Ground Elevation:		Surface Conditions:	Slight Slope, Grass
Date Finished:	13/3/24	Water Level:	Groundwater Not Encountered		

STRATIGRAPHY	DEPTH (m)	GRAPHIC LOG	Soil description in accordance with the NZ Geotechnical Society Inc 2005 "Guidelines for Field Description of Soil and Rock in Engineering Use"	WATER LEVEL (m)	DEPTH (m)	SCALA PENETROMETER TEST NZS:4402:1986 test 6.5.2 (Blows per 100mm Increment) 10 20 30 (Blows) / SHEAR STRENGTH REMOULDED SHEAR v r 50 100 150 (kPa)	LABORATORY TESTS
K. GROUP	0.0		fine SAND, minor silt, brown, loose, moist (DUNE SAND)		0.0		
			grey, brown, medium dense			2	
						3	
			trace silt			3	
	0.5		red brown, dark red brown		0.5	4	
			END OF BORE. 0.50 METRES. (TOO DENSE TO AUGER)				
	1.0				1.0		
	1.5				1.5		
	2.0				2.0		
	2.5				2.5		
	3.0				3.0		
	3.5				3.5		
	4.0				4.0		
	4.5				4.5		
	5.0				5.0		

HAND AUGER LOG WITH SCALA NL230102 AH01 - AH20 174 LAMB ROAD 15MARCH24.GPJ S+R_2013.GDT 15/3/24

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CLIENT: Realm Property Group Ltd

PROJECT: Geotechnical Investigation, 174 Lam Road, Pukenui

Auger Hole No: AH16

Sheet 1 of 1

Drill Type:	50mm Hand Auger	Project No:	NL230102	Logged By:	DEG
Drilled By:	SMB	Coordinates:		Shear Vane No - Calibration Date:	
Date Started:	13/3/24	Ground Elevation:		Surface Conditions:	Slight Slope, Grass
Date Finished:	13/3/24	Water Level:	Groundwater Not Encountered		

STRATIGRAPHY	DEPTH (m)	GRAPHIC LOG	Soil description in accordance with the NZ Geotechnical Society Inc 2005 "Guidelines for Field Description of Soil and Rock in Engineering Use"	WATER LEVEL (m)	DEPTH (m)	SCALA PENETROMETER TEST NZS:4402:1986 test 6.5.2 (Blows per 100mm Increment) 10 20 30 (Blows) / SHEAR STRENGTH REMOULDED SHEAR v r 50 100 150 (kPa)	LABORATORY TESTS
K. GROUP	0.0		fine SAND, trace silt, brown, loose, moist (DUNE SAND)		0.0	2	
			grey brown, medium dense			3	
	0.5		red brown		0.5	3	
			END OF BORE. 0.55 METRES. (TOO DENSE TO AUGER)			3	
	1.0				1.0		
	1.5				1.5		
	2.0				2.0		
	2.5				2.5		
	3.0				3.0		
	3.5				3.5		
	4.0				4.0		
	4.5				4.5		
	5.0				5.0		

HAND AUGER LOG WITH SCALA NL230102 AH01 - AH20 174 LAMB ROAD 15MARCH24.GPJ S+R_2013.GDT 15/3/24

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CLIENT: Realm Property Group Ltd

PROJECT: Geotechnical Investigation, 174 Lam Road, Pukenui

Auger Hole No: AH17

Sheet 1 of 1

Drill Type:	50mm Hand Auger	Project No:	NL230102	Logged By:	JN
Drilled By:	KMAC	Coordinates:		Shear Vane No - Calibration Date:	
Date Started:	13/3/24	Ground Elevation:		Surface Conditions:	Near Level, Grass
Date Finished:	13/3/24	Water Level:	Groundwater Not Encountered		

STRATIGRAPHY	DEPTH (m)	GRAPHIC LOG	Soil description in accordance with the NZ Geotechnical Society Inc 2005 "Guidelines for Field Description of Soil and Rock in Engineering Use"	WATER LEVEL (m)	DEPTH (m)	SCALA PENETROMETER TEST NZS:4402:1986 test 6.5.2 (Blows per 100mm Increment) 10 20 30 (Blows) / SHEAR STRENGTH REMOULDED SHEAR v r 50 100 150 (kPa)	LABORATORY TESTS
K. GROUP	0.0		fine SAND, minor silt, dark grey, white speckles, loose, moist (DUNE SAND) medium dense		0.0	2	
	0.5		some silt, dark red brown		0.5	4 5 4 4 4	
	1.0		END OF BORE. 0.65 METRES. (TOO DENSE TO AUGER)		1.0		
	1.5				1.5		
	2.0				2.0		
	2.5				2.5		
	3.0				3.0		
	3.5				3.5		
	4.0				4.0		
	4.5				4.5		
	5.0				5.0		

HAND AUGER LOG WITH SCALA NL230102 AH01 - AH20 174 LAMB ROAD 15MARCH24.GPJ S+R_2013.GDT 15/3/24

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CLIENT: Realm Property Group Ltd

PROJECT: Geotechnical Investigation, 174 Lam Road, Pukenui

Auger Hole No: AH18

Sheet 1 of 1

Drill Type:	50mm Hand Auger	Project No:	NL230102	Logged By:	JN
Drilled By:	KMAC	Coordinates:		Shear Vane No - Calibration Date:	
Date Started:	13/3/24	Ground Elevation:		Surface Conditions:	Near Level, Grass
Date Finished:	13/3/24	Water Level:	Groundwater Not Encountered		

STRATIGRAPHY	DEPTH (m)	GRAPHIC LOG	Soil description in accordance with the NZ Geotechnical Society Inc 2005 "Guidelines for Field Description of Soil and Rock in Engineering Use"	WATER LEVEL (m)	DEPTH (m)	SCALA PENETROMETER TEST NZS:4402:1986 test 6.5.2 (Blows per 100mm Increment) 10 20 30 (Blows) / SHEAR STRENGTH REMOULDED SHEAR v r 50 100 150 (kPa)	LABORATORY TESTS
K. GRP	0.0		fine SAND, minor silt, dark grey, white speckles, medium dense, moist (DUNE SAND)		0.0	3 4 4 4	
			dark grey, brown				
			trace silt, dark red brown				
	0.5				0.5		
	1.0		END OF BORE. 0.45 METRES. (TOO DENSE TO AUGER)		1.0		
	1.5				1.5		
	2.0				2.0		
	2.5				2.5		
	3.0				3.0		
	3.5				3.5		
	4.0				4.0		
	4.5				4.5		
	5.0				5.0		

HAND AUGER LOG WITH SCALA NL230102 AH01 - AH20 174 LAMB ROAD 15MARCH24.GPJ S+R_2013.GDT 15/3/24

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CLIENT: Realm Property Group Ltd

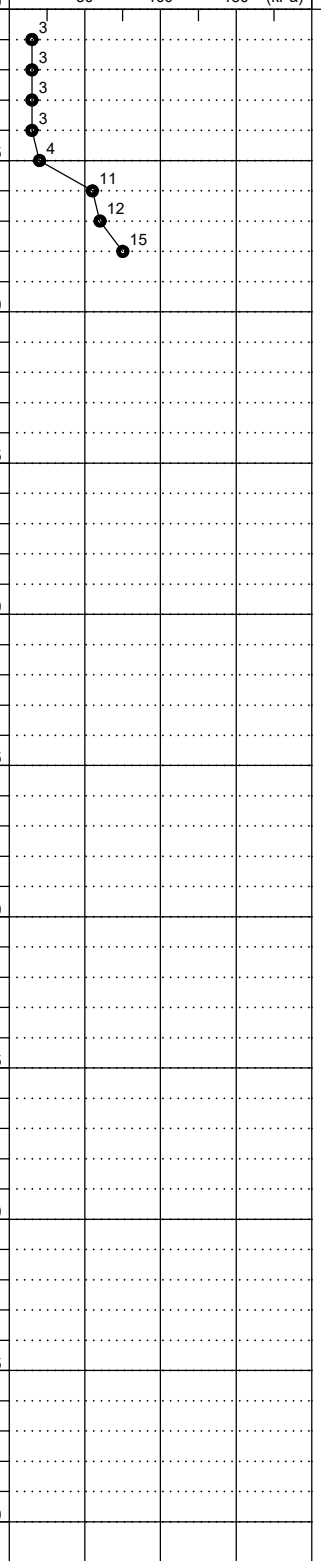
PROJECT: Geotechnical Investigation, 174 Lam Road, Pukenui

Auger Hole No: AH19

Sheet 1 of 1

Drill Type:	50mm Hand Auger	Project No:	NL230102	Logged By:	DEG
Drilled By:	SMB	Coordinates:		Shear Vane No - Calibration Date:	
Date Started:	12/3/24	Ground Elevation:		Surface Conditions:	Slight Slope, Grass
Date Finished:	12/3/24	Water Level:	Groundwater Not Encountered		

STRATIGRAPHY	DEPTH (m)	GRAPHIC LOG	Soil description in accordance with the NZ Geotechnical Society Inc 2005 "Guidelines for Field Description of Soil and Rock in Engineering Use"	WATER LEVEL (m)
KARIOITAHI G.	0.0		fine SAND, trace silt, light brown, medium dense, moist (DUNE SAND)	
			light grey	
	0.5		light grey, brown	
			light grey, dense	
			white	
			minor silt, light grey, light brown	
	1.0		brown	
			END OF BORE. 0.90 METRES. (TOO DENSE TO AUGER)	
	1.5			
	2.0			
	2.5			
	3.0			
	3.5			
	4.0			
	4.5			
	5.0			



LABORATORY TESTS

HAND AUGER LOG WITH SCALA NL230102 AH01 - AH20 174 LAMB ROAD 15MARCH24.GPJ S+R_2013.GDT 15/3/24

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CLIENT: Realm Property Group Ltd

PROJECT: Geotechnical Investigation, 174 Lam Road, Pukenui

Auger Hole No: AH20

Sheet 1 of 1

Drill Type:	50mm Hand Auger	Project No:	NL230102	Logged By:	DEG
Drilled By:	SMB	Coordinates:		Shear Vane No - Calibration Date:	
Date Started:	13/3/24	Ground Elevation:		Surface Conditions:	Slight Slope, Grass
Date Finished:	13/3/24	Water Level:	1.10m 13/3/24		

STRATIGRAPHY	DEPTH (m)	GRAPHIC LOG	Soil description in accordance with the NZ Geotechnical Society Inc 2005 "Guidelines for Field Description of Soil and Rock in Engineering Use"	WATER LEVEL (m)	DEPTH (m)	SCALA PENETROMETER TEST NZS:4402:1986 test 6.5.2 (Blows per 100mm Increment) 10 20 30 (Blows) / SHEAR STRENGTH REMOULDED SHEAR ○ v ⊙ r 50 100 150 (kPa)	LABORATORY TESTS
KARIOITAHI G	0.0		fine SAND, minor silt, dark brown grey, orange speckles, loose, moist (DUNE SAND)		0.0	2	
	0.5		fine SAND, some organic silt, black with orange speckles, loose, wet medium dense black, dark red brown		0.5	2 2 2 3 3 4 4 4 4	
	1.0		fine to medium SAND, some silt, red brown, medium dense, saturated	13/3/24	1.0		
	1.5		END OF BORE. 1.10 METRES. (TOO DENSE TO AUGER)		1.5		
	2.0				2.0		
	2.5				2.5		
	3.0				3.0		
	3.5				3.5		
	4.0				4.0		
	4.5				4.5		
	5.0				5.0		

HAND AUGER LOG WITH SCALA NL230102 AH01 - AH20 174 LAMB ROAD 15MARCH24.GPJ S+R_2013.GDT 15/3/24

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www.soilandrock.co.nz

SCALA PENETROMETER SHEET - TABLE OF BLOWS PER INCREMENT

JOB NO: NL230102 **TESTED BY:** DEG, JN, KMAC, SMB

JOB NAME: 174 Lamb Road, Pukenui **DATE:** 12-13/3/24

Depth of Penetration [mm]	AH01	AH02	AH03	cont…	AH04	AH05	AH06	AH07	AH08	AH09	AH10	AH11
DEPTH START[m]	0.15	0.70	5.00	7.00	1.80	0.30	0.65	0.65	0.80	0.65	0.60	0.55
50 mm	20+	7	4	5	7	6	20+	20+	20+	19	8	20+
100		10	3	5	9	7				20+	11	
150		12	4	4	10	7					20+	
200		10	4	5	8	11						
250		10	4	6	9	12						
300		10	4	5	10	11						
350			3	4	10	12						
400			2	5	10	13						
450			2	5	10	10						
500			2	6	10	11						
550			2	6		12						
600			3	7		12						
650			3	6		12						
700			4	6								
750			4	6								
800			4	8								
850			6	7								
900			5	6								
950			6	6								
1000			5	6								
1050			4									
1100			4									
1150			4									
1200			4									
1250			5									
1300			4									
1350			4									
1400			3									
1450			6									
1500			5									
1550			4									
1600			5									
1650			5									
1700			4									
1750			5									
1800			6									
1850			6									
1900			5									
1950			7									
2000			5									
DEPTH END [m]	0.20	1.00	7.00	8.00	2.30	0.95	0.70	0.70	0.85	0.75	0.75	0.60

Testing Method: NZS 4402:1988 Test 6.5.2 Dynamic Cone Penetrometer

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SCALA PENETROMETER SHEET - TABLE OF BLOWS PER INCREMENT

JOB NO: NL230102 **TESTED BY:** DEG, JN, KMAC, SMB

JOB NAME: 174 Lamb Road, Pukenui **DATE:** 12-13/3/24

Depth of Penetration [mm]	AH12	AH13	AH14	AH15	AH16	AH17	AH18	AH19	AH20			
DEPTH START[m]	0.50	0.60	0.70	0.50	0.50	0.65	0.45	0.90	1.20			
50 mm	20+	16	20+	20+	20+	5	10	20+	12			
100		20				20+	20+		20+			
150												
200												
250												
300												
350												
400												
450												
500												
550												
600												
650												
700												
750												
800												
850												
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1500												
1550												
1600												
1650												
1700												
1750												
1800												
1850												
1900												
1950												
2000												
DEPTH END [m]	0.55	0.70	0.75	0.55	0.55	0.75	0.55	0.70	1.30			

Testing Method: NZS 4402:1988 Test 6.5.2 Dynamic Cone Penetrometer

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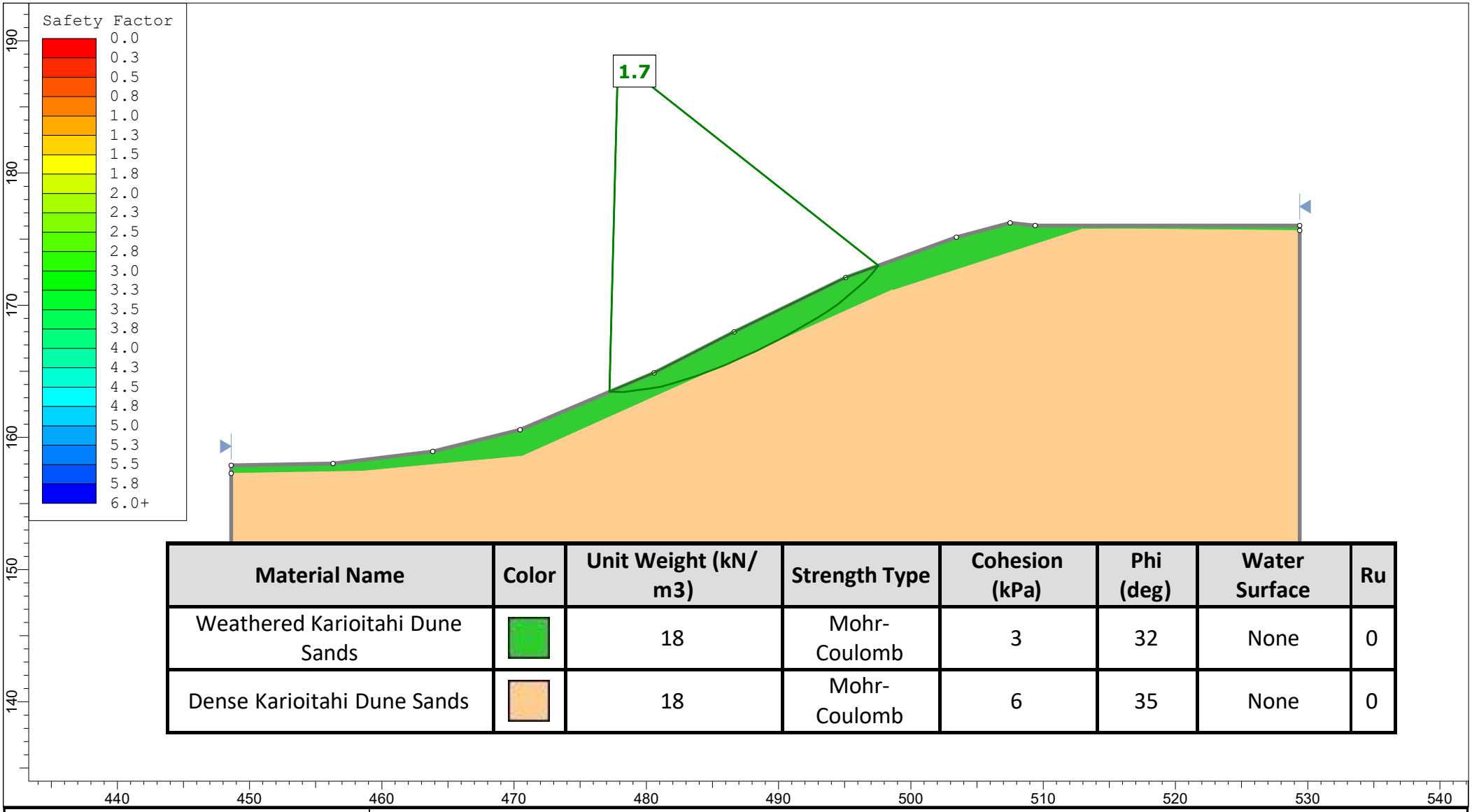
Appendix C

Slope Stability Results



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Ru
Weathered Karioitahi Dune Sands		18	Mohr-Coulomb	3	32	None	0
Dense Karioitahi Dune Sands		18	Mohr-Coulomb	6	35	None	0

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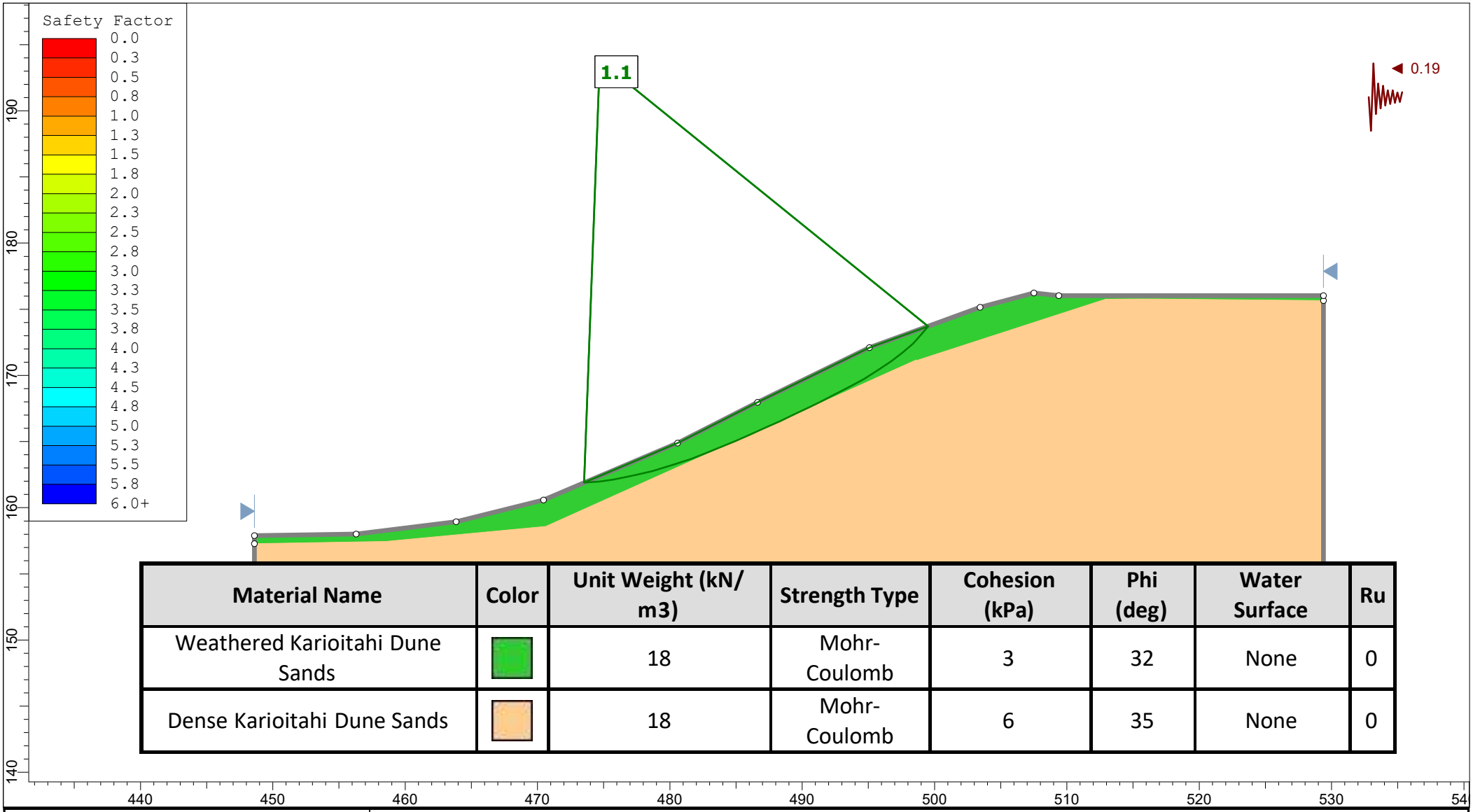
SLIDEINTERPRET 9.016

Project	174 Lamb Road, Pukenui		
Group	Sec A-A' - Existing Topography	Scenario	Normal Groundwater Condition
Drawn By	RL	Company	Soil & Rock Consultants
Date	25/03/2024	File Name	NI230102 Slide A-A.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Ru
Weathered Karioitahi Dune Sands		18	Mohr-Coulomb	3	32	None	0
Dense Karioitahi Dune Sands		18	Mohr-Coulomb	6	35	None	0

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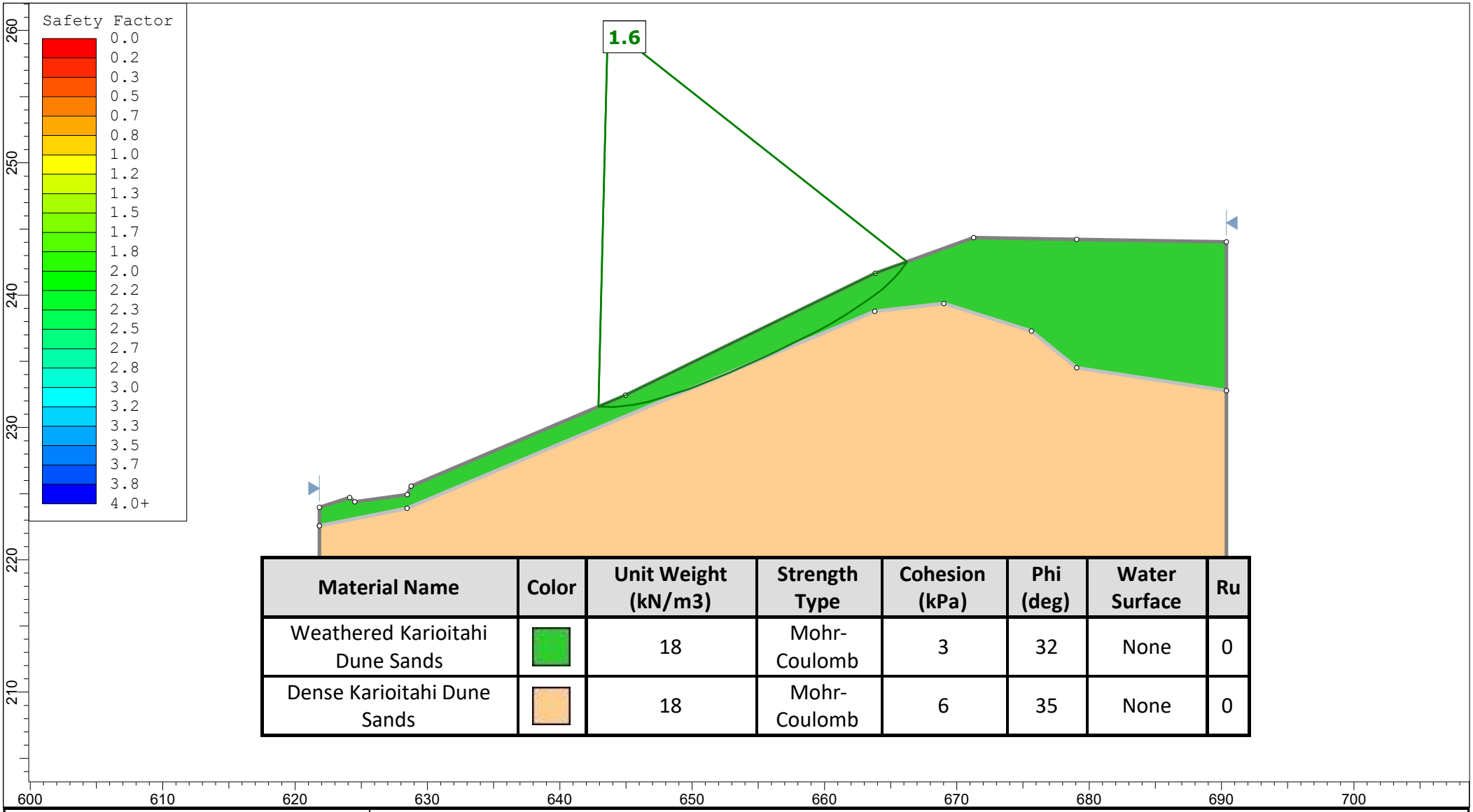
SLIDEINTERPRET 9.016

Project	174 Lamb Road, Pukenui		
Group	Sec A-A' - Existing Topography	Scenario	Seismic Condition
Drawn By	RL	Company	Soil & Rock Consultants
Date	25/03/2024	File Name	NI230102 Slide A-A.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Ru
Weathered Karioitahi Dune Sands		18	Mohr-Coulomb	3	32	None	0
Dense Karioitahi Dune Sands		18	Mohr-Coulomb	6	35	None	0

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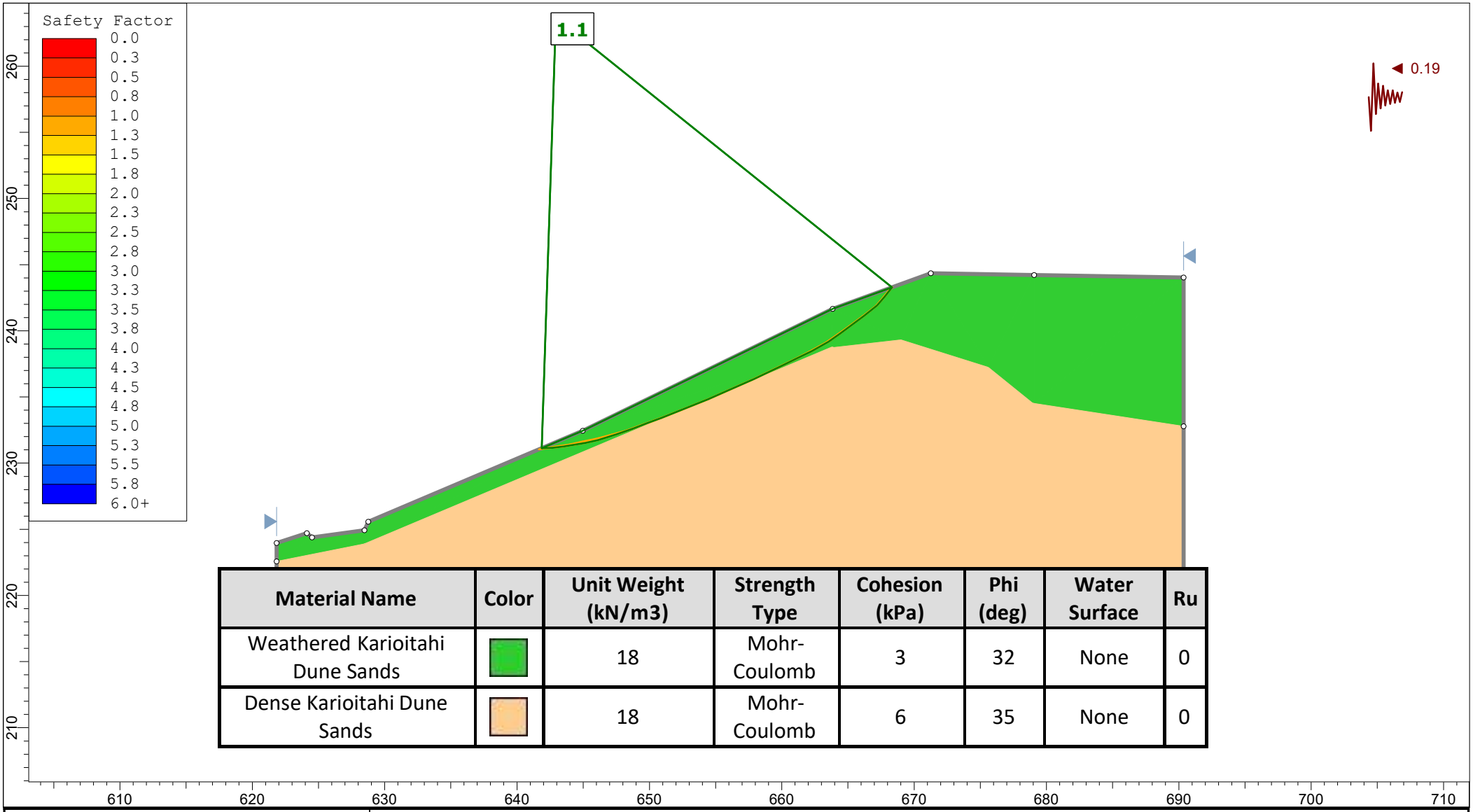
SLIDEINTERPRET 9.016

Project	174 Lamb Road, Pukenui		
Group	Sec B-B' - Existing Topography	Scenario	Normal Groundwater Condition
Drawn By	RL	Company	Soil & Rock Consultants
Date	25/03/2024	File Name	NI230102 Slide B-B.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Ru
Weathered Karioitahi Dune Sands		18	Mohr-Coulomb	3	32	None	0
Dense Karioitahi Dune Sands		18	Mohr-Coulomb	6	35	None	0

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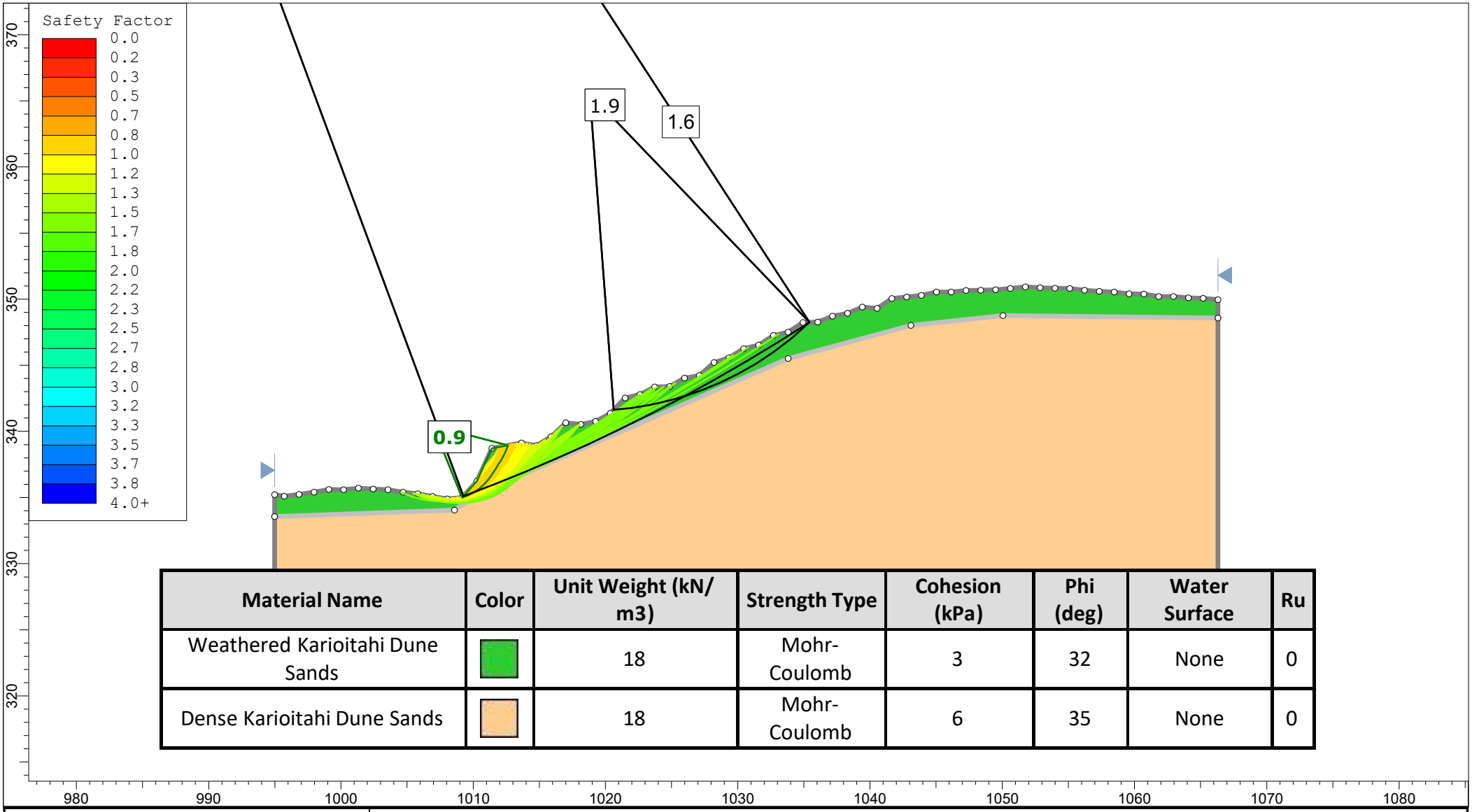
SLIDEINTERPRET 9.016

Project	174 Lamb Road, Pukenui		
Group	Sec B-B' - Existing Topography	Scenario	Seismic Condition
Drawn By	RL	Company	Soil & Rock Consultants
Date	25/03/2024	File Name	NI230102 Slide B-B.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Ru
Weathered Karioitahi Dune Sands		18	Mohr-Coulomb	3	32	None	0
Dense Karioitahi Dune Sands		18	Mohr-Coulomb	6	35	None	0

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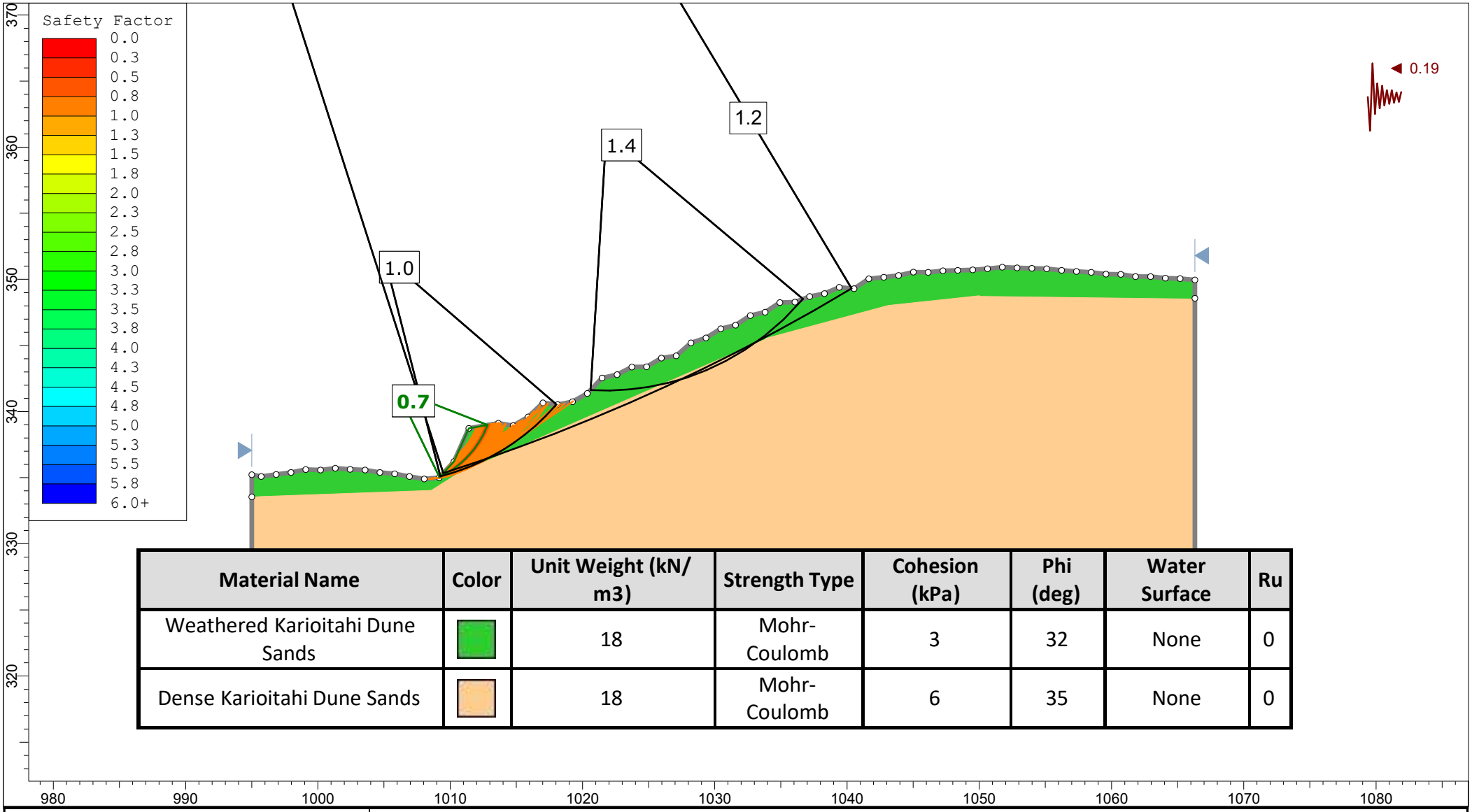
Project	174 Lamb Road, Pukenui		
Group	Sec D-D' - Existing Topography	Scenario	Normal Groundwater Condition
Drawn By	RL	Company	Soil & Rock Consultants
Date	25/03/2024	File Name	Nl230102 Slide D-D.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Ru
Weathered Karioitahi Dune Sands		18	Mohr-Coulomb	3	32	None	0
Dense Karioitahi Dune Sands		18	Mohr-Coulomb	6	35	None	0

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Project	174 Lamb Road, Pukenui		
Group	Sec D-D' - Existing Topography	Scenario	Seismic Condition
Drawn By	RL	Company	Soil & Rock Consultants
Date	25/03/2024	File Name	NI230102 Slide D-D.slmd