



Quirino Limited

ORANGEFIELDS CIVIL INFRASTRUCTURE REPORT

482-484 Kerikeri Road

DOCUMENT CONTROL

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1 INTRODUCTION

LDE Ltd was engaged by Quirino Limited to undertake a civil engineering assessment for the proposed subdivision of Lot 1 DP154181 and Lot 6 DP25904, 482-484 Kerikeri Road, Kerikeri.

It is proposed to develop an eco-village, which entails constructing twelve (12) new dwellings. It is also proposed to upgrade the existing food stall at the front of the property.

This report has been prepared to support a Resource Consent application.



Figure 1: Location Plan Lot 1, DP154181 (Image Sourced from FNDC Maps)



Figure 2: Lot 6, DP154181 (Image Sourced from FNDC Maps)

2 SITE DESCRIPTION

The site is situated approximately 2 km to the South of Kerikeri CBD. The site is located more or less on the border of the rural/urban transition. North of the site the area starts to consist more of residential housing, and to the south the area transitions to rural with mostly lifestyle blocks or farming and commercial activity.



Figure 3: Photo of Orchard Located on Lot 6 DP25904

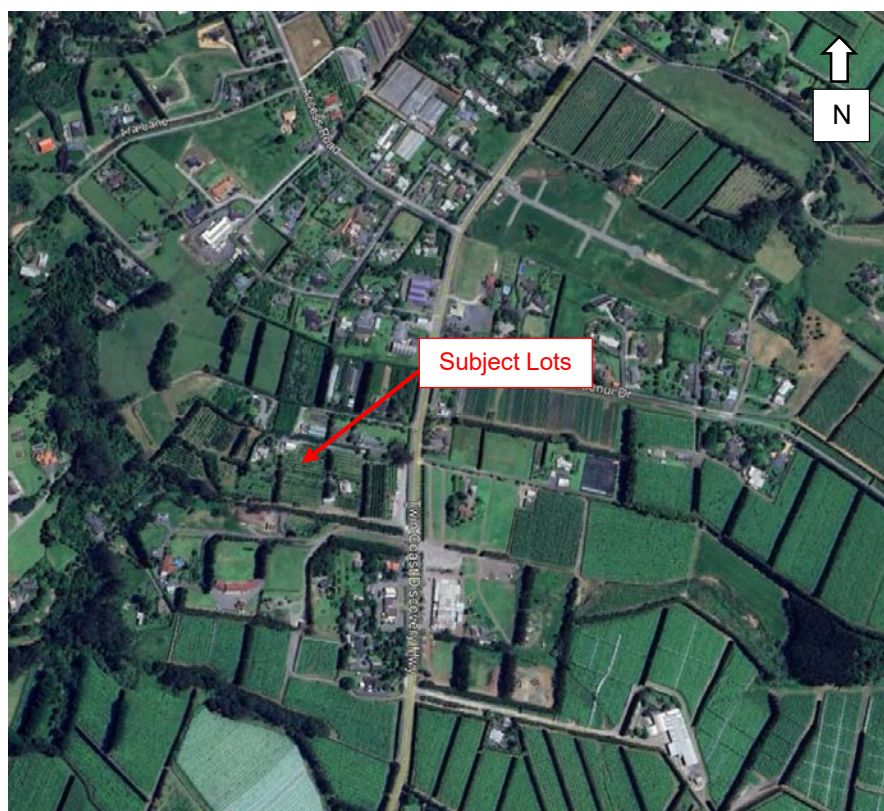


Figure 4: Location of Subject Lots (Image Sourced from Google Earth)

On the site there are two dwellings with outbuildings on the two respective lots and an existing roadside stall located on Lot 6 DP25904. It is proposed to maintain the dwelling on Lot 1 DP25904 and to demolish the existing dwelling and outbuildings on Lot 6 DP25904 and upgrade the roadside stall.

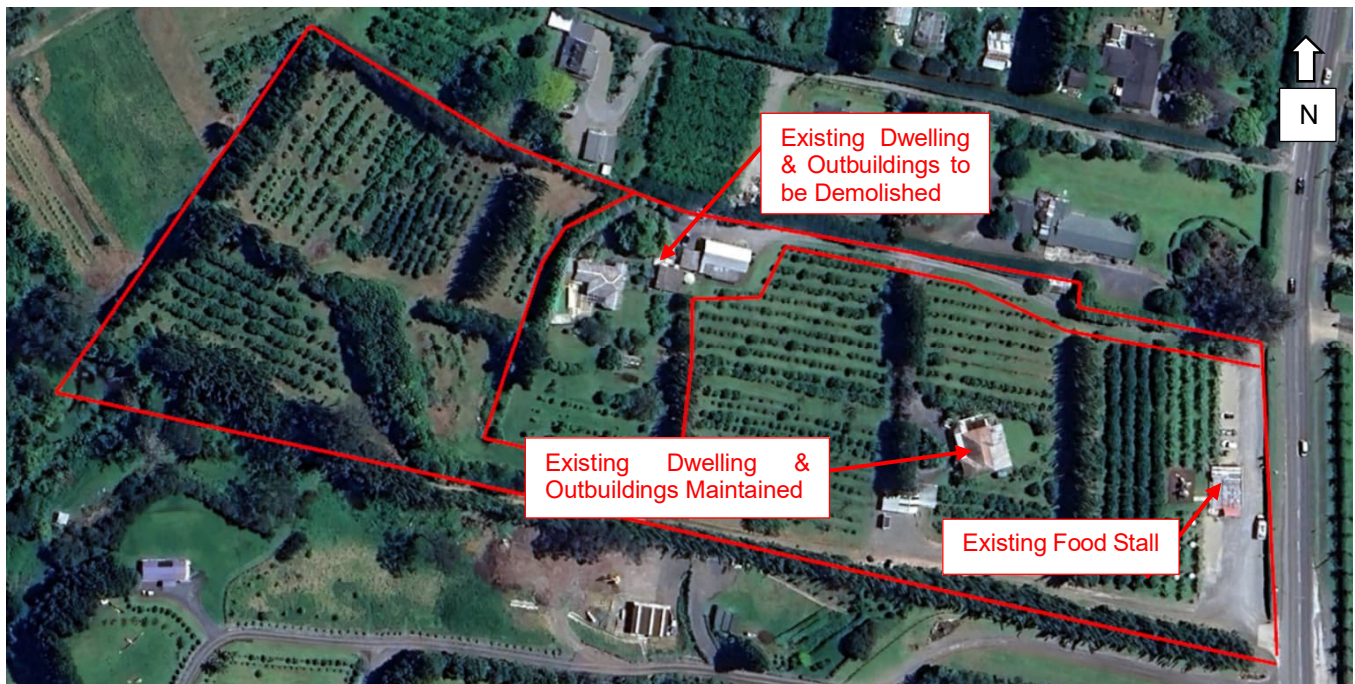


Figure 5: Existing Dwellings and Roadside Stall Shown (Image Sourced from Google Earth)

There is no public sewer or stormwater reticulation in the vicinity of the site. The Kerikeri irrigation scheme is available to the site for water supply. The water however is not suitable for drinking without undergoing any treatment.

The existing dwellings are serviced by rainwater tanks for the supply of potable water and on-site waste-water treatment and effluent disposal systems. The existing food stall is serviced with reticulated water supply by means of the Kerikeri irrigation scheme with an on site treatment system.

3 PROPOSED DEVELOPMENT

It is proposed to subdivide Lot 1 DP25904 and Lot 6 DP25904 into the following:

3.1 Lot 20 (Common Ownership) & Associated Residential Allotments¹

It is proposed to construct the following and associated roading/access:

- Nine (9) three-bedroom dwellings
- Three (3) two-bedroom dwellings

3.2 Lot 22 (Commercial)

It is proposed to upgrade the existing food stall on Lot 22 to a building with a footprint of 585m². It is further proposed to formalize the existing metalled parking area to a sealed parking area.

3.3 Lot 21 (Existing Dwelling)

It is intended to keep the existing dwelling currently located on Lot 1 DP25904, to be contained within the boundaries of the proposed Lot 21.

¹ Common Ownership & Associated Residential Allotments hereon referenced under the same Lot, Lot 20

3.4 Scheme Plan

The proposed scheme plan is shown below in Figure 6 (also attached Appendix A).



Figure 6: Proposed Scheme Plan

4 WATER SUPPLY

4.1 Onsite Supply

4.1.1 Lot 20 (New Residential)

It is intended that potable water supply be via the collection of rainwater from roof areas with storage in rainwater tanks.

We recommend installing a minimum storage tank volume containing 25,000L/dwelling for potable water supply. Appropriate filters should be installed to provide suitable quality drinking water.

Proposed locations of the tanks can be seen on the engineering drawings.

4.1.2 Lot 21 (Existing Dwelling)

The existing dwelling is supplied with potable water from collection of rainwater from roof areas with storage tanks which will remain in place within the proposed boundaries of Lot 21.

4.1.3 Lot 22 (Commercial)

It is intended that the upgraded food store utilise its supply from the Kerikeri irrigation scheme, with an onsite treatment system providing suitable quality drinking water.

4.2 Firefighting Water Supply

4.2.1 Lot 20 (New Residential)

The NZ Fire Service Firefighting Water Supplies Code of Practise recommends a 45,000L volume of water should be within a 90m radius of housing.

It is proposed to install 2 x 25,000L underground tanks at two locations on Lot 20. Provision is to be made for hardstands for the fire appliance to park adjacent to the proposed tanks and be able to access the tanks, via the lids with a suction hose.

Proposed locations of the tanks and extent of 90m radius from the tanks can be seen on the engineering drawings.

4.2.2 Lot 22 (Commercial)

It proposed that a sprinkler system is installed in the upgraded food store. Given the footprint and the sprinkler system, NZ Fire Service Firefighting Water Supplies Code of Practise requires that there is a 45,000L provision.

It is proposed to install 2 x 25,000L underground tanks on Lot 22. Hardstand for the fire appliance will be available with access in a similar manner to Lot 20's tanks. The proposed locations of the tanks and extent of 90m radius from the tanks can be seen on the engineering drawings.

4.2.3 Lot 21 (Existing Dwelling)

The 45,000L provision made for Lot 22 covers most of the footprint of the existing dwelling on Lot 21 when considering the required 90m radius.

5 STORMWATER

5.1 Existing Infrastructure

There is no existing public stormwater infrastructure within the vicinity of the subject site, except for two roadside catchpits located on Kerikeri Road which discharge through the subject site.

5.2 Downstream Flooding & Existing Pond

An ephemeral stream is located along the western boundary of the site with an in-line pond located partially on the south-west border of the site.

This feeds into the Puketotoara Stream which then drains into the Kerikeri River. The catchment has substantial flooding indicated on the Northland Regional Council maps when considering the regionwide models for the 100-year climate change extent downstream of this site.

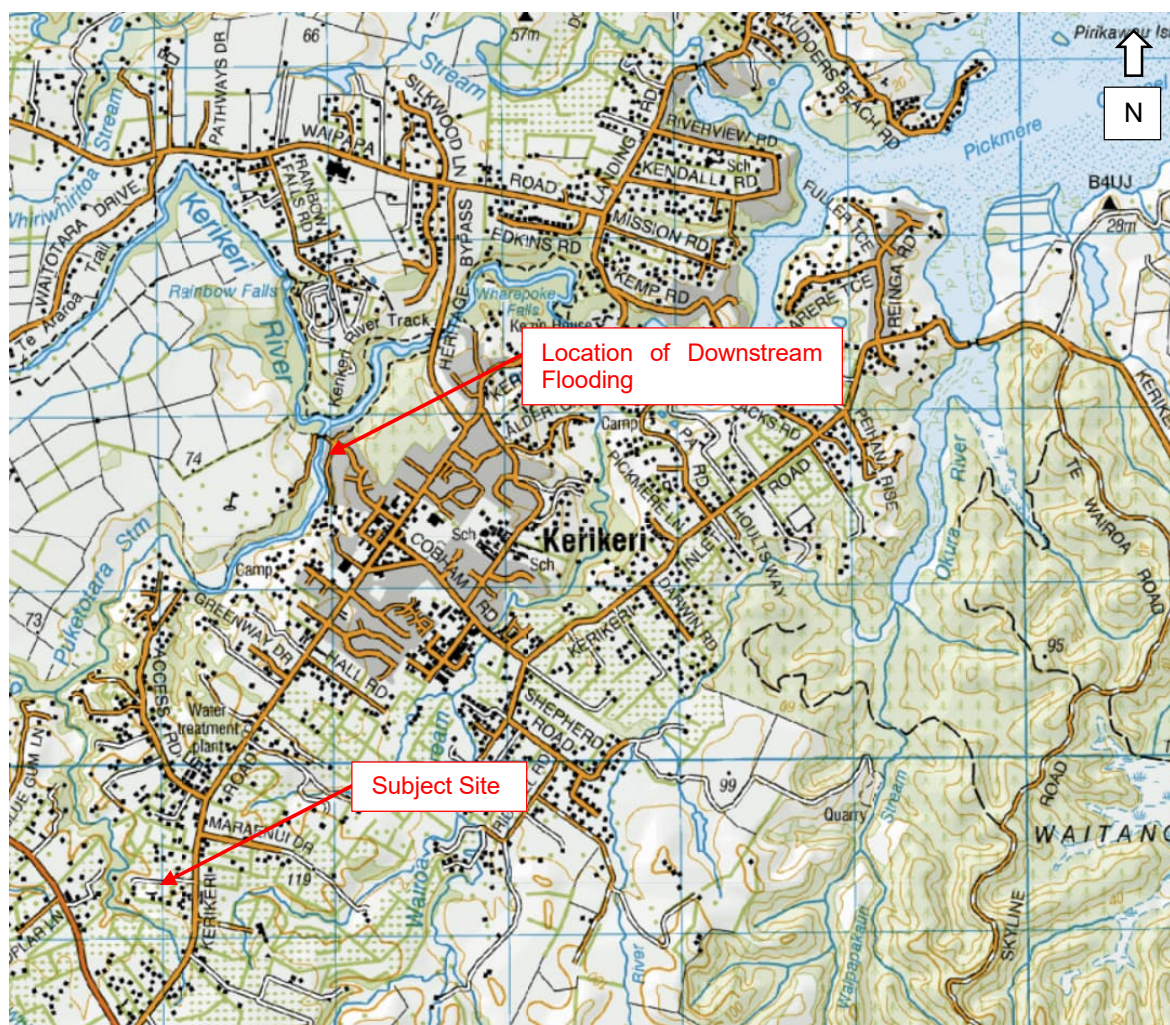


Figure 7: Map of Water Features (Sourced from Topomap)

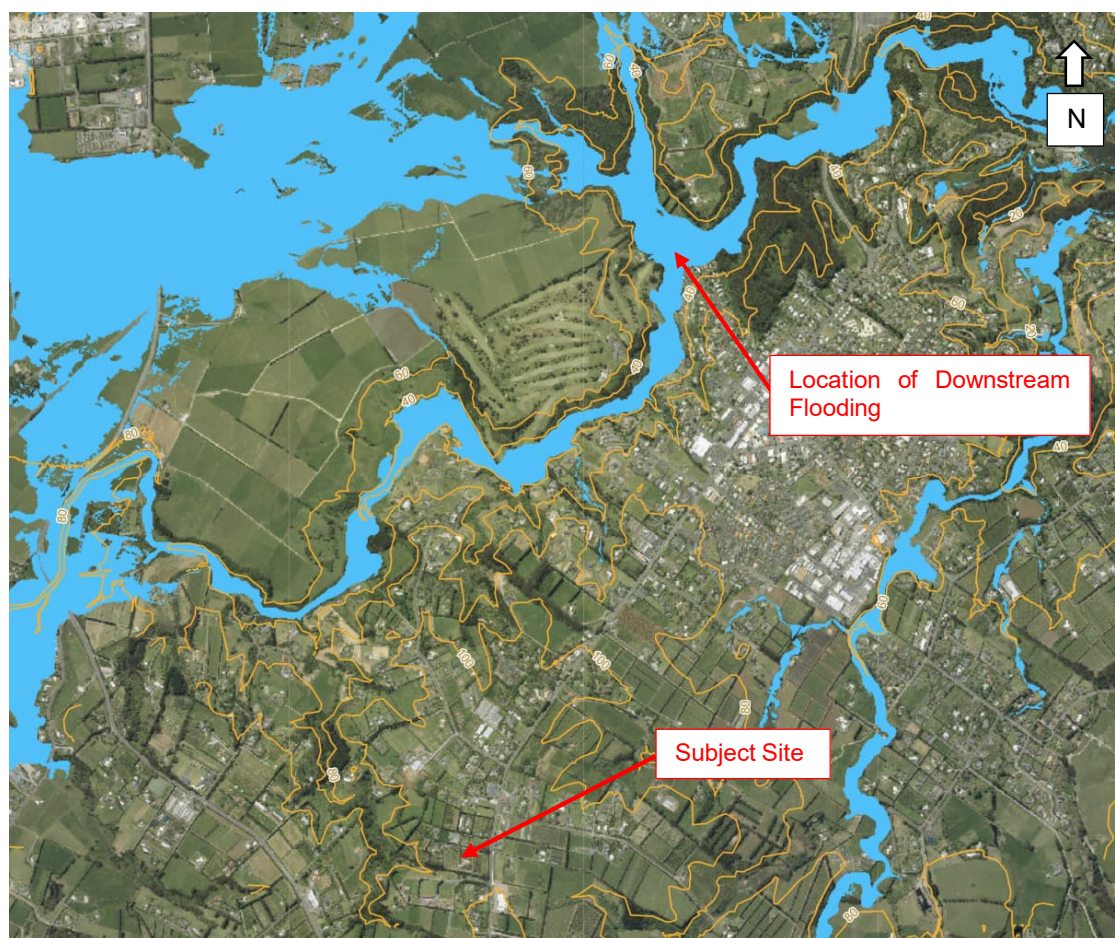


Figure 8: Flooding Map (Sourced for NRC Maps)

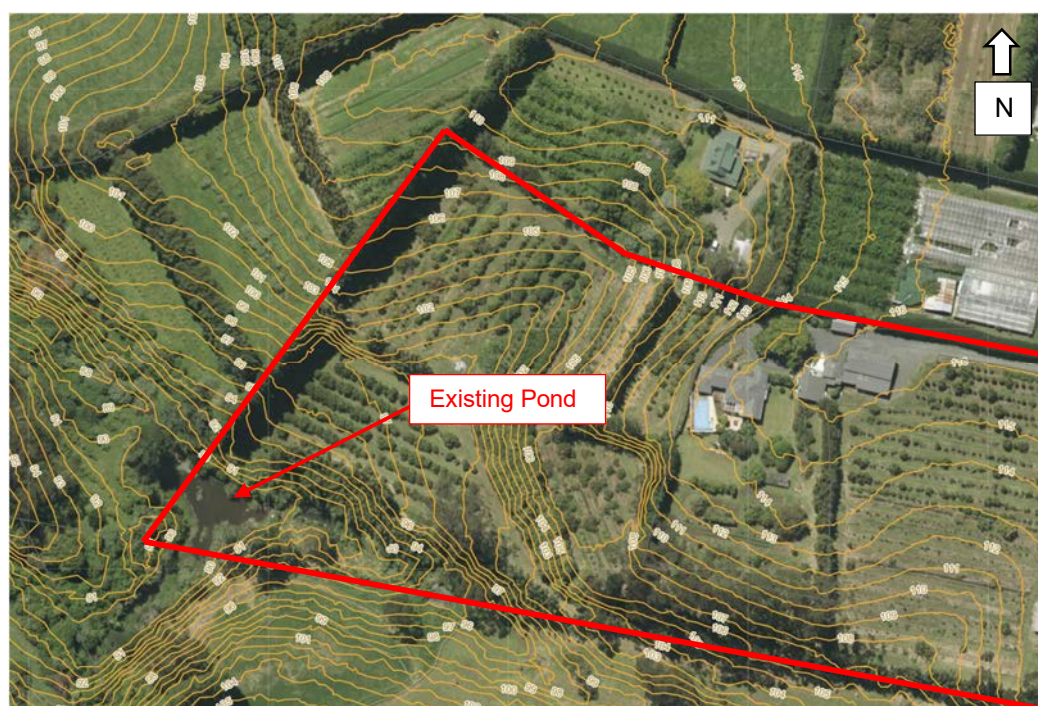


Figure 9: Location of Existing Pond (South-West Corner of Site)

5.3 Overland Flow Paths

On the site itself there are two identified overland flow paths which enter the pond on the south-west corner of the site which are identified in Figure 10 below.

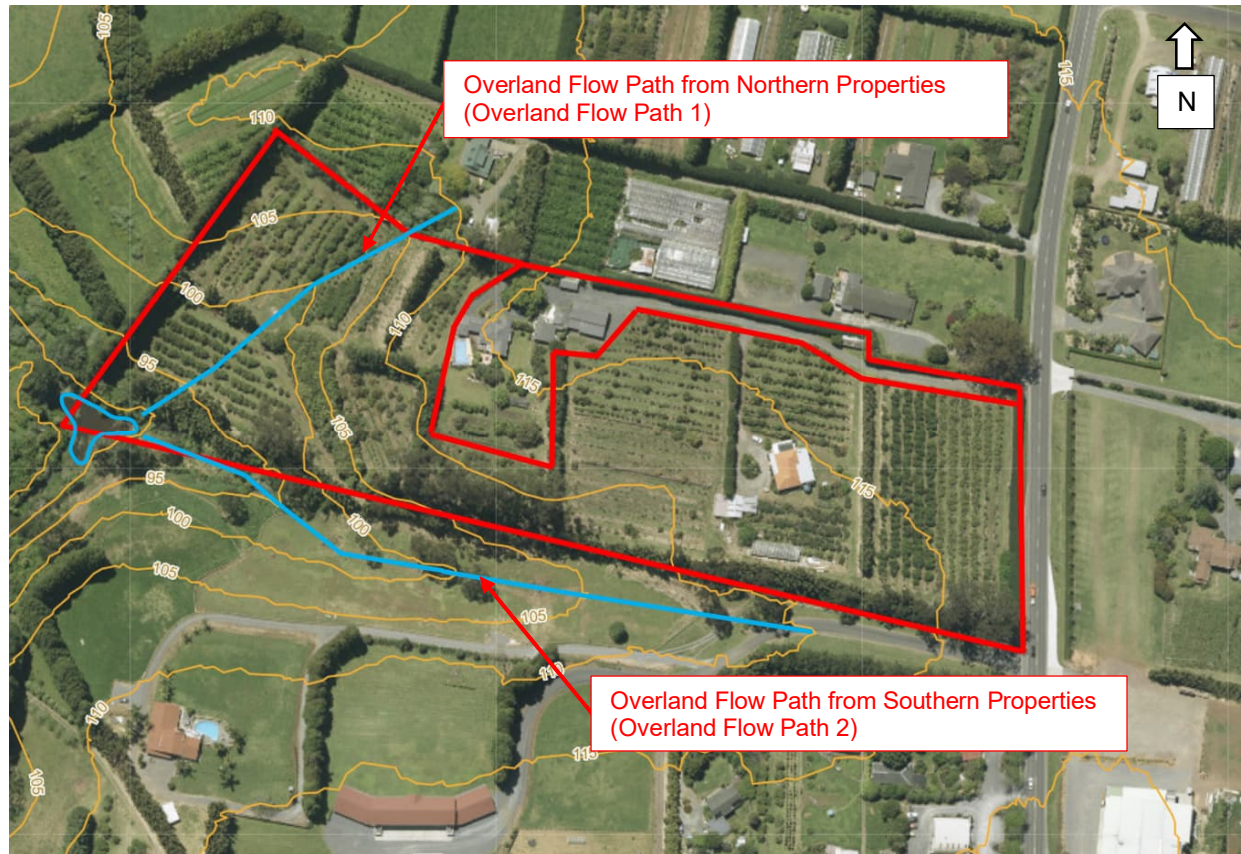


Figure 10: Overland Flow Path Through the Site

5.3.1.1 Overland Flow Path 1

The overland flow path originates across the northern boundary and crosses through the site in a south-west direction. The overland flow path accommodates a catchment area which partially consist of the neighbouring properties located to the north of the subject lots. As this overland flow path crosses over the proposed development footprint, its route and management through the site has been considered in the proposed stormwater design layout of the site.

5.3.1.2 Overland Flow Path 2

The other overland flow path enters from the neighbouring property on the south. This overland flow path does not traverse any of the areas being developed, so is to be maintained in its current state.

Runoff from Kerikeri Road enters this overland flow path via catchpits located on Kerikeri Road in front of proposed Lot 22. Currently the runoff from these catchpits discharges into the orchard on proposed Lot 22 via a bubble up, after which it flows across the surface towards the overland flow path as can be seen in Figure 11 below. The proposed design requires alteration to this system as it discharges upstream from a proposed effluent disposal field.

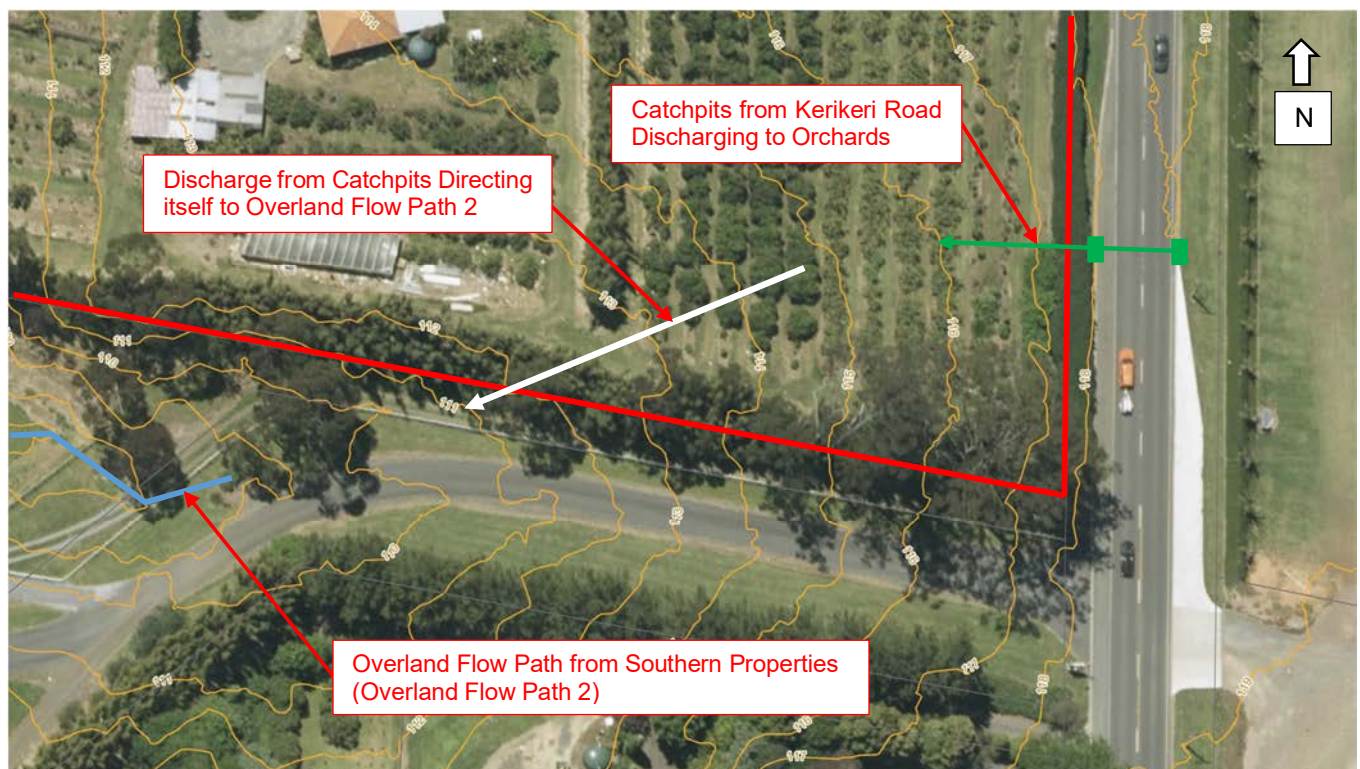


Figure 11: Schematic of Runoff from Kerikeri Road Entering Overland Flow Path 2 via Catchpits Discharging to Orchards on Proposed Lot 22

5.4 Existing Impervious Areas

The impervious areas associated with the existing development are shown below in Table 1.

The areas were obtained from up-to-date drone imagery as identified in Figure 12.

Table 1: Predevelopment Impervious Areas

DESCRIPTION	AREA (m ²)	RELEVANCE TO PROPOSED DEVELOPMENT
Lot 1 DP25904 Impervious Buildings (Red)	756	To be considered in attenuation calculations on Lot 20
Lot 1 DP25904 Roads (Blue)	1364	To be considered in attenuation calculations on Lot 20
Lot 6 DP25904 Buildings (Pink)	168	To be considered in attenuation calculations on Lot 22
Lot 6 DP25904 Road/Parking (Green)	1438	To be considered in attenuation calculations on Lot 22
PRE-DEVELOPMENT TOTAL IMPERVIOUS ASSOCIATED WITH PROPOSED LOT 20	2120	
PRE-DEVELOPMENT TOTAL IMPERVIOUS ASSOCIATED WITH PROPOSED LOT 22	1606	



Figure 12: Map of Existing Impervious Areas Associated with Proposed Lots 20 & 22

5.5 Proposed Impervious Areas

The impervious areas associated with the proposed development are shown below in Table 2 and Figure 13 below.



Figure 13: Map of Impervious Areas

Table 2: Post Development Impervious Areas

DESCRIPTION	AREA (m ²)	COLOUR
PROPOSED LOT 20		
Type A Dwelling x 2	488	
Type B Dwelling x 3	405	
Type C Dwelling x 7	1050	
Access Road Captured in Primary System (Excluding parking which will be pervious )	2240	
Access Road Not Captured in Primary System & Driveways	680	
Additional Provision for Other Impervious on Unit Lots (60m ² /Unit Lot)	600	Not shown
TOTAL PROPOSED LOT 20	5463	
PROPOSED LOT 22		
Upgraded Food Store	585	
Parking Area	1021	
TOTAL PROPOSED LOT 22	1606	

5.6 Summary of Increased Impervious Areas

A summary of the increased impervious areas is shown in Table 3 below.

Table 3: Summary of Increased Impervious Surfaces

DESCRIPTION	AREA (m ²)
PROPOSED LOT 20	
Predevelopment	2120
Post-development	5463
INCREASE	3343
PROPOSED LOT 22	
Predevelopment	1606
Post-development	1606
INCREASE	0

As per Table 3 above, the development on proposed Lot 20 will result in an increase of 3,343m² of impervious area, and development on proposed Lot 22 will not result in any increase of impervious area as the building and carpark areas are not planned to increase, with the slightly larger building using some of the existing formed parking area.

5.7 Environmental Considerations

5.7.1 Lot 20 (New Residential)

New impervious areas will be created with this development which will increase the rate of runoff downstream. This is to be managed in the design utilising attenuation devices including a stormwater pond. Water quality treatment will be provided via the proposed pond, ensuring that the stormwater discharge into the stream network from the site has been adequately treated prior to discharge.

5.7.2 Lot 22 (Commercial)

All of the area to be developed is already impervious as the additional building area will use some of the existing parking areas which are impervious, therefore no new impervious areas will be created. We have considered the need for water quality treatment of the carparking areas for which treatment is proposed.

5.8 Regional & District Rules/Requirements

Due to the downstream flooding hazard identified, detention is required, limiting the post development for 1% AEP storm event flow rates to 80% of the pre-development flow rates in accordance with FNDC engineering standards.

For the stormwater discharge to be classed as a permitted activity, in terms of the NRC Proposed Regional Plan (October 2023) the design needs to comply with:

- The diversion and discharge do 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.
- The discharge does not contain more than 15 milligrams per litre of total petroleum hydrocarbons.

The proposed design is intended to comply with these rules.

5.9 Attenuation & Treatment Strategy

It is proposed to manage with the attenuation and treatment as follows:

5.9.1 Lot 20 (New Residential)

It is proposed to construct a stormwater pond near the south-west corner of the site capturing all the roof areas on Lot 20, the entire main access road located along the northern boundary and as many as practical of the shared driveways. The proposed pond will be sized to achieve neutrality considering all the new impervious areas that will be created by the new dwellings and associated accessways.

As part of this strategy, it is proposed to manage Overland Flow Path 1 (5.3.1.1) through the site with some modifications to redirect it past the proposed stormwater pond. This was deemed essential to minimize the size of the pond required and avoid the need to retreat the clean overland flows from upstream if they were mixed with the runoff from the proposed road network.

5.9.2 Lot 22 (Commercial)

It is proposed to install filters (Enviropods or similar) in the catchpits to remove pollutants from the runoff coming from the commercial parking areas. Due to the development not increasing impervious areas on proposed Lot 22, no attenuation is required. Runoff from the main road and the commercial areas will be directed towards the existing overland flow path as currently occurs.

5.10 Stormwater Analysis

We have used HEC-HMS to model both the pre- and post-development scenarios to calculate the required storage volumes, the size and the configurations of outlet orifices to limit post development stormwater peak flow rates to 80% of predevelopment levels.

The pre-development rainfall depths used in the stormwater analysis have been taken from the historical data extracted from the NIWA HIRDS V4 website. For the post-development scenario, the 24-hour rainfall depths have been increased by 20% to account for climate change.

To calculate the required water quality volume, a 1/3 of the 24-hour storm rainfall depth was used, which was also adjusted for climate change.

A SCS Type 1A storm profile with 24-hour duration was used in the modelling.

Table 4: NIWA HIRDS V4 RAINFALL DATA

Rainfall depths (mm) : Historical Data									
ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h
2	0.5	11.3	16.4	20.5	29.6	42.2	70.9	94.3	120
5	0.2	14.6	21.3	26.5	38.4	54.9	92.5	123	158
10	0.1	17	24.8	30.9	44.9	64.2	108	145	186
20	0.05	19.5	28.4	35.4	51.4	73.8	125	167	214
30	0.033	20.9	30.5	38.1	55.4	79.5	135	180	231
40	0.025	22	32	40	58.2	83.5	142	190	244
50	0.02	22.8	33.2	41.5	60.3	86.7	147	197	253
60	0.017	23.4	34.2	42.7	62.1	89.3	152	203	261
80	0.013	24.4	35.7	44.6	64.9	93.4	159	213	274
100	0.01	25.2	36.9	46.1	67.1	96.5	164	220	283

Table 5 below shows the parameters used in the HEC-HMS hydrological model of the site. A hydrological soil group, Class C, was adopted to determine the applicable curve numbers used in the SCS curve method for stormwater modelling. The hydrological soil group was inferred based on site-specific geotechnical information, with a time of concentration of 10 minutes being used due to the small catchment areas being assessed.

Table 5: HEC-HMS Model Parameters

Land use, group C soils	Runoff curve Number	Initial rainfall abstraction (mm)
Permeable (Grass/Garden)	74	5
Impervious Pavement Area	98	0

It is intended to mitigate the effect of increased peak flow rates from the new impervious areas. As such, this analysis only considers increases and difference in impervious areas rather than the site in its entirety as much of the site will remain pervious post development, with pervious areas not being collected or directed into the proposed stormwater pond.

5.10.1 HEC-HMS Model Schematics

The model within HEC-HMS for calculation of water quality volume were set up as per Figure 14 below.

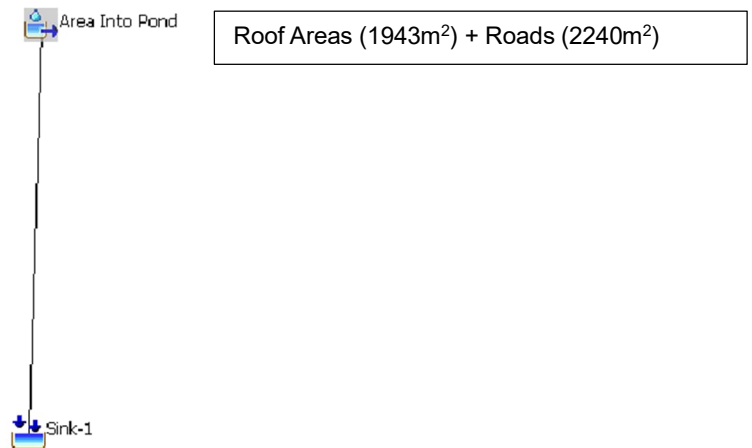


Figure 14: Water Quality Volume HEC-HMS Model Schematic

The model within HEC-HMS for predevelopment were set up as per Figure 15 below.

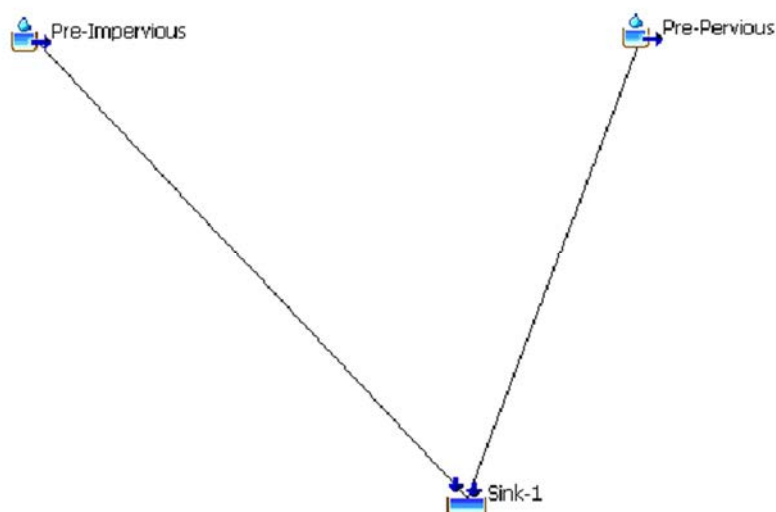


Figure 15: Predevelopment HEC-HMS Model Schematic

The model within HEC-HMS for post-development were set up as per Figure 16 below, with the captured areas offsetting the impervious areas where it is not practical to collect and divert them into the pond.

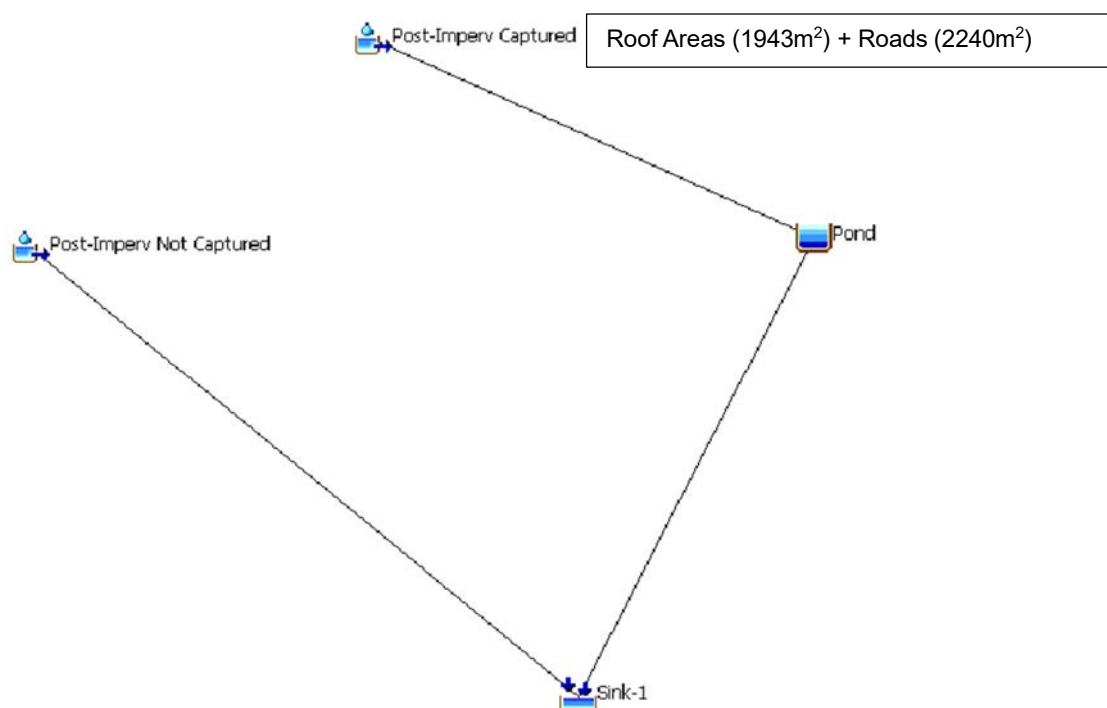


Figure 16: Post-development HEC-HMS Model Schematic

5.10.2 Pond Details

Pond design is in general accordance with Auckland Council GD01. The pond detail as shown in Table 6 is applicable to the pond used in the HEC-HMS model.

Table 6: Pond Details

Description	Values
Internal Pond Bank Below PWL Height / Width / Slope	0.5m / 2.0m / 1V:4H
Safety Bench Height / Width / Slope	0.38m / 3.0m / 1V:8H
Internal Pond Bank Above PWL Height / Width / Slope	0.76m / 2.3m / 1V:3H
Water Quality Volume	180m ³
Pond Detention Volume	240m ³
Capped Outlet Diameter (Base of Ponds)	150mm

The detail of the outlets for the pond used in the HEC-HMS model is shown below in Table 7.

Table 7: Pond Outlet Detail

Measured from permanent water level (m)	Outlet
0.10 (to center of outlet)	120Ø mm
0.25 (to center of outlet)	150Ø mm
0.27 (to center of outlet)	100Ø mm
0.41 (to rim of outlet structure)	1050Ø mm

5.10.3 HEC-HMS Outputs

The HEC-HMS outputs for water quality volume, predevelopment and post-development are attached under Appendix D of the report. Table 8 below summarises the outputs:

Table 8: Summary of HEC-HMS Outputs for Predevelopment, Post-Development & Water Quality Volume

DESCRIPTION	50% AEP	20% AEP	10% AEP	1% AEP
Predevelopment Peak Flow	28.9 l/s	41.1 l/s	50.4 l/s	83.6 l/s
Post-development Peak Flow	21.4 l/s	29.8 l/s	40.1 l/s	65.9 l/s
	WQV calculated using 1/3 of 50% AEP			
Water Quality Volume	180m ²			

5.11 Stormwater Management Design Considerations

5.11.1 Lot 20

5.11.1.1 Management of Overland Flow Path 1 to Pond Outlet Structure

An essential part of the intended design is to incorporate a cut-off channel along the northern boundary of the site to divert all the flow into where Overland Flow Path 1 enters the site. From there it is collected and pipes underneath the road to a scruffy dome structure located further downstream, which then connects to the outlet structure of the pond. The outlet structure of the pond is combined with the flow from Overland Flow Path 1 and discharged to a headwall located near the existing pond located on the south-west corner of the site. At this point the flows are being directed back to the current overland flow path route, so the only changes to the overland flow occur within the site itself.

The area of the catchment north of the main access road relevant to the cut-off channel and Overland Flow Path 1 amounts to approximately 2.6ha. A peak flow rate of 460l/s have been calculated for this catchment for the 1% AEP using a runoff coefficient of 0.40, 10minutes time of concentration and a rainfall intensity of 181.4mm/hr which has been adjusted to include additional provision of 20% for climate change. The pipe/culvert from the inlet north of the road will need to be sized to accommodate the 460l/s flow.

The proposed scruffy dome just north of the pond makes provision to capture the runoff from some of the pervious areas to the south of the main access road. The catchment area of the scruffy amounts to approximately 0.5ha. A peak flow rate of 100l/s have been calculated for this catchment for the 1% AEP using a runoff coefficient of 0.40, 10minutes time of concentration and a rainfall intensity of 181.4mm/hr which has been adjusted to include additional provision of 20% for climate change. The pipe between the scruffy dome and the outlet structure of the pond will need to be sized to accommodate a minimum flow rate of 570l/s (460l/s + 110l/s).

Note that both inlet structures will need to be designed appropriately to collect these flows with no overtopping until the 1% AEP has been collected.

5.11.1.2 Pond Outlet Structure to Final Point of Discharge

The pipe between the outlet structure of the pond will need to be designed to accommodate upstream flows as discussed above (5.11.1.1) and the discharges from the pond. This amounts to a minimum flow rate of 685 l/s (570l/s + 115l/s).

The anticipated velocity from the final point of discharge is anticipated in excess of 6 m/s, therefore at detailed design stage a specific engineering design will need to be undertaken to manage the discharge velocities to avoid the need for large areas of riprap the discharges are to be managed through specifically designed outlet structures which minimises land disturbance.

5.11.2 Conveyance of 1% AEP to Pond

Due to site constraints all infrastructure will need to be designed to convey runoff from a 1% AEP to the pond. This includes roof gutters from all the proposed buildings which must be designed to collect 1% AEP rainfall.

5.11.3 Lot 22

5.11.3.1 Runoff from Kerikeri Road and Parking Lot area

As per the status quo, runoff from Kerikeri Road discharges from catchpits to a bubble up located in the orchards (refer to 5.3.1.2). The design makes provision to combine the flow from Kerikeri Road and the parking lot area and roof area of the upgraded food store into a piped system discharging to a new outlet structure located on the southern boundary of the site which is where this flow current drains to.

The combined catchment area for Kerikeri Road and the parking lot area and roof area for the food store consists of approximately 0.45ha. A peak flow rate of 205l/s have been calculated for this catchment for the 1% AEP using a runoff coefficient of 0.90, 10minutes time of concentration and a rainfall intensity of 181.4mm/hr which has been adjusted to include additional provision of 20% for climate change.

The topography along the southern boundary is such that no downstream flooding will occur as a result of the discharge and the intended design maintains the general flow regime in terms of direction, flow rates and flow volume.

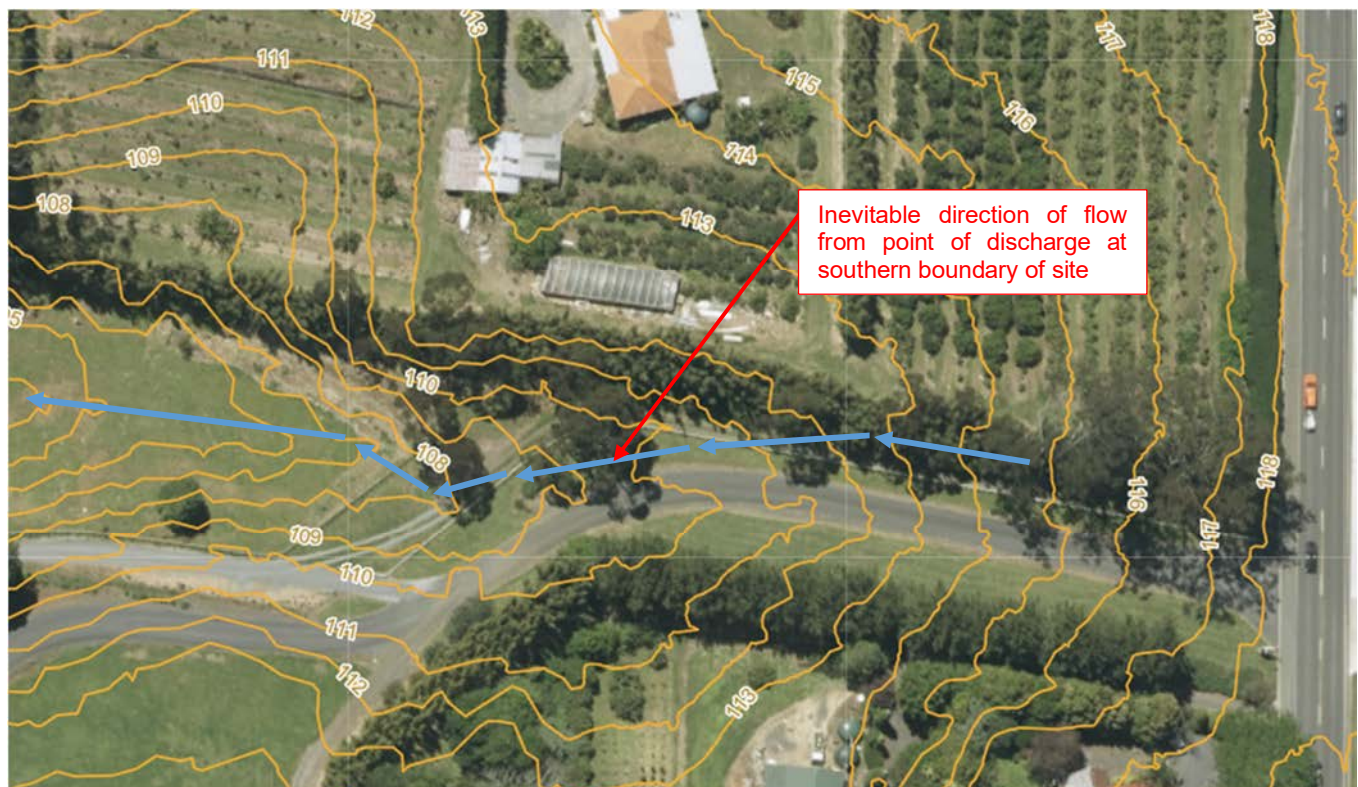


Figure 17: Topography from Point of Discharge on Southern Boundary

6 ONSITE WASTEWATER DISPOSAL

There is no existing public reticulated wastewater system available and therefore onsite wastewater disposal will be required.

6.1 Existing Onsite Wastewater System

The existing dwelling is to remain on Lot 21 and has an existing wastewater system, this is to remain unchanged with it contained within the proposed boundaries of Lot 21. It is assumed that the system is primary treatment with trenches for effluent disposal located just south of the dwelling.

6.2 Proposed Lot 20 and Lot 22 Wastewater Systems

It is intended that the wastewater from proposed Lots 20 and 22 be managed with separate systems so each Lot is independent of the others:

6.2.1 Lot 20

It intended that the system on Lot 20 incorporates greywater being recycled by each dwelling for the purpose of flushing toilets. This will result in all the dwellings having a greywater and drinking water system installed.

6.2.2 Lot 22

The upgraded commercial building includes provision for a toilet which is to be used by the public so this has been included in the wastewater design for this Lot.

6.3 Clearances

Minimum separation distances must be maintained as per the Northland Regional Council Requirements. The following setbacks are required for a tertiary wastewater system:

- Stormwater flow path minimum 5m
- Natural wetland, river, pond minimum 15m
- Existing water supply bore minimum 20m
- Property boundary minimum 1.5m
- Winter groundwater table minimum 0.6m

We consider that wastewater disposal fields can be located within the proposed site meeting the required setback distances.

In the LDE investigation of the proposed wastewater disposal fields, no groundwater table was encountered considering 28 boreholes with some up to three meters deep. Also given the topography of the site which slopes

down to the pond in the south-west corner of the site so shallow groundwater is not anticipated at the higher elevations of the site.

6.4 Daily Wastewater Demand

In terms of the proposed scheme plan, it is anticipated that the following flows as shown in Table 9 below will be generated by the proposed development for proposed Lot 20 & 22:

Table 9: Proposed Wastewater Demand Volumes

Description	Flow Generated Liter/day	Requirement Guideline
Residential (Lot 20)		
3 x Three-bedroom dwellings (>200m²) (5 x person occupancy assumed) 90L/Day/Person	1350	NZS 1547:2012 (Table H3) Assuming full water reduction facilities, roof water supply, recycled grey water
7 x Three-bedroom dwellings (<200m²) (4 x person occupancy assumed) 90L/Day/Person	2520	NZS 1547:2012 (Table H3) Assuming full water reduction facilities, roof water supply, recycled grey water
2 x Two-bedroom dwellings (3 x person occupancy assumed) 90L/Day/Person	540	NZS 1547:2012 (Table H3) Assuming full water reduction facilities, roof water supply, recycled grey water
<u>RESIDENTIAL (LOT 20) TOTAL</u>	4410	
Commercial (Lot 22)		
Café / Foodstore (4 x employees assumed) 30L/Day/Person	120	NZS 1547:2012 (Table H4)
Café / Foodstore (218 x customers assumed based on traffic report trip generation, and assuming 1.5x persons per vehicle uses toilet facility) 15L/Day/Person	3270	NZS 1547:2012 (Table H4)
<u>COMMERCIAL (LOT 22) TOTAL</u>	3390	

6.5 Regulatory Considerations

The discharge for both the sites is considered a Discretionary Activity under the Proposed Regional Plan for Northland (October 2023). This is due to the following requirement:

- The volume of wastewater discharged does not exceed two cubic metres per day (C.6.1.3 – 2)

The proposed design demonstrates compliance in other aspects required by the rules.

6.6 Mitigation of Discharge Volume (Discretionary Aspect of Design)

In terms of the discharge volume, the disposal areas of the systems are to be specifically designed to accommodate the anticipated volumes defined under sub-heading 6.4. The design of the disposal areas considers the specific subsurface conditions of the site, which were evaluated by means of soakage tests.

In terms of the final design, a tertiary treatment system will be specifically designed during building consent stage for each of the lots which can accommodate the calculated effluent volumes.

6.7 Areas Identified for Disposal

On the engineering plans attached under Appendix B the proposed disposal field areas required have been identified.

6.8 Site Investigation

6.8.1 Site Visit

The site was visited in January 2024 by an engineer from the LDE Whangarei office and a site assessment relating to the wastewater design was conducted. This comprised a site walkover of where the disposal areas are to be located and evaluating these areas in accordance with the standards.

6.8.2 Surface Conditions

6.8.2.1 Stormwater flows/Flooding

All the areas identified for disposal fields are adequately sloped and flooding is not a concern.

6.8.2.2 Ground Contamination

A detailed site investigation (PSI/DSI) was done by LDE to determine the extent of contamination on the site. Although some contamination is present on the site, it does not affect the disposal areas as there is no earthworks required where the disposal areas are proposed.

6.8.2.3 Land stability as it relates to the on-site waste system

The areas dedicated for disposal areas varies in slope. Slopes however are well vegetated, and instability is not a concern on these steep grades. Reduction in disposal have been applied as part of the design in accordance with AS/NZS1547:2012.

6.8.2.4 Climatic Factors

The areas of the proposed disposal fields are mostly open with free airflow and have exposure to the sun.

6.8.3 Subsurface Conditions

Two soakage tests were conducted along with 28 boreholes across the site. Based on the findings of the site investigation and boreholes, the soil has been conservatively assessed as a Category 4 soil as defined in AS/NZS1547:2012. The soakage tests results and borehole logs are included in Appendix C of the report.

A conservative design loading rate of 3.5mm/day has therefore been selected. It is proposed to dispose the effluent via pressure compensating drip irrigation.

6.9 Recommended System

For resource consent purposes, a tertiary treatment system is proposed for both Lots 20 & 22 due to the effluent disposal fields being located in orchards with produce being sold to the public. There are many tertiary treatment systems which could be suitable and the details of this will be determined in the detailed design stage once developed plans for each dwelling are available. We consider the most viable option for the site is discharging the tertiary treated effluent to pressure compensated dripper lines.

6.9.1 Lot 20 Disposal Area Size

Given the daily wastewater demand of 4,410L/day and the soil loading rate of 3.5 mm/day the disposal area calculated is 1260m².

A disposal field of this size can be located in various smaller portions within the proposed boundaries of Lot 20.

Where dripper lines are to be located on steeper slopes, the dripper lines will need to be attached to the ground and covered with by a minimum of 100mm topsoil, mulch or bark.

Accordingly, we consider that the proposed development on Lot 20 can achieve wastewater disposal on site.

6.9.2 Lot 22 Disposal Area Size

Given the daily wastewater demand of 3,390L/day and the soil loading rate of 3.5 mm/day the disposal area calculated is 968m².

A disposal field of this size can be located within the proposed boundaries of Lot 22.

Where dripper lines are to be located on steeper slopes, the dripper lines will need to be attached to the ground and covered with by a minimum of 100mm topsoil, mulch or bark.

Accordingly, we consider that the proposed development on Lot 22 can achieve wastewater disposal on site.

6.10 Detailed Design

We note the design outlined above is for the purposes of resource consent application and a specific design suitable for building consent and construction will be required following the detailed development of the building designs.

6.11 Reserve Disposal Areas

It is proposed to designate 30% reserve disposal areas for both Lots 20 and 22.

The locations of proposed reserve disposal areas are shown on the engineering plans attached under Appendix B.

6.12 Assessment of Environmental Effects

6.12.1 Potential Impact on Water and Soils

The quality of the effluent applied to the disposal field from a tertiary treatment system will be high and pose little risk to the soil. The diffuse dosed loading of a well designed and installed pressure compensated dripperline system provides regular doses well below the soil's long term acceptance rate followed by rest periods allowing the bacteria within the soil to proliferate and aerobically treat the effluent.

The quality of the effluent applied to the disposal field from a modern tertiary treatment system will be high and pose little risk of pollution or nuisance to ground or surface water.

Considering the location of the proposed disposal field, the potential for the highly treated effluent to impact on the water and soils of the site and neighbouring properties is therefore considered to be less than minor.

6.12.2 Visual Impacts

The treatment system and pump station will be buried with only a riser and access lids above ground level. The system can be landscaped to screen if desired.

The pressure compensated dripperlines can be either surface laid within the landscaping and pinned or mole ploughed just below the ground surface. If the dripperlines are placed in landscaping, then they will be covered with a minimum of 100mm of topsoil, bark or mulch. If the lines are mole ploughed in grass, the manual flushing valves at the ends of the lines should be placed in flush-to-ground sprinkler boxes to minimize damage during landscape maintenance.

The visual impacts of the system are therefore considered to be less than minor.

6.12.3 Noise

This system uses a blower unit for aeration that typically runs 24 hours a day generating a small hum. The treatment system will be sited away from site boundaries, sleeping or entertaining areas to avoid introducing a nuisance.

6.12.4 Odour

Odour can be a concern with any sanitary sewage system, and steps need to be taken to minimise the risk of nuisance. Any septic system should be preferably well away from a dwelling and not in an up-wind direction if there is a choice.

The lids on the treatment system will be sealed and secured to prevent casual access and the system shall be appropriately vented to allow bio- gases which are lighter than air to be vented well clear of the ground. The draw off of foul air (or biogas) from within the tank will reduce the chance of smell when that foul air within the tank is suddenly displaced by a sudden influx of water.

An appropriate management and servicing agreement with a qualified company will ensure that the system remains “healthy” and does not die off as a result of bleaches and other harmful chemical use. This will protect against any odours being created.

Should regular odours be noted from either the treatment system or disposal field, the servicing company will investigate and remedy the issue.

6.12.5 System Failure

6.12.5.1 General

In order to mitigate any danger of failure, the following methodologies will be incorporated into the treatment and disposal field design for Building Consent:

- An appropriate monitoring and maintenance agreement shall be entered in to with a qualified company. The maintenance contract shall require regular inspection and maintenance of the dripperlines and disposal field infrastructure.
- The loading rate used for the design shall be appropriately conservative for the soils.

6.12.5.2 24 Hour storage

As a minimum, the treatment systems will be equipped with 24 hours emergency storage. There is the capacity to increase this storage volume as part of the design if it is considered necessary.

Emergency storage is typically required due to failure of the treatment system itself, rather than the disposal fields. To further reduce the danger of system failure, having a generator and replacement pump on hand is recommended.

It is considered that the treatment system can be appropriately designed during Building Consent to reduce the danger of failure and to have in place appropriate management plans to address any mechanical issues and mitigate the effects of any failure.

6.12.6 Maintenance and System Management

The on-site waste treatment system selected will have blower, pumps, filters and dripperlines all of which require ongoing maintenance for reliable operation. A maintenance contract should be undertaken by the owner with an appropriate system maintainer. The owner should be made aware of the general system operational requirements and alarms during commissioning.

On-site waste systems will not efficiently process ground food waste so household sink grinders should not be installed in dwellings connected to this system. On-site waste systems use living biological treatment processes to treat the effluent which can be damaged by the introduction of certain products.

The following products should never be put down the drains or toilet:

- Petroleum products- Motor oil, paint, paint thinner, petrol or solvents.
- Non-biodegradable products- Sanitary napkins, tampons, condoms.
- Toxic substances- Pesticides, strong disinfectants, strong caustic drain cleaners, chlorinated swimming pool or spa water.
- Animal fats- Bacon grease, lard, etc. (normal cleaning of pots and pans is acceptable after draining and wiping pan with paper towel)
- Unwanted antibiotics or medicines.
- Waste foods that are slow to biodegrade- animal bones, melon rinds, corn cobs, eggshells, etc.

All cleaning chemicals must be used with care and in all cases, the less that is discharged; the better this will be for the receiving soils in the long term. Use the following products sparingly to insure the health of the septic system:

- General cleaners- Use soft soap cleaners and bio-degradable cleaners and those low in chlorine levels.
- Drain decloggers- Avoid declogging chemicals. Instead use a plunger or metal snake or remove and clean trap.
- Laundry powders or liquids- Choose one with a zero-phosphate content and low in alkaline salts (in particular, a low sodium level) and no chlorine.
- Laundry bleach and whiteners.
- Household cleansers (sodium bicarbonate, sodium carbonate and sodium borate cleansers are better than chlorine-based cleansers).

6.12.7 Access for Operations and Maintenance

Both the treatment systems and disposal fields shall be easily accessible for cleaning, flushing and maintenance.

7 VEHICLE ACCESS AND ROADING

7.1 General

To provide access to the proposed dwellings an access road will be constructed along the northern boundary with the main access/intersection to Kerikeri Road located at the north-east corner of the site. Along the eastern boundary a carpark will be constructed to service the upgraded food store, only allowing one-way traffic with the entrance located at the south-east corner of the site, and the exit combined with the exit of the main access road. The roading layout has also been checked by the projects team traffic engineer to ensure it meets the requirements of the developments ITA. The maximum allowable gradient is 22.5%, all the accessways have been designed at gradients below this maximum.

7.2 Main Access Road

The main access road has a carriageway width of 6m. The gradient is approximately 0.5-2% for the first 200m then steepens to a maximum of 21.5% before flattening out again at the rear of the property where the cul-de-sac turning head is located. The crossfall is a single cross fall of 3% (sealed).

7.3 Shared ROW from Main Access Road

The shared ROW from the main access road servicing four lots will have a carriageway width of 4m. The maximum gradient is 7.6% near the bottom. The cross section incorporates a reverse crown with 3% grades (sealed).

7.4 Vehicle Crossings

Vehicle crossings to be surfaced. The maximum gradient incorporated in the design is 7.9%. The minimum formed width of the vehicle crossings shall be 3m.

7.5 Proposed Layout & Profile

A proposed layout of the access road and vehicle crossings, and profile for the access road is included in Appendix B.

8 EARTHWORKS

8.1 General

The proposed earthworks are to be undertaken within Council's earthworks season and during periods of fine weather. The earthworks will include installation of erosion and sediment control devices.

Subject to detailed design, earthworks for the development will be carried out over a maximum area of some 7,700m² with a cut of 2,400m³, fill volume of 1,900m³ and spoil volume of 500m³. Approximately 1,200 m³ of material will need to be imported for the construction of layerworks (gravel etc) for the roads, vehicles crossings and parking areas. The earthworks model considers the design pavement depth to be 350mm for the roads, vehicles crossings and parking areas. This will be refined as part of the detailed design once construction begins and detailed testing is undertaken along the road alignments to confirm CBR of 7 or higher.

The earthworks volume given is solid measure and the suitability of any material used for fill must be confirmed by the geotechnical engineer prior to use, noting that lab testing may be required in some instances. Engineering plans detailing the extent of proposed earthworks are shown in Appendix B.

8.2 Extreme Extent of Cut & Fill

Excavations of up to 2.5m are proposed for the western most cul-de-sac on the access road near Lots 10-12. Additionally, a small area of up 1.7m cut is present at the pond.

Filling of up to 2.5m high is proposed to construct the stormwater pond. Placement of approximately 1.9m of fill material between Lot 9 and Lot 10 will be required along the main road access to maintain suitable gradients as outlined in council standards.

Pond batters are proposed to be formed at maximum slopes of 1V:3H both internally and externally with a 1V:8H safety bench proposed below permanent water level for Health & Safety reasons.

8.3 Road Corridor Batter Slopes & Retaining Walls

Batter slopes for the road corridors incorporate 1V:3H and 1V:2H slopes for the fill and cut respectively.

Some batter slopes are not achievable within the extent of the subject site in the vicinity of the cul-de-sac where retaining walls up to 2.3m in height are required to retain cut slopes.

Pond

8.4 Controlled Activity

In terms of the Proposed Regional Plan for Northland (February 2024) Rule C.8.3.1, the earthworks for the project is considered a Controlled Activity considering the footprint exceeds the allowable 5000 square meters for a Permitted Activity.

The matters of control is further discussed under 8.5 and 8.6.

8.5 Erosion and Sediment Control Methodology

Erosion and sediment control and site stabilisation during the earthworks will be undertaken in general accordance with the provisions set out in Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region (GD05). Earthworks undertaken in accordance with these guidelines will act to minimise and/or mitigate any adverse environmental effects of sediment discharge during the works through appropriate design and use of erosion and sediment control techniques and measures.

The proposed erosion and sediment control methodology is detailed in the following subsections and on the engineering drawings. It is noted that the methodology may be subject to change depending on the Contractors construction operation and phasing which will be discussed with the Council's monitoring officer at the time of construction.

As part of engineering plan approval, a full erosion and sediment control plan will be submitted.

8.6 Proposed Construction Sequence

The proposed construction sequence for the development site is shown below:

- Construct silt fence around lower end of construction footprint boundary of site.
- Construct diversion channel along northern boundary with temporary culvert underneath main access.
- Construct decanting bund below proposed pond, along with silt fence downstream of the bund.

8.7 Utilised Erosion and Sediment Control Devices

A drawing is included in Appendix B showing the erosion and sediment control measures to form part of the project. The proposed erosion and sediment control measures are as follows:

8.7.1 Monitoring & Maintenance

The Contractor will:

- Inspect the channel daily, before forecasted rainfall event, and after every rainfall event including looking for accumulated sediment which may cause overtopping or for any signs of breaching.

- Check any discharge points for signs of scouring and install further armouring or other stabilisation if scouring is evident.
- Immediately repair any damage
- Install culvert crossings to avoid machinery tracking through clean water paths.
- All sediment removed must be disposed of responsibly to an approved receiving facility.

9 CONCLUSION

The purpose of this report is to accompany a resource consent application for the proposed subdivision of Lot 1 DP154181 and Lot 6 DP25904, 482-484 Kerikeri Road, Kerikeri. We consider that the proposed development can be adequately serviced with regards to water supply, firefighting water supply, wastewater, stormwater, and access using the recommendations outlined in this report.

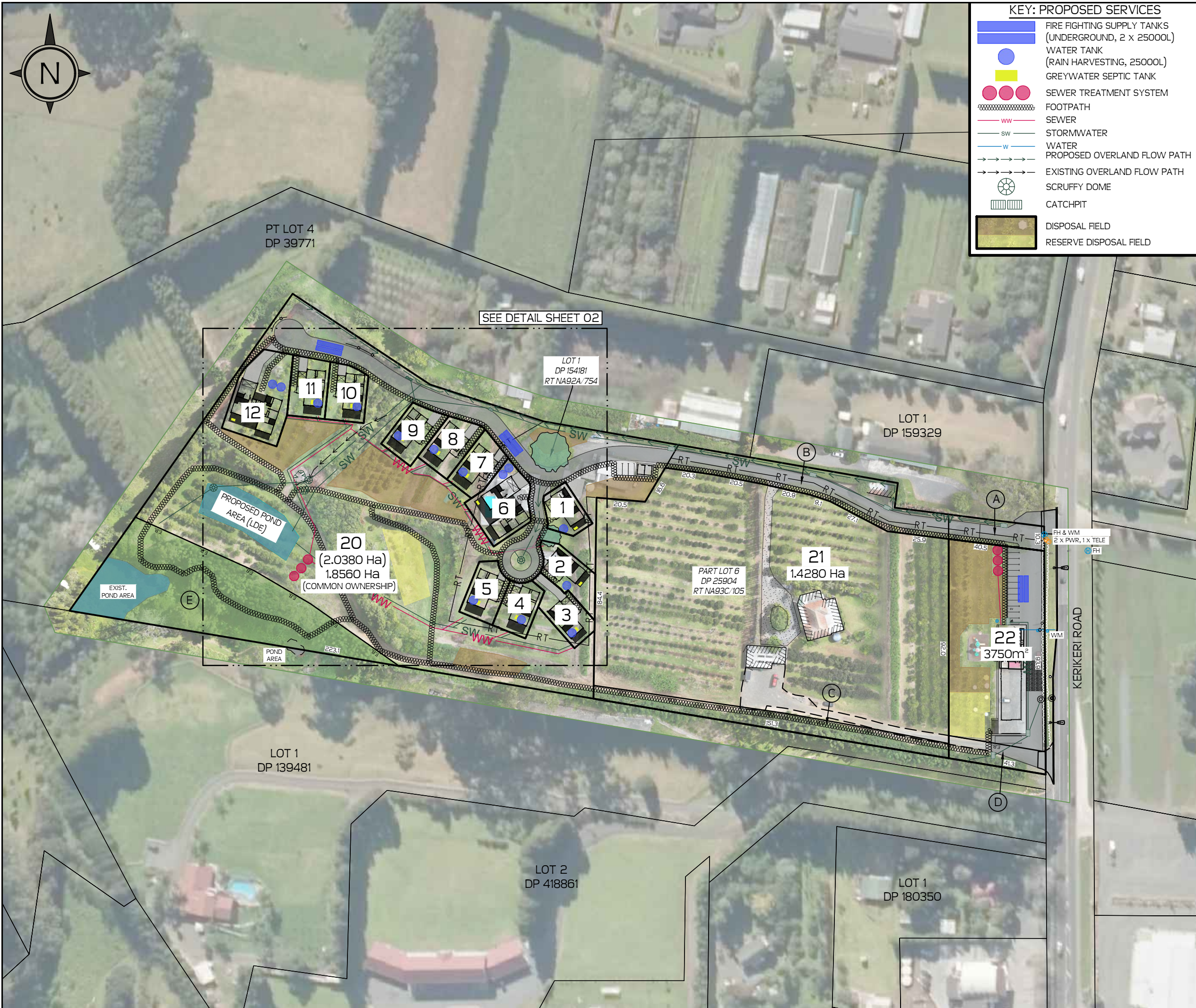
10 LIMITATIONS

This report should be read and reproduced in its entirety including the limitations to understand the context of the opinions and recommendations given.

This report has been prepared exclusively for Quirino Limited in accordance with the brief given to us or the agreed scope and they will be deemed the exclusive owner on full and final payment of the invoice. Information, opinions, and recommendations contained within this report can only be used for the purposes with which it was intended. LDE accepts no liability or responsibility whatsoever for any use or reliance on the report by any party other than the owner or parties working for or on behalf of the owner, such as local authorities, and for purposes beyond those for which it was intended.

This report was prepared in general accordance with current standards, codes and best practice at the time of this report. These may be subject to change.

APPENDIX A: PROPOSED SCHEME PLAN



KEY: PROPOSED SERVICES

- FIRE FIGHTING SUPPLY TANKS (UNDERGROUND, 2 x 25000L)
- WATER TANK (RAIN HARVESTING, 25000L)
- GREYWATER SEPTIC TANK
- SEWER TREATMENT SYSTEM
- FOOTPATH
- SEWER
- STORMWATER
- WATER
- PROPOSED OVERLAND FLOW PATH
- EXISTING OVERLAND FLOW PATH
- SCRUFFY DOME
- CATCHPIT
- DISPOSAL FIELD
- RESERVE DISPOSAL FIELD

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- DRONE IMAGE SOURCED FROM REYBURN AND BRYANT DRONE FLIGHT COMPLETED 02-FEB-2024
- SITE PLAN DESIGNED BY HB ARCHITECTURE LIMITED. DATA SOURCED FROM MASTER PROVIDED 24/04/2024
- SERVICES SHOWN ARE PROPOSED. THEY HAVE BEEN SOURCED FROM LDE LTD CIVIL DESIGN PROVIDED 29/04/2024
- ALL BOUNDARIES ARE TO BE MINIMUM 1.5M FROM BUILDINGS

PROPOSED AMALGAMATION CONDITION

PURSUANT TO SECTION 220 (1)(b)(iv) OF THE RMA 1991 THAT LOT 20 HEREON (COMMON PROPERTY) BE HELD AS TO THIRTEEN UNDIVIDED ONE-THIRTEENTH SHARES BY THE OWNERS OF LOTS 1 - 12 & 21 HEREON AS TENANTS IN COMMON IN THE SAID SHARES AND THAT INDIVIDUAL RECORDS OF TITLE BE ISSUES IN ACCORDANCE THEREWITH.

PROPOSED EASEMENT SCHEDULE			
PURPOSE	SHOWN	BURDENED (SERV.TENE.)	BENEFITTED (DOM.TENE.)
RIGHT OF WAY & SERVICES	A	LOT 20 HEREON	LOTS 21 & 22 HEREON
	B	LOT 20 HEREON	LOT 21 HEREON
	D	LOT 22 HEREON	LOT 21 HEREON
RIGHT OF WAY - PEDESTRIAN ONLY	C	LOT 21 HEREON	LOTS 1 - 12 HEREON
	D	LOT 22 HEREON	LOTS 1 - 12 HEREON

SEE SHEET 03 FOR EXISTING EASEMENTS & COVENANTS TO BE CANCELLED

PROPOSED CONSERVATION COVENANTS
PURSUANT TO S77 RESERVES ACT 1977

SHOWN	UNDERLYING PARCEL	AREA
E	LOT 20 HEREON	0.3405 HA

TOTAL AREA: 4.3403 HA
COMPRISED IN: RT NA93C/105 & NA92A/754

THIS SITE IS ZONED 'RURAL PRODUCTION' AND THE BUILDING SETBACKS ARE THUS: 10m FROM ALL BOUNDARIES AND 12m FROM KERIKERI ROAD.

D	02.05.24	ADD COVENANT & AMEND. AMALG. - RS / SB
C	01.05.24	REFLECT NEW LDE CIVIL DESIGN - RS / SB
A	22.02.24	ISSUED FOR CONSIDERATION - RS / SB
REV	DATE	DESCRIPTION

REF. DATA:

reyburn & bryant

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

CLIENT

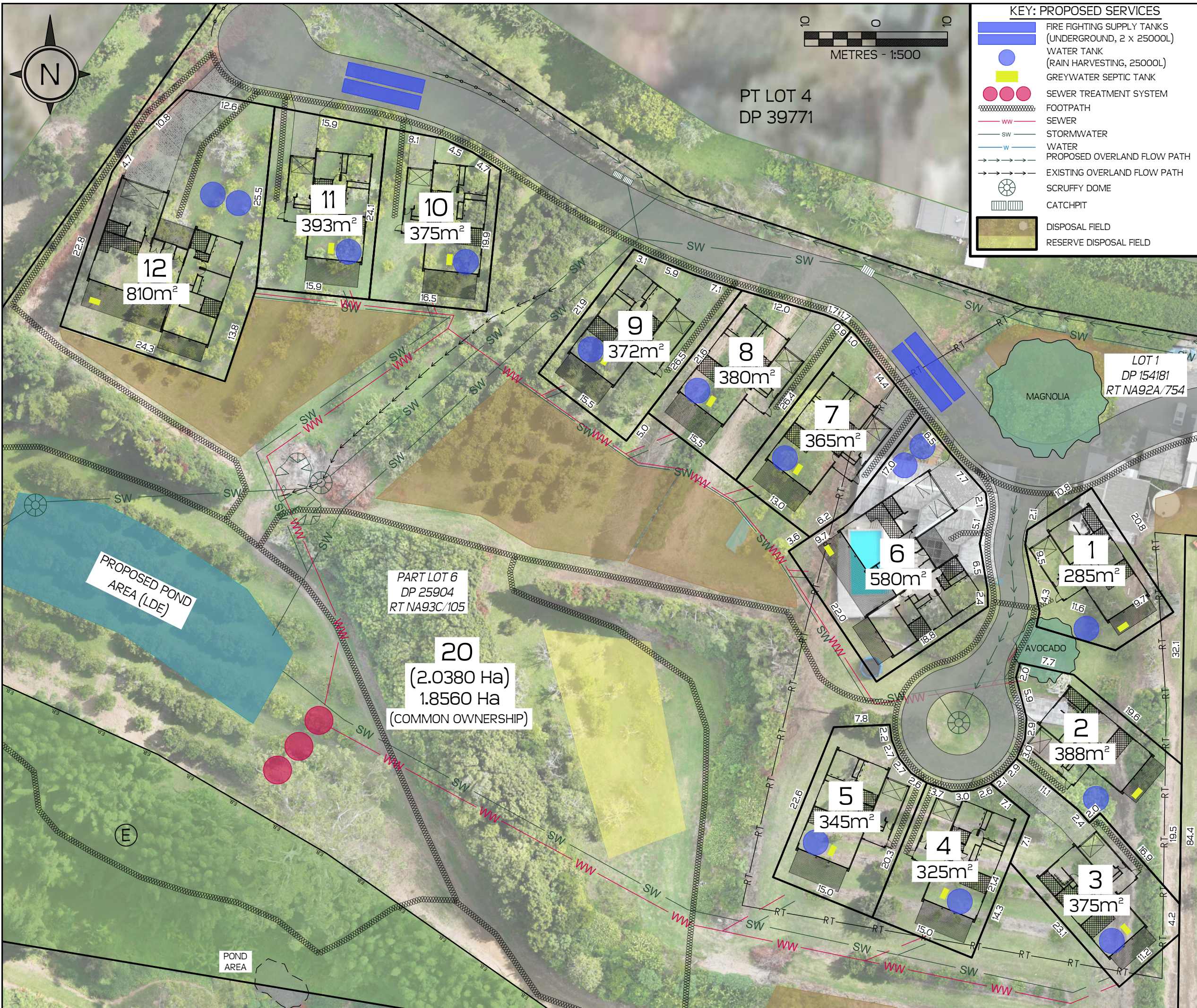
QUIRINO LIMITED
482 AND 484 A&B KERIKERI ROAD,
KERIKERI

TITLE

**PROPOSED SUBDIVISION OF
LOT 1 DP 154181
& PART LOT 6 DP 25904**

DATE	MAY 2024	SCALE	1:1500 @A3
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DRAWING REF.	SHEET	REV
S17837	01 OF 03	D



KEY: PROPOSED SERVICES

- FIRE FIGHTING SUPPLY TANKS (UNDERGROUND, 2 x 25000L)
- WATER TANK (RAIN HARVESTING, 25000L)
- GREYWATER SEPTIC TANK
- SEWER TREATMENT SYSTEM
- FOOTPATH
- SEWER
- STORMWATER
- WATER
- PROPOSED OVERLAND FLOW PATH
- EXISTING OVERLAND FLOW PATH
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- CATCHPIT
- DISPOSAL FIELD
- RESERVE DISPOSAL FIELD

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PROPOSED AMALGAMATION CONDITION
PURSUANT TO SECTION 220 (1)(b)(iv) OF THE RMA 1991 THAT LOT 20 HEREON (COMMON PROPERTY) BE HELD AS TO THIRTEEN UNDIVIDED ONE-THIRTEENTH SHARES BY THE OWNERS OF LOTS 1 - 12 & 21 HEREON AS TENANTS IN COMMON IN THE SAID SHARES AND THAT INDIVIDUAL RECORDS OF TITLE BE ISSUES IN ACCORDANCE THEREWITH.

PROPOSED EASEMENT SCHEDULE			
PURPOSE	SHOWN	BURDENED (SERV.TENE.)	BENEFITTED (DOM.TENE.)
RIGHT OF WAY & SERVICES	A	LOT 20 HEREON	LOTS 21 & 22 HEREON
	B	LOT 20 HEREON	LOT 21 HEREON
	D	LOT 22 HEREON	LOT 21 HEREON
RIGHT OF WAY - PEDESTRIAN ONLY	C	LOT 21 HEREON	LOTS 1 - 12 HEREON
	D	LOT 22 HEREON	LOTS 1 - 12 HEREON

SEE SHEET 03 FOR EXISTING EASEMENTS & COVENANTS TO BE CANCELLED

PROPOSED CONSERVATION COVENANTS
PURSUANT TO S77 RESERVES ACT 1977

SHOWN	UNDERLYING PARCEL	AREA
E	LOT 20 HEREON	0.3405 HA

TOTAL AREA: 4.3403 HA		
COMPRISED IN: RT NA93C/105 & NA92A/754		
THIS SITE IS ZONED 'RURAL PRODUCTION' AND THE BUILDING SETBACKS ARE THUS: 10m FROM ALL BOUNDARIES AND 12m FROM KERIKERI ROAD.		
D	02.05.24	ADD COVENANT & AMEND. AMALG. - RS / SB
C	01.05.24	REFLECT NEW LDE CIVIL DESIGN - RS / SB
A	22.02.24	ISSUED FOR CONSIDERATION - RS / SB
REV	DATE	DESCRIPTION
REF. DATA:		

Ph: 09 438 3563 PO Box 191, Whangarei 0140

7 Selwyn Ave, Whangarei www.reyburnandbryant.co.nz

CLIENT

QUIRINO LIMITED

482 AND 484 A&B KERIKERI ROAD, KERIKERI

TITLE

PROPOSED SUBDIVISION OF LOT 1 DP 154181 & PART LOT 6 DP 25904

DATE	MAY 2024	SCALE	1:500 @A3
DRAWING REF.	S17837	SHEET	02 OF 03
		REV	D

PROPOSED CANCELLATION OF CONDITIONAL EASEMENTS
PURSUANT TO SECTION 243(e) OF THE RMA 1991, THE FAR NORTH DISTRICT COUNCIL
IS TO CANCEL THE CONDITIONS AS TO THE CREATION OF:

THE RIGHT OF WAY MARKED A ON DP 154181, OVER LOT 1 DP 154181 (RT NA92A/754)
& APPURTENANT TO PART LOT 6 DP 25904 (RT NA93C/105)
& CREATED BY C460756.3;
REASON: THIS LOT WILL NO LONGER EXIST.
NEW ROW TO BE PROPOSED TO BETTER SUIT THE DEVELOPMENT.

&

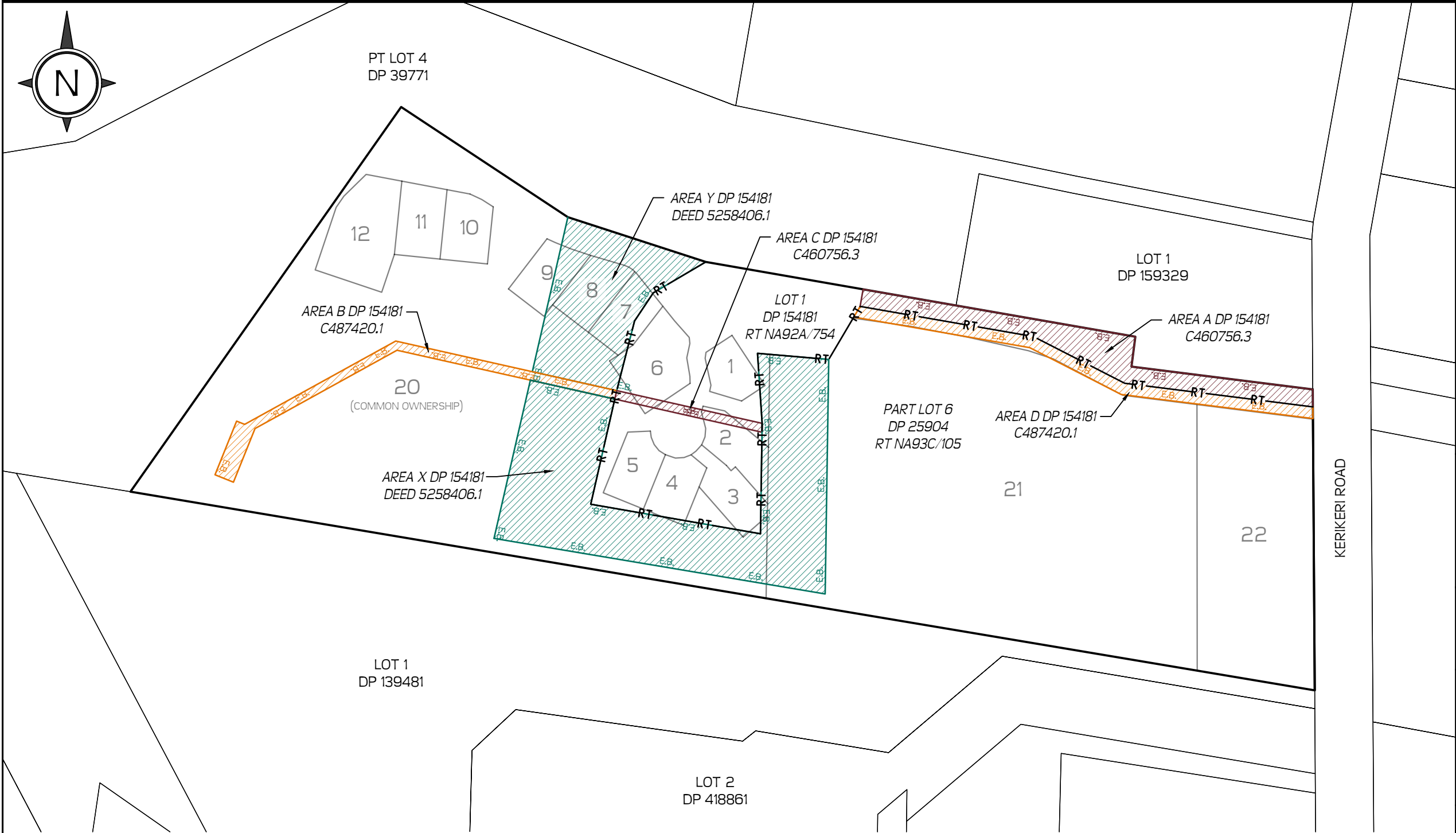
THE RIGHT TO CONVEY WATER MARKED C ON DP 154181, OVER
LOT 1 DP 154181 (RT NA92A/754) & APPURTENANT TO
PART LOT 6 DP 25904 (RT NA93C/105)
& CREATED BY C460756.3;

&

THE RIGHT TO CONVEY WATER MARKED B ON DP 154181 AND THE RIGHT TO
TRANSMIT ELECTRICITY MARKED B & D ON DP 154181, OVER PART LOT 6 DP 25904
(RT NA93C/105) & APPURTENANT TO LOT 1 DP 154181 (RT NA92A/754)
& CREATED BY C460756.3;
REASON: THESE SERVICE EASEMENTS ARE EITHER NO LONGER REQUIRED OR WILL BE
PROPOSED TO BETTER SUIT THE DEVELOPMENT.

PROPOSED CANCELLATION OF LAND COVENANTS
THE RESTRICTIVE 'NO BUILD' COVENANT MARKED X & Y ON DP 154181,
OVER PART LOT 6 DP 25904 (RT NA93C/105) & APPURTENANT TO
LOT 1 DP 154181 (RT NA92A/754) & CREATED BY DEED 5258406.1
IS TO BE CANCELLED

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TOTAL AREA: 4.3403 HA
COMPRISED IN: RT NA93C/105 & NA92A/754
THIS SITE IS ZONED 'RURAL PRODUCTION' AND THE BUILDING SETBACKS
ARE THUS: 10m FROM ALL BOUNDARIES AND 12m FROM KERIKERI ROAD.

D	02.05.24	ADD COVENANT & AMEND. AMALG. - RS / SB
C	01.05.24	REFLECT NEW LDE CIVIL DESIGN - RS / SB
A	22.02.24	ISSUED FOR CONSIDERATION - RS / SB
REV	DATE	DESCRIPTION

REF. DATA:



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

CLIENT

QUIRINO LIMITED
482 AND 484 A&B KERIKERI ROAD,
KERIKERI

TITLE EXIST. EASEMENTS TO BE CANCELLED PROPOSED SUBDIVISION OF LOT 1 DP 154181 & PART LOT 6 DP 25904		
DATE	MAY 2024	SCALE 1:1500 @A3
DRAWING REF.	S17837	SHEET 03 OF 03
		REV D

APPENDIX B: ENGINEERING DRAWINGS

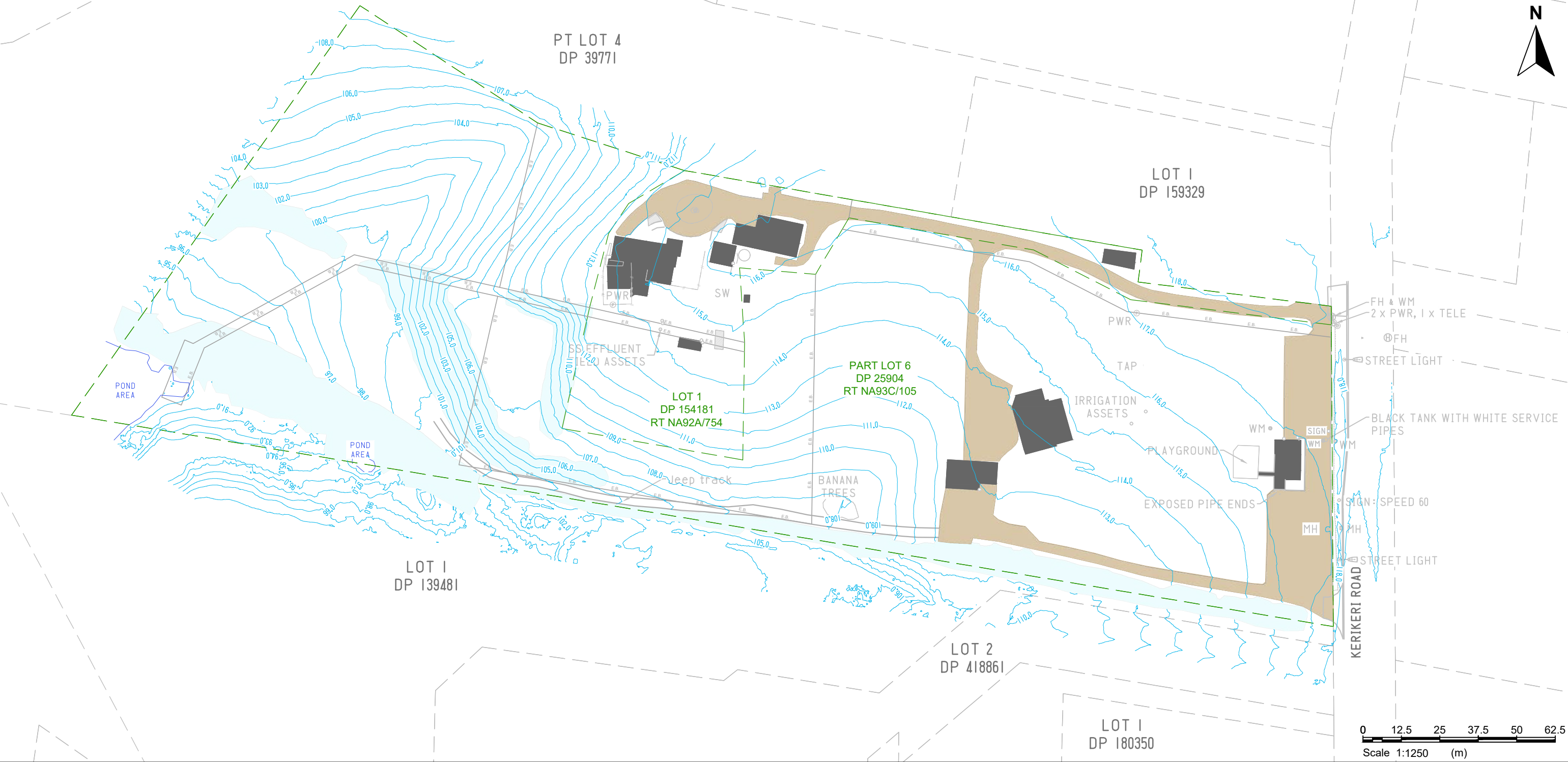


Project Number: 25575
Project Office: Whangarei
Project Manager: Riaan Louwrens

Drawing Status: Resource Consent

Orangefields, 482/484 Kerikeri Road, Kerikeri

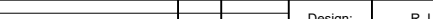
DRAWING INDEX				
SHEET	DESCRIPTION	ISSUE DATE	STATUS	REVISION
C01	Existing Layout	01.05.2024	Resource Consent	A
C02	Design Site Layout	01.05.2024	Resource Consent	A
C03	Earthworks Cut/Fill Plan	01.05.2024	Resource Consent	A
C04	Erosion & Sediment Control Plan	01.05.2024	Resource Consent	A
C05	Proposed Site Grades & Floor Levels	01.05.2024	Resource Consent	A
C06	Stormwater Plan	01.05.2024	Resource Consent	A
C07	Wastewater Plan	01.05.2024	Resource Consent	A
C08	Water Supply & Fire Fighting Layout	01.05.2024	Resource Consent	A
C09	Main Alignment Long Section	01.05.2024	Resource Consent	A
D01	Pond Details	01.05.2024	Resource Consent	A
D02	Erosion & Sediment Control Device Details	01.05.2024	Resource Consent	A

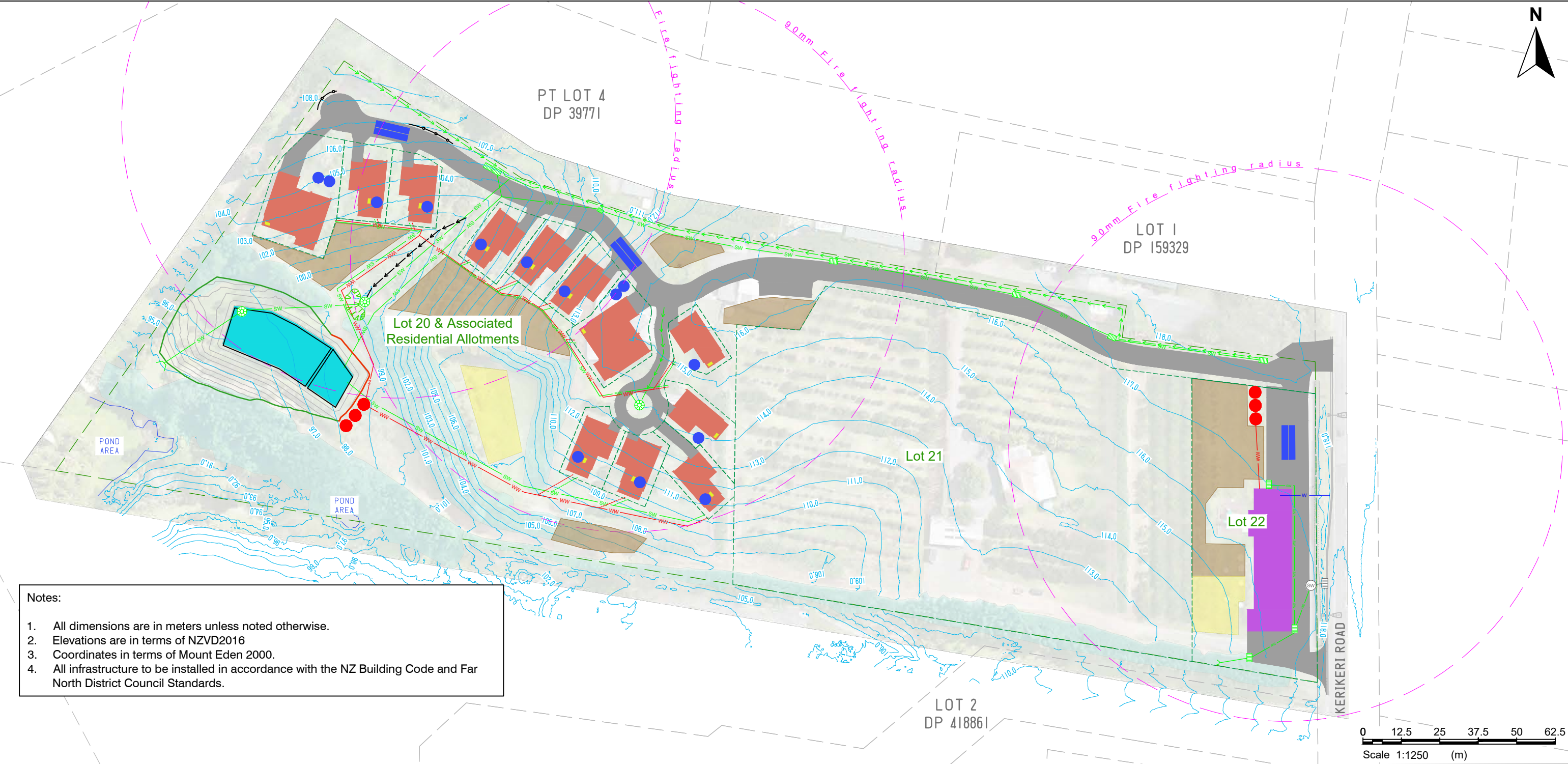


- Legend:
- Property Boundary Subject Site
 - Neighbouring Properties
 - Existing Metalled/Roads
 - Existing Buildings/Structures
 - Existing Easements
 - Existing Contours
 - Inaccurate Survey Areas (Bush)

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Original size = A3

Client Quirino Ltd	Project Orangefields 482 & 484 A&B Kerikeri Road, Kerikeri Proposed Subdivision	Drawing Title Existing Site Layout						Design:	R. Louwrens	Project status: Resource Consent				
								Drawn:	R. Louwrens	Project: 25575				
								Approved:	A. Holland	Drawing No: C01				
								Scale A3:	1:1250	Issue/Rev: A				
								A	Resource Consent	Issue/Revision	AH	01.05.2024	Aprvd	Date
								No.						



- Notes:
1. All dimensions are in meters unless noted otherwise.
 2. Elevations are in terms of NZVD2016
 3. Coordinates in terms of Mount Eden 2000.
 4. All infrastructure to be installed in accordance with the NZ Building Code and Far North District Council Standards.

Legend:			
	Proposed Boundaries		Proposed Stormwater
	Neighbouring Properties		Proposed Catchpit
	Proposed Dwellings		Proposed Stormwater Manhole
	Proposed Upgraded Foodstore		Proposed Scruffy Dome
	Proposed Roads / Parking		Proposed Headwall
	Existing Contours		Proposed Overland Flow Path (Diversion/New)
	Inaccurate Survey Areas (Bush)		Existing Overland Flow Path
	Proposed Wastewater		Proposed Disposal Field
	Proposed Reserve Disposal		Proposed Water Tank (Rain Harvesting, 25000L)
	Proposed Treatment System		Proposed Fire Fighting Water Supply (Underground, 2 x 25000L)
	Proposed Greywater Septic Tank		Proposed Retaining Wall
	Proposed Water Connection		

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Original size = A3

Client Quirino Ltd	Project Orangefields 482 & 484 A&B Kerikeri Road, Kerikeri Proposed Subdivision	Drawing Title Proposed Site Layout				Design:	R. Louwrens	Project status: Resource Consent	
						Drawn:	R. Louwrens	Project: 25575	
						Approved:	A. Holland	Drawing No: C02	
						Scale A3:	1:1250	Issue/Rev: A	
						</			



Legend:

- Proposed Boundaries
- Neighbouring Properties
- Existing Contours
- Inaccurate Survey Areas (Bush)
- Proposed Dwellings
- Proposed Upgraded Foodstore

Surface Analysis: Depth Ranges				
NUMBER	MINIMUM DEPTH	MAXIMUM DEPTH	AREA (m2)	COLOR
1	-2.55	-0.64	1124	
2	-0.64	-0.42	919	
3	-0.42	-0.31	950	
4	-0.31	-0.19	926	
5	-0.19	-0.02	841	
6	-0.02	0.13	620	
7	0.13	0.70	1183	
8	0.70	2.58	1061	

Notes:

- All dimensions are in meters unless noted otherwise.
- Elevations are in terms of NZVD2016
- Coordinates in terms of Mount Eden 2000.
- Levels shown are a combination of site survey and Council GIS.
- Sediment controls to be installed generally in accordance with Erosion & Sediment Control Guide for Land Disturbing Activities in the Auckland Region.
- Sediment control measures to be established prior to commencement of earthworks
- No earthworks to be carried out during periods of wet weather.
- Exposed earthworks to be stabilised prior to periods of wet weather.
- Depths shown are the difference between FGL and EGL, except for over footprint of the road surfaces, where the difference are shown between EGL and formation level (bottom of box cut).

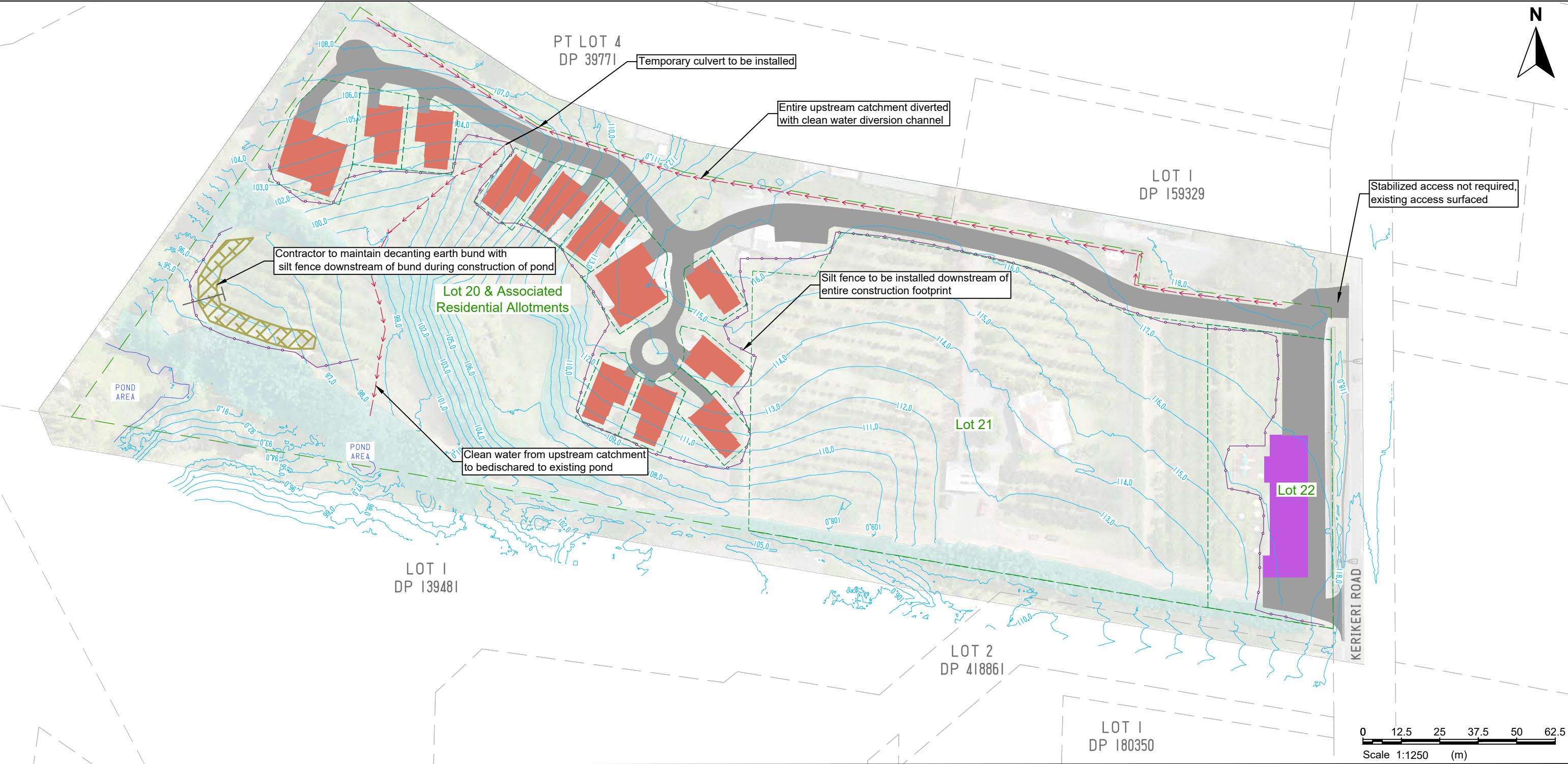
Earthwork Details:

Total Earthworks Area:	7,700m ²
Cut:	2,400m ³
Fill:	1,900m ³
Spoil:	500m ³
Imported Gravel Layerworks:	1,200m ³

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Original size = A3

Client Quirino Ltd	Project Orangefields 482 & 484 A&B Kerikeri Road, Kerikeri Proposed Subdivision	Drawing Title Earthworks Cut / Fill Plan				Design:	R. Louwrens	Project status: Resource Consent	
						Drawn:	R. Louwrens	Project: 25575	
						Approved:	A. Holland	Drawing No: C03	
						Scale A3:	1:1250	Issue/Rev: A	
A		Resource Consent		AH	01.05.2024				
No.		Issue/Revision		Apvrd	Date				



Legend:

- | | | | |
|--|--------------------------------|--|--|
| | Proposed Boundaries | | Proposed Clean Water Diversion Channel |
| | Neighbouring Properties | | Proposed Silt Fence |
| | Proposed Dwellings | | |
| | Proposed Upgraded Foodstore | | |
| | Proposed Roads / Parking | | |
| | Existing Contours | | |
| | Inaccurate Survey Areas (Bush) | | |

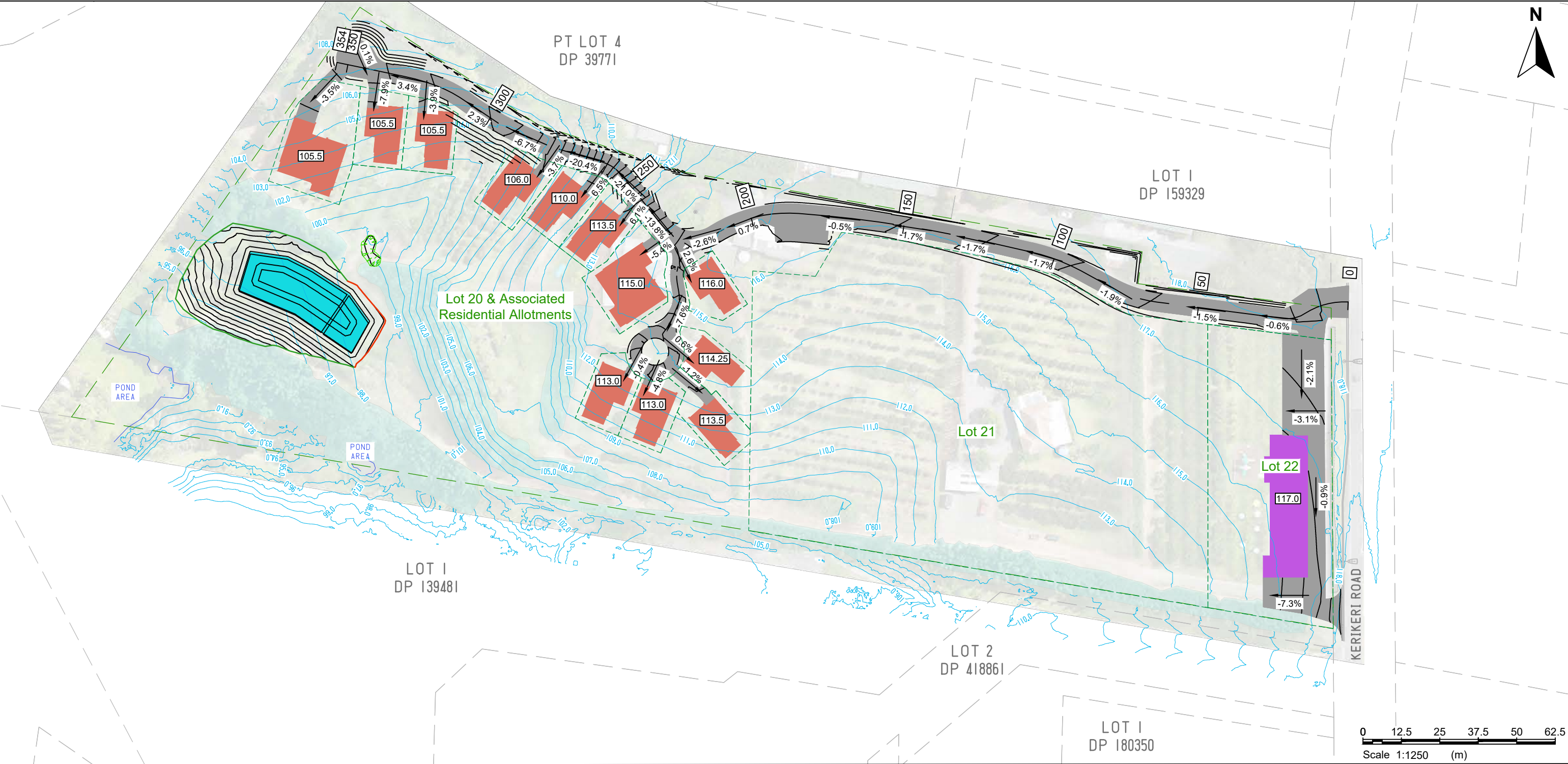
Notes:

1. Sediment controls to be installed generally in accordance with GD05 Erosion & Sediment Control Guide for Land Disturbing Activities in the Auckland Region.
2. Sediment control measures to be established prior to commencement of earthworks
3. No earthworks to be carried out during periods of wet weather.
4. Exposed earthworks to be stabilised prior to periods of wet weather.

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Original size = A3

Client Quirino Ltd	Project Orangefields 482 & 484 A&B Kerikeri Road, Kerikeri Proposed Subdivision	Drawing Title Erosion & Sediment Control Plan								Design:	R. Louwrens	Project status: Resource Consent	
										Drawn:	R. Louwrens		Project: 25575
										Approved:	A. Holland	Drawing No: C04	
										Scale A3:	1:1250		
								A	Resource Consent	AH	01.05.2024		
								No.	Issue/Revision	Aprvd	Date		

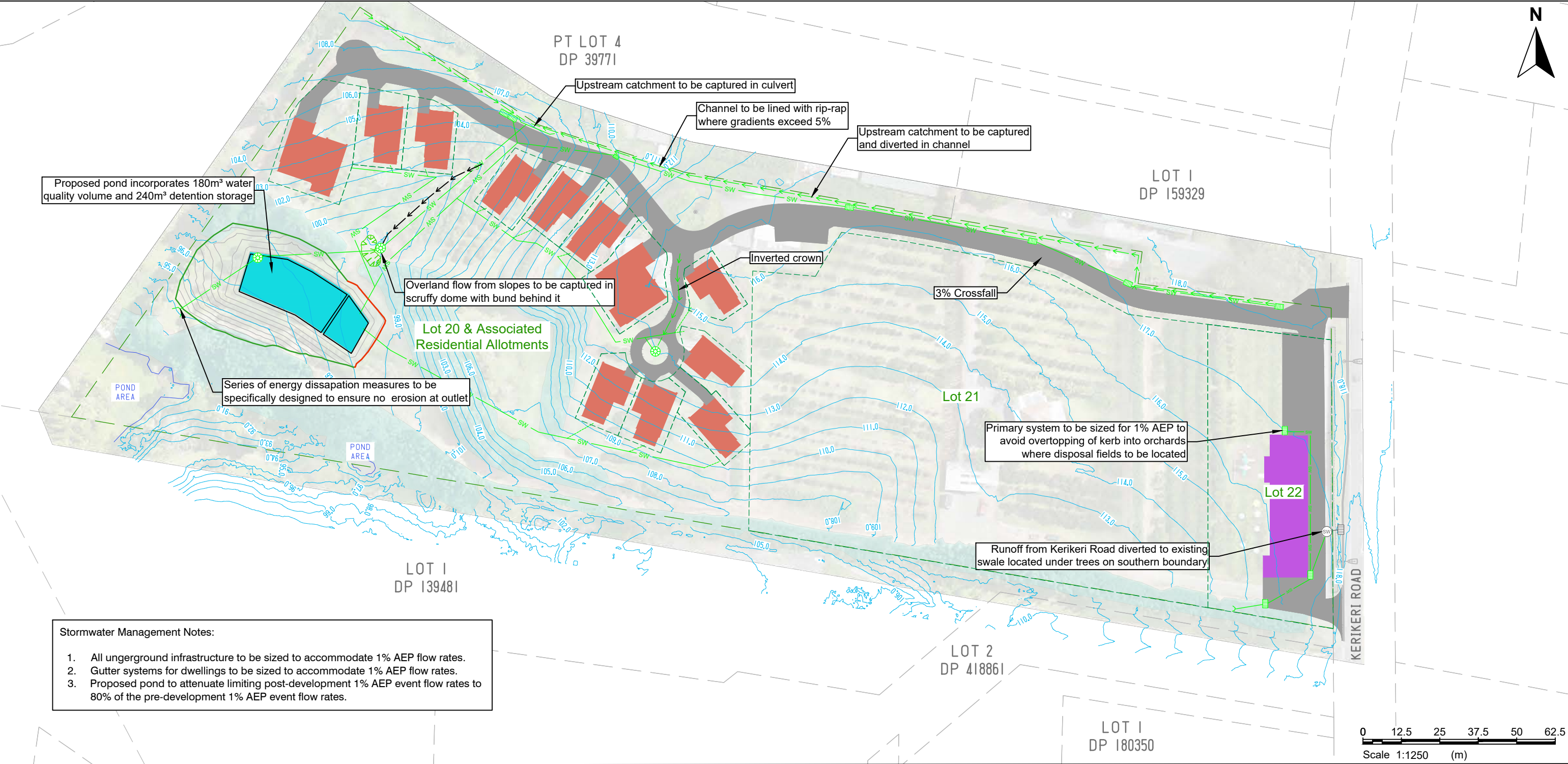


- Legend:
- Proposed Boundaries
 - Neighbouring Properties
 - Existing Contours
 - Proposed Contours (0.5m)
 - Inaccurate Survey Areas (Bush)
 - Proposed Dwellings
 - Proposed Upgraded Foodstore

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Original size = A3

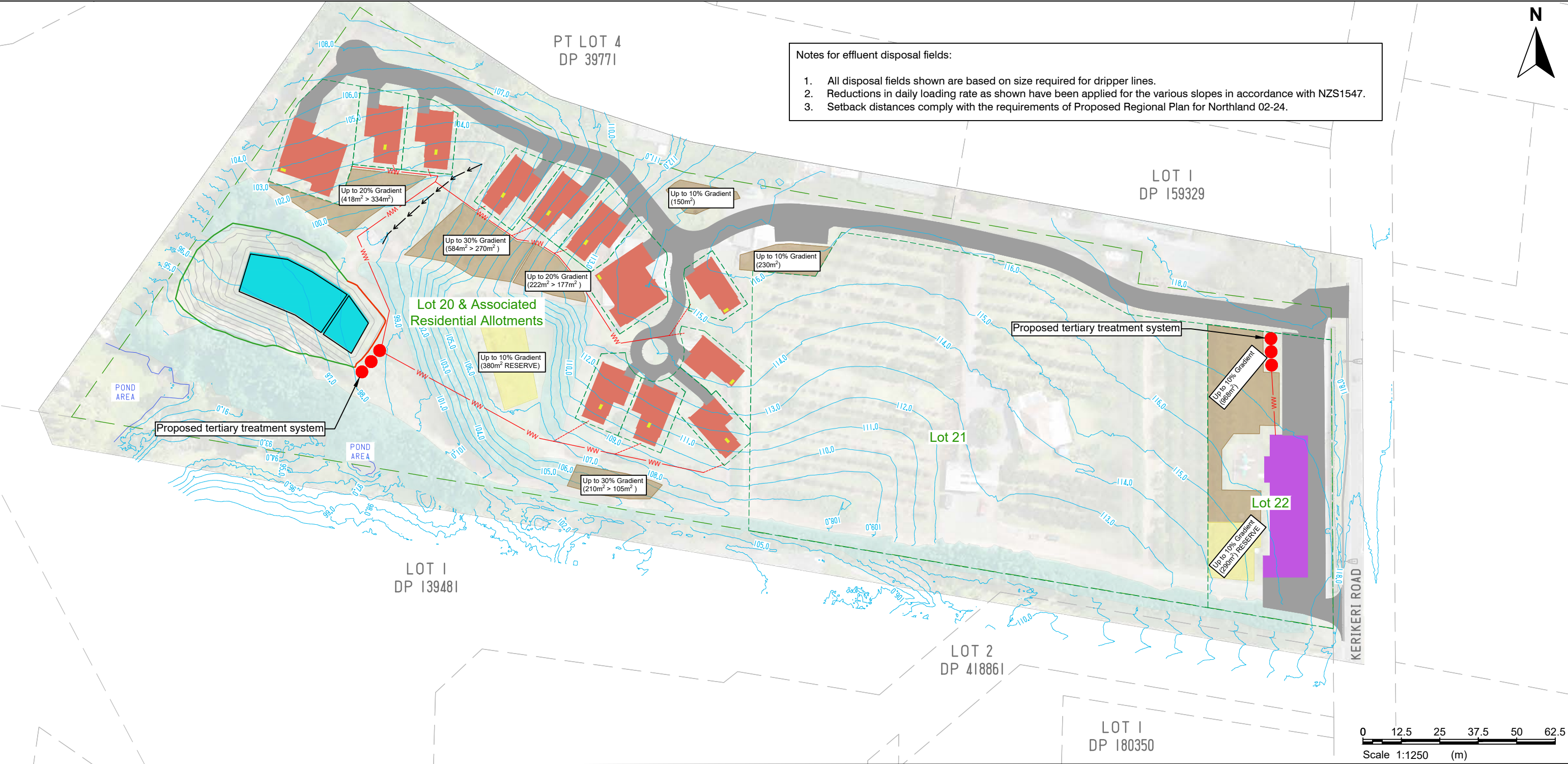
Client Quirino Ltd	Project Orangefields 482 & 484 A&B Kerikeri Road, Kerikeri Proposed Subdivision	Drawing Title Proposed Site Grades & Floor Levels				Design:	R. Louwrens	Project status: Resource Consent	
						Drawn:	R. Louwrens	Project: 25575	
						Approved:	A. Holland	Drawing No: C05	
						Scale A3:	1:1250	Issue/Rev: A	
		A No.		Resource Consent Issue/Revision		AH Apvd		01.05.2024 Date	



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Original size = A3

Client Quirino Ltd	Project Orangefields 482 & 484 A&B Kerikeri Road, Kerikeri Proposed Subdivision	Drawing Title Stormwater Plan				Design:	R. Louwrens	Project status: Resource Consent	
						Drawn:	R. Louwrens	Project: 25575	
						Approved:	A. Holland	Drawing No: C06	
						Scale A3:	1:1250	Issue/Rev: A	
		A No.		Resource Consent Issue/Revision		AH Apv'd		01.05.2024 Date	



Notes for effluent disposal fields:

1. All disposal fields shown are based on size required for dripper lines.
2. Reductions in daily loading rate as shown have been applied for the various slopes in accordance with NZS1547.
3. Setback distances comply with the requirements of Proposed Regional Plan for Northland 02-24.

- Legend:
- | | | | |
|---|--------------------------------|--|---|
| --- | Proposed Boundaries | --- | Proposed Wastewater |
| --- | Neighbouring Properties | | Proposed Disposal Field (Dripper lines) |
| | Proposed Dwellings | | Proposed Reserve Disposal |
| | Proposed Upgraded Foodstore | ●●● | Proposed Treatment System |
| | Proposed Roads / Parking | | Proposed Greywater Septic Tank |
| --- | Existing Contours | --- | Proposed Overland Flow Path (Diversion/New) |
| | Inaccurate Survey Areas (Bush) | --- | Existing Overland Flow Path |

Notes:

1. All infrastructure to be installed in accordance with NZ Building Code and Far North District Council Standards.
2. Lot WW laterals to be Ø100mm uPVC.
3. New WW mains to be Ø150mm uPVC
4. Lot laterals to be saddled to WW main via PVC Y-junction with rubber ring joint slip couplers.
5. WW manholes to be standard Ø1050mm.

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Original size = A3

Client Quirino Ltd	Project Orangefields 482 & 484 A&B Kerikeri Road, Kerikeri Proposed Subdivision	Drawing Title Wastewater Plan						Project status:			
								Resource Consent			
								Project:			
								25575			
								Drawing No:			
								C07			
								Issue/Rev:			
				A							



- Legend:
- Proposed Boundaries
 - Neighbouring Properties
 - Proposed Dwellings
 - Proposed Upgraded Foodstore
 - Proposed Roads / Parking
 - Existing Contours
 - Inaccurate Survey Areas (Bush)
 - Proposed Water Connection
 - Proposed Water Tank (Rain Harvesting, 25000L)
 - Proposed Fire Fighting Water Supply (Underground, 2 x 25000L)

- Notes:
- Water supply classification FW2 adopted for proposed dwellings on Lot 22, with a minimum 45,000L required in terms of SNZ PAS 4509:2008.
 - Water supply classification FW2 adopted for proposed upgraded foodstore on Lot 20, with a minimum 45,000L and sprinkler system required in terms of SNZ PAS 4509:2008.

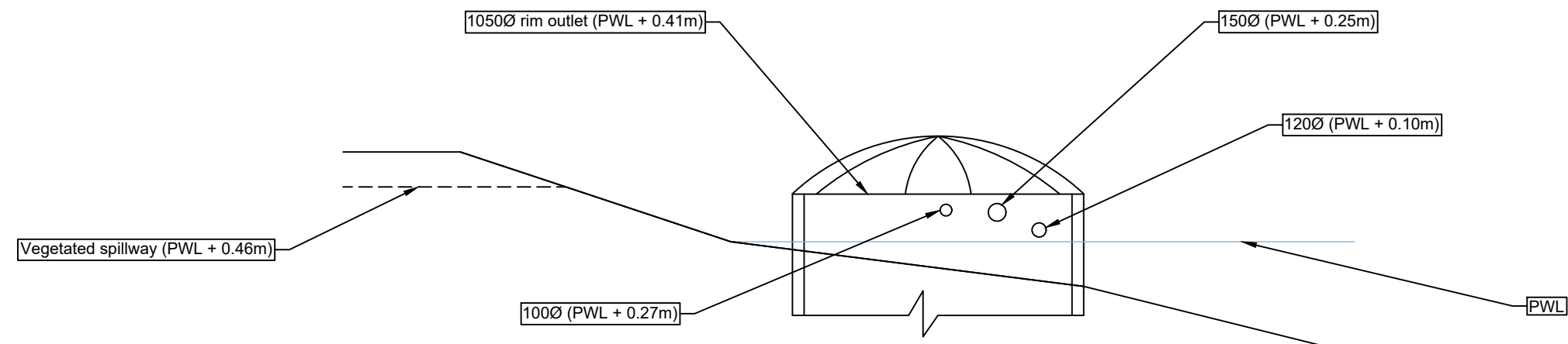
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Original size = A3

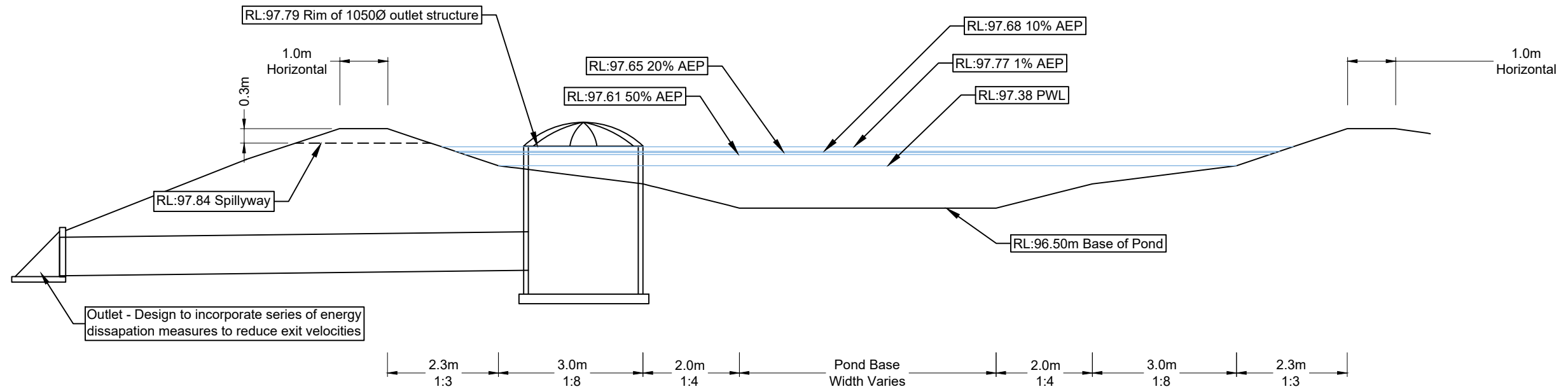
Client Quirino Ltd	Project Orangefields 482 & 484 A&B Kerikeri Road, Kerikeri Proposed Subdivision	Drawing Title Water Supply & Fire Fighting Layout						Design:		R. Louwrens	Project status: Resource Consent	
								Drawn:		R. Louwrens	Project: 25575	
								Approved:		A. Holland	Drawing No: C08	
								Scale A3:		1:1250	Issue/Rev: A	
				A	Resource Consent		AH	01.05.2024				
				No.	Issue/Revision		Aprvd	Date				

[illegible]

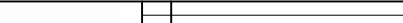
MAIN ACCESS LONG SECTION

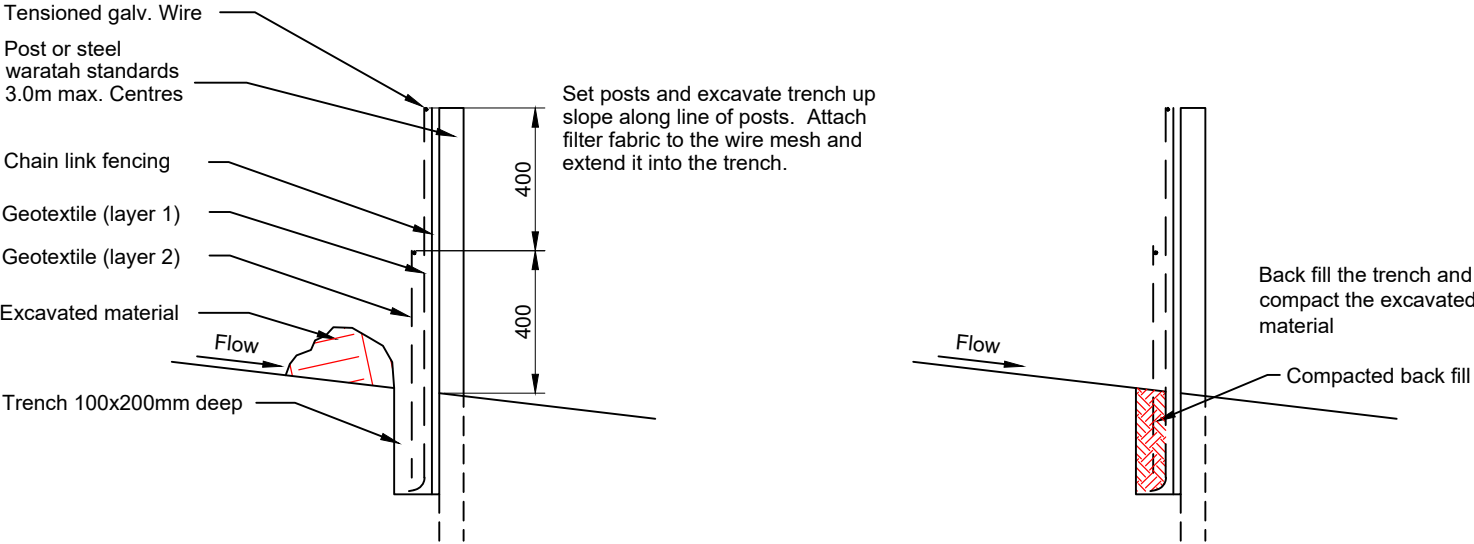


Pond Outlet Orifices Detail
Scale 1:50

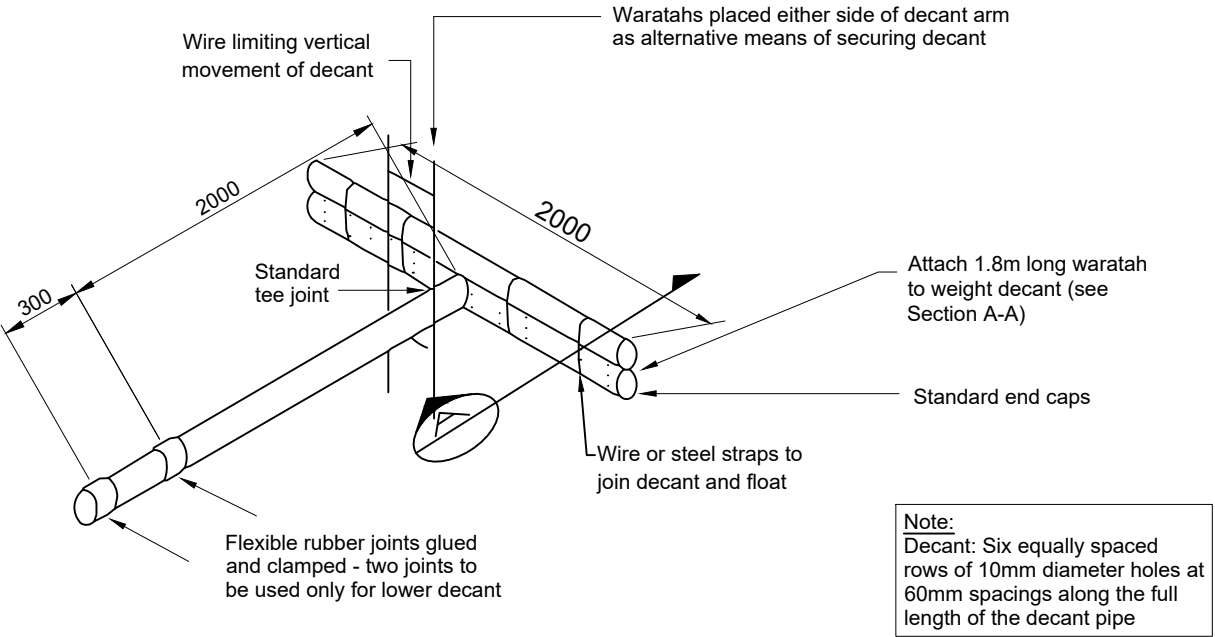


Pond Cross Section
Scale 1:100

Client Quirino Ltd	Project Orangefields 482 & 484 A&B Kerikeri Road, Kerikeri Proposed Subdivision	Drawing Title Detention Pond Detail																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							</
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Super Silt Fence Construction
Scale: NTS



Decant System (up to 1.0ha)
Scale: NTS

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Original size = A3

Client Quirino Ltd	Project Orangefields 482 & 484 A&B Kerikeri Road, Kerikeri Proposed Subdivision	Drawing Title Erosion & Sediment Control Device Details																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																</
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APPENDIX C: SOAKAGE TEST AND HOREHOLE LOGS

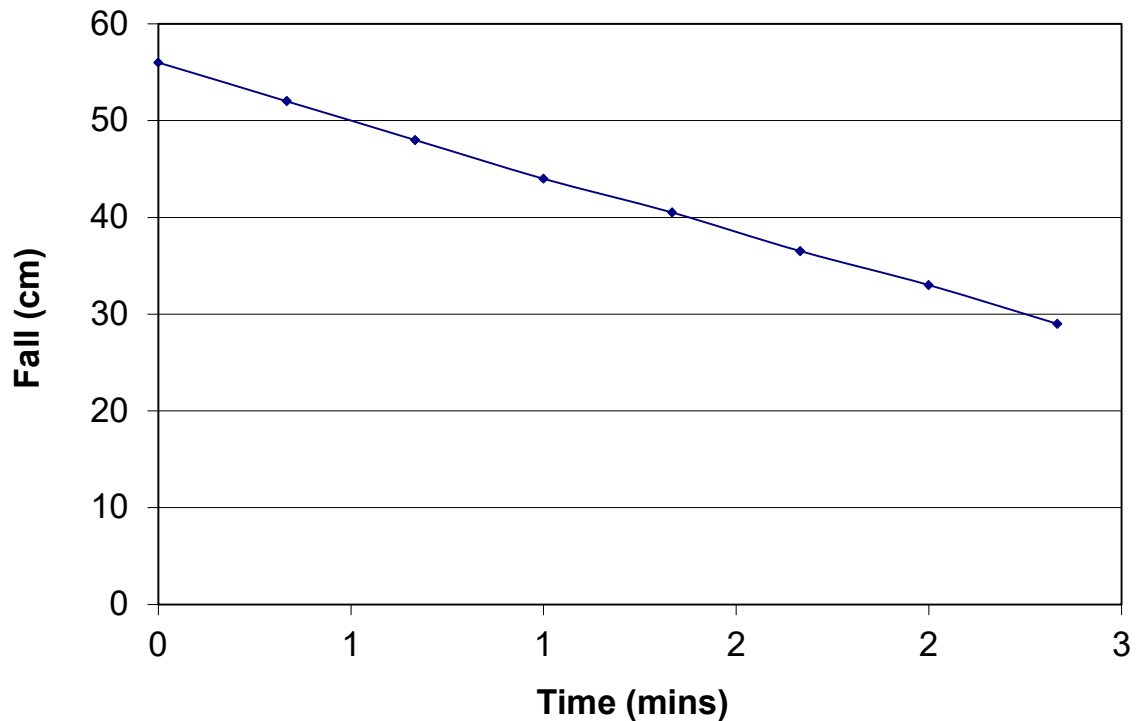
CONSTANT HEAD TEST

BOREHOLE No: **Test Bore 01**

TALLSMA HALLAM METHOD

Client: Audrey Campbell-Frear			Project: Soakage Testing for On-site Wastewater Management			LDE Project No: 25575		
Project Location: 482/484 Kerikeri Road, Kerikeri			Borehole Location: See Bore Coordinates			Hole started: 17/01/2024		
Co-ordinates: 1684904.8 Lat NZTM2000 6099443.4 Lon			R.L. m			Hole completed:		
			Drill method: Hand Auger 10cmØ			Drilled by: GG		
						Logged by: RL		

Depth (m)	Graphic	Moisture	Strength	Soil Description	Geology	Data			Results	
0.00				Topsoil - Silt		Time (min)	Water Level in Reservoir (cm)	Differential (cm/min)	Rate of loss of water in reservoir at consistent differential Q= 144.5 (cm³/min)	
0.05						0	56	-		
0.10						0.33	52	12.0		
0.15						0.67	48	12.0		
0.20						1.00	44	12.0		
0.25		M		Clayey SILT, LP		1.33	40.5	10.5	K _{sat} = 1.13 m/day	
0.30						1.67	36.5	12.0		
0.35						2.00	33	10.5		
0.40						2.33	29	12.0		
0.45										
0.50		M		Silty CLAY, HP		Test dimensions				Total Time (min) 2.33
0.55						Radius test hole (cm)	r = 5			
0.60						Depth test hole (cm)	50			
0.65						Depth water in hole (cm)	H = 25			
0.70										
0.75										
0.80										
0.85										
0.90										
0.95										
1.00										



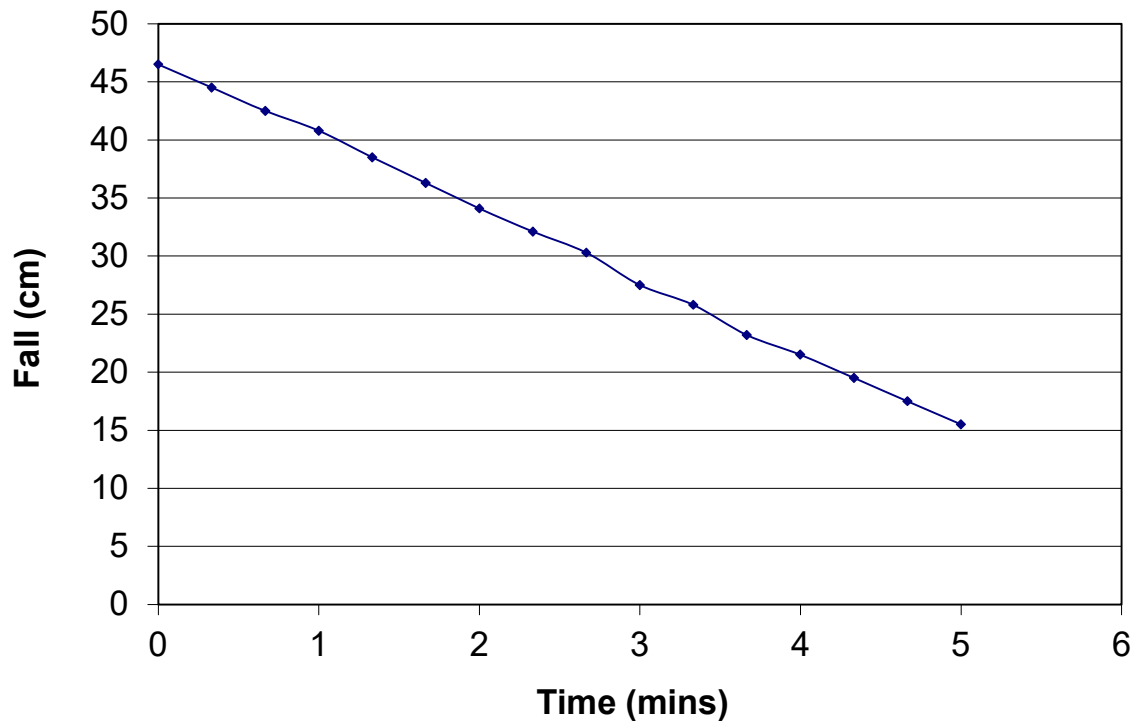
CONSTANT HEAD TEST

BOREHOLE No: **Test Bore 02**

TALLSMA HALLAM METHOD

Client: Audrey Campbell-Frear			Project: Soakage Testing for On-site Wastewater Management			LDE Project No: 25575		
Project Location: 482/484 Kerikeri Road, Kerikeri			Borehole Location: See Bore Coordinates			Hole started: 17/01/2024		
Co-ordinates: 1684919.8 Lat NZTM2000 6099413.8 Lon			R.L. m			Hole completed:		
			Drill method: Hand Auger 10cmØ			Drilled by: GG		
						Logged by: RL		

Depth (m)	Graphic	Moisture	Strength	Soil Description	Geology	Data			Results
0.00				Topsoil - Silt		Time (min)	Water Level in Reservoir (cm)	Differential (cm/min)	Rate of loss of water in reservoir at consistent differential
0.05						0	46.5	-	Q= 78.1 (cm³/min)
0.10						0.33	44.5	6.0	
0.15						0.67	42.5	6.0	
0.20						1.00	40.8	5.1	
0.25						1.33	38.5	6.9	
0.30		M		Clayey SILT, LP		1.67	36.3	6.6	K _{sat} = 0.61 m/day
0.35						2.00	34.1	6.6	
0.40						2.33	32.1	6.0	
0.45						2.67	30.3	5.4	
0.50						3.00	27.5	8.4	
0.55						3.33	25.8	5.1	Total Time (min) 5.00
0.60						3.67	23.2	7.8	
0.65						4.00	21.5	5.1	
0.70						4.33	19.5	6.0	
0.75						4.67	17.5	6.0	
0.80						5.00	15.5	6.0	
0.85									
0.90									
0.95									
1.00									
						Test dimensions			
						Radius test hole (cm)	r =	5	
						Depth test hole (cm)		50	
						Depth water in hole (cm)	H =	25	



DE LAND DEVELOPMENT & ENGINEERING Hand Auger Borehole Log Method: 50mm Hand Auger					Test ID: HA02 Project ID: 25575 Sheet: 1 of 1								
Client: Quirino Limited Project: Geotechnical Investigation Location: 484 Kerikeri Road, Kerikeri Test Site: 482/484 Kerikeri Road, Kerikeri			Coordinates: 6099445mN, 1684988mE System: NZTM Elevation: Ground Located By: Phone GPS		Test Date: 09/01/2024 Logged By: CF Prepared By: CF Checked By: CP								
Depth (m)	Geology	Graphic Log	Material Description	Water	In-situ Testing				Values	Depth (m)			
					Dynamic cone penetrometer (blows / 50mm)								
					Vane undrained shear strength, s_u (kPa)				Vane ID: 713 peak / residual (sensitivity)				
					2	4	6	8					
					50	100	150	200					
	Topsoil		Organic SILT; dark brown; dry,grass rootlets										
	Kerikeri Volcanics		Clayey SILT; light brown, with orange streaks; stiff, low plasticity	Groundwater not encountered						202+			
											202+		
0.5												202+	
												UTP	
												UTP	
1.0												72 / 32 (2.3)	
												202+	
1.5							1.60m: becomes moist					202+	
							Fine sandy SILT; brown; moist, very stiff, low plasticity					UTP	
												UTP	
2.0												202+	
												UTP	
2.5							2.40m: white specks					202+	
												UTP	
3.0								202+					
Hole Depth: 3.00m			Termination: Target Depth Reached			● Vane peak ◐ Vane residual ◆ Vane UTP ▼ Standing water level ◁ Groundwater inflow ▷ Groundwater outflow UTP = Unable to Penetrate							
Remarks:													
Materials are described in general accordance with NZGS 'Field Description of Soil and Rock' (2005). No correlation is implied between shear vane and DCP values.													

Hole Depth: 3.00m	Termination: Target Depth Reached	● Vane peak ▼ Standing water level
Remarks: Materials are described in general accordance with NZGS 'Field Description of Soil and Rock' (2005). No correlation is implied between shear vane and DCP values.		○ Vane residual ◁ Groundwater inflow
		◆ Vane UTP ▷ Groundwater outflow
		UTP = Unable to Penetrate



Hand Auger Borehole Log

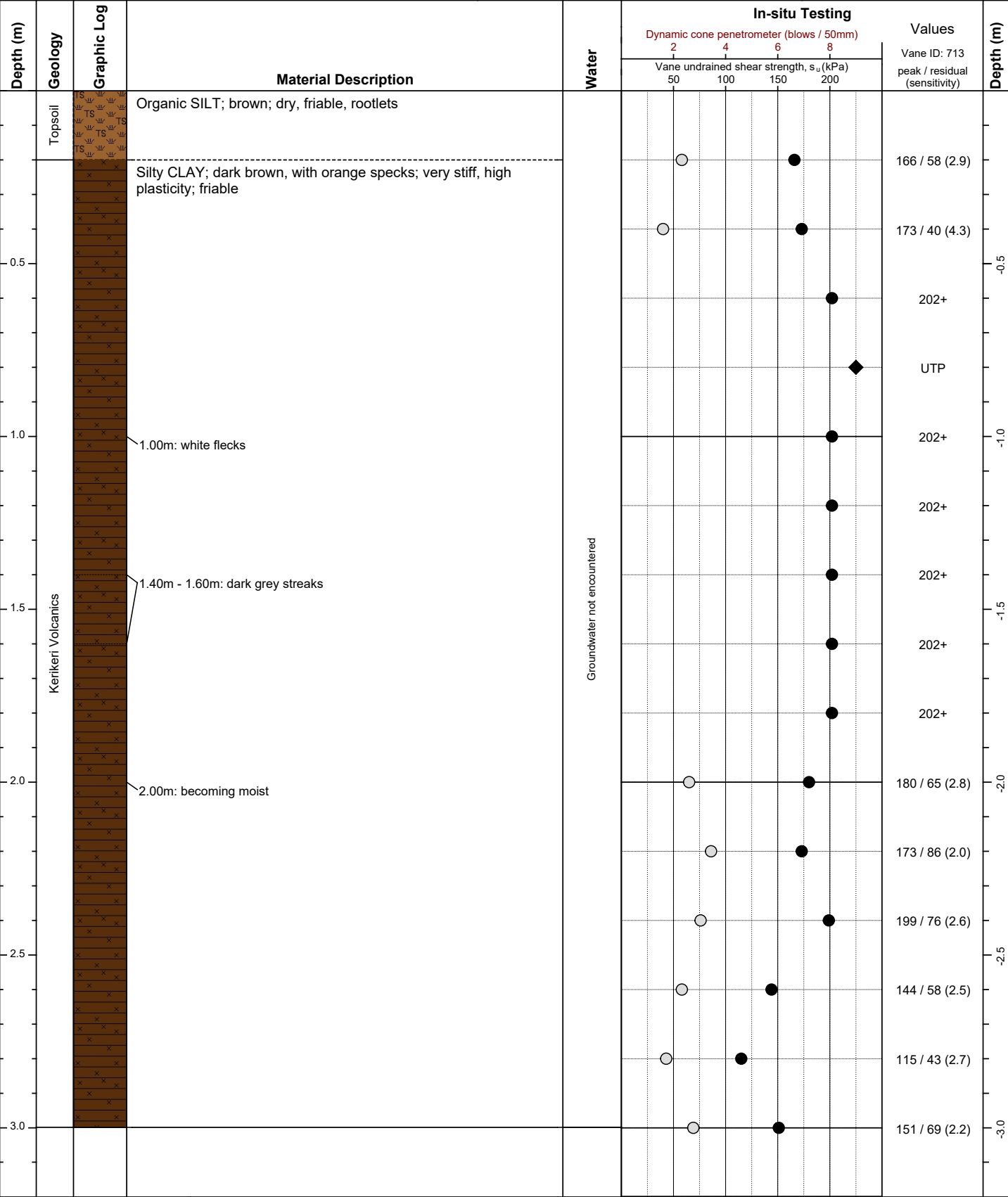
Method: 50mm Hand Auger

Test ID: HA04
Project ID: 25575
Sheet: 1 of 1

Client: Quirino Limited
Project: Geotechnical Investigation
Location: 484 Kerikeri Road, Kerikeri
Test Site: 482/484 Kerikeri Road, Kerikeri

Coordinates: 6099434mN, 1684949mE
System: NZTM
Elevation: Ground
Located By: Phone GPS

Test Date: 14/11/2023
Logged By: CF
Prepared By: CF
Checked By: CP



Hole Depth: 3.00m	Termination: Target Depth Reached	● Vane peak	▼ Standing water level
Remarks: Materials are described in general accordance with NZGS 'Field Description of Soil and Rock' (2005). No correlation is implied between shear vane and DCP values.		○ Vane residual	↖ Groundwater inflow
		◆ Vane UTP	▷ Groundwater outflow
		UTP = Unable to Penetrate	

LAND DEVELOPMENT & ENGINEERING DE				Hand Auger Borehole Log				Test ID: HA06 Project ID: 25575 Sheet: 1 of 1						
				Method: 50mm Hand Auger										
Client: Quirino Limited Project: Geotechnical Investigation Location: 484 Kerikeri Road, Kerikeri Test Site: 482/484 Kerikeri Road, Kerikeri				Coordinates: 6099424mN, 1684979mE System: NZTM Elevation: Ground Located By: Phone GPS				Test Date: 14/11/2023 Logged By: MJL Prepared By: MJL Checked By: CP						
Depth (m)	Geology	Graphic Log	Material Description	Water	In-situ Testing				Values	Depth (m)				
					Dynamic cone penetrometer (blows / 50mm)									
					Vane undrained shear strength, s_u (kPa)				Vane ID: 1945 peak / residual (sensitivity)					
					2	4	6	8						
					50	100	150	200						
	Topsoil		Organic SILT (Topsoil); dark brown, with lenses of yellowish light brown silt; dry, medium dense, non plastic, some grass rootlets											
	Fill		Organic SILT, mixed with clayey SILT; brown, with dark brown streaks; moist, firm, low plasticity							132 / 35 (3.8)				
	Kerikeri Volcanics		Clayey SILT, some gravels; reddish brown; moist, firm, low plasticity. Gravels: fine, angular, highly weathered, white in colour.	Groundwater not encountered							212 / 73 (2.9)			
-0.5													239 / 118 (2.0)	-0.5
													243+	
-1.0													239 / 104 (2.3)	-1.0
													236 / 59 (4.0)	
-1.5													226 / 108 (2.1)	-1.5
													219 / 76 (2.9)	
-2.0													170 / 76 (2.2)	-2.0
													205 / 62 (3.3)	
-2.5													243+	-2.5
									243+					
-3.0									243+	-3.0				
									243+					
									243+					
									243+					
									243+					
Hole Depth: 3.00m Termination: Target Depth Reached Remarks:								● Vane peak ▼ Standing water level ○ Vane residual ◁ Groundwater inflow ◆ Vane UTP ▷ Groundwater outflow UTP = Unable to Penetrate						
Materials are described in general accordance with NZGS 'Field Description of Soil and Rock' (2005). No correlation is implied between shear vane and DCP values.														



Hand Auger Borehole Log

Method: 50mm Hand Auger

Test ID: HA07

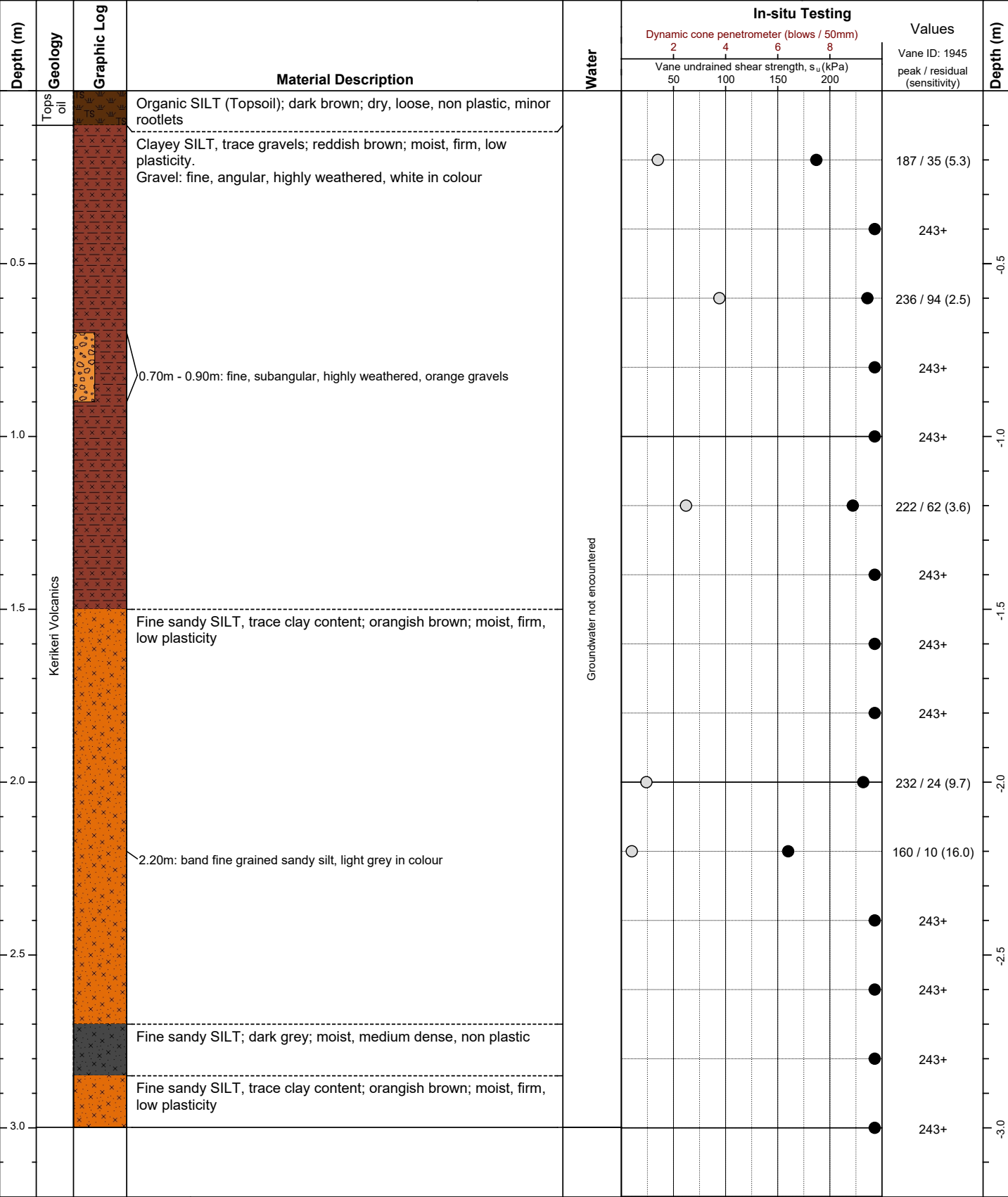
Project ID: 25575

Sheet: 1 of 1

Client: Quirino Limited
Project: Geotechnical Investigation
Location: 484 Kerikeri Road, Kerikeri
Test Site: 482/484 Kerikeri Road, Kerikeri

Coordinates: 6099412mN, 1684995mE
System: NZTM
Elevation: Ground
Located By: Phone GPS

Test Date: 14/11/2023
Logged By: MJL
Prepared By: MJL
Checked By: CP



Hole Depth: 3.00m	Termination: Target Depth Reached	● Vane peak	▼ Standing water level
Remarks: Materials are described in general accordance with NZGS 'Field Description of Soil and Rock' (2005). No correlation is implied between shear vane and DCP values.		○ Vane residual	↖ Groundwater inflow
		◆ Vane UTP	▷ Groundwater outflow
		UTP = Unable to Penetrate	

		Hand Auger Borehole Log			Test ID: HA08 Project ID: 25575 Sheet: 1 of 1						
Method: 50mm Hand Auger											
Client: Quirino Limited Project: Geotechnical Investigation Location: 484 Kerikeri Road, Kerikeri Test Site: 482/484 Kerikeri Road, Kerikeri			Coordinates: 6099409mN, 1684950mE System: NZTM Elevation: Ground Located By: Phone GPS		Test Date: 14/11/2023 Logged By: MJL Prepared By: MJL Checked By: CP						
Depth (m)	Geology	Graphic Log	Material Description	Water	In-situ Testing				Values	Depth (m)	
					Dynamic cone penetrometer (blows / 50mm)						
					Vane undrained shear strength, s_u (kPa)						
					2	4	6	8	Vane ID: 1945 peak / residual (sensitivity)		
					50	100	150	200			
	Tops oil		Organic SILT (Topsoil); dark brown; dry, loose, non plastic, minor rootlets								
			Clayey SILT; brown, with orange streaks; moist, stiff, low plasticity							170 / 31 (5.5)	
			Fine sandy SILT; orangish brown; moist, stiff, low plasticity							229 / 101 (2.3)	
-0.5										156 / 73 (2.1)	-0.5
										170 / 14 (12.1)	
-1.0			0.90m: fine, angular, grey, silty gravel. clasts easily broken							219 / 14 (15.6)	-1.0
			Fine sandy SILT; grey, with faint orange streaks; moist, medium dense, non plastic, uniformly graded							243+	
-1.5			Fine sandy SILT, trace clay content; orangish brown; moist, soft, low plasticity							222 / 35 (6.3)	-1.5
										243+	
-2.0			Fine sandy SILT; grey; moist, medium dense, non plastic, uniformly graded							243+	-2.0
			Fine sandy SILT; grey, with faint orange streaks; wet, medium dense, non plastic, uniformly graded							174 / 28 (6.2)	
-2.5			Fine sandy SILT; grey; wet, medium dense, non plastic, uniformly graded							243+	-2.5
			Fine sandy SILT, some gravel; brown; wet, medium dense, non plastic, uniformly graded							243+	
			gravel: medium, size, subangular, grey in colour							243+	
			Silty fine SAND, some gravel; grey; dry, dense, non plastic, uniformly graded							239 / 28 (8.5)	
			gravel: fine, angular, grey in colour								
			Fine sandy SILT; brownish grey; moist, medium dense, non plastic, uniformly graded								
-3.0										UTP	-3.0
Hole Depth: 3.00m			Termination: Target Depth Reached								
Remarks:						● Vane peak ○ Vane residual ◆ Vane UTP ▼ Standing water level ⏏ Groundwater inflow ⏏ Groundwater outflow					
Materials are described in general accordance with NZGS 'Field Description of Soil and Rock' (2005). No correlation is implied between shear vane and DCP values.						UTP = Unable to Penetrate					

		Hand Auger Borehole Log			Test ID: HA09 Project ID: 25575 Sheet: 1 of 1						
Method: 50mm Hand Auger											
Client: Quirino Limited Project: Geotechnical Investigation Location: 484 Kerikeri Road, Kerikeri Test Site: 482/484 Kerikeri Road, Kerikeri			Coordinates: 6099398mN, 1684953mE System: NZTM Elevation: Ground Located By: Phone GPS		Test Date: 14/11/2023 Logged By: CF Prepared By: CF Checked By: CP						
Depth (m)	Geology	Graphic Log	Material Description	Water	In-situ Testing				Values	Depth (m)	
					Dynamic cone penetrometer (blows / 50mm)						
					Vane undrained shear strength, s_u (kPa)						
					2	4	6	8	Vane ID: 713 peak / residual (sensitivity)		
	Topsoil		Organic SILT, dark brown, dry, rootlets								
	Kerikeri Volcanics		Silty CLAY, brown; friable, high plasticity							199 / 55 (3.6)	
									202+	-0.5	
-0.5										202+	
										202+	
-1.0			1.00m: becomes sandy with grey mottling							202+	-1.0
-1.5				Groundwater not encountered						-1.5	
-2.0										-2.0	
-2.5										-2.5	
-3.0										-3.0	
Hole Depth: 1.00m			Termination: Auger unable to penetrate			Vane peak Vane residual Vane UTP				Standing water level Groundwater inflow Groundwater outflow UTP = Unable to Penetrate	
Remarks:											
Materials are described in general accordance with NZGS 'Field Description of Soil and Rock' (2005). No correlation is implied between shear vane and DCP values.											



Hand Auger Borehole Log

Method: 50mm Hand Auger

Test ID: HA10
Project ID: 25575
Sheet: 1 of 1

Client: Quirino Limited

Project: Geotechnical Investigation

Location: 484 Kerikeri Road, Kerikeri

Test Site: 482/484 Kerikeri Road, Kerikeri

Coordinates: 6099394mN, 1684969mE

System: NZTM

Elevation: Ground

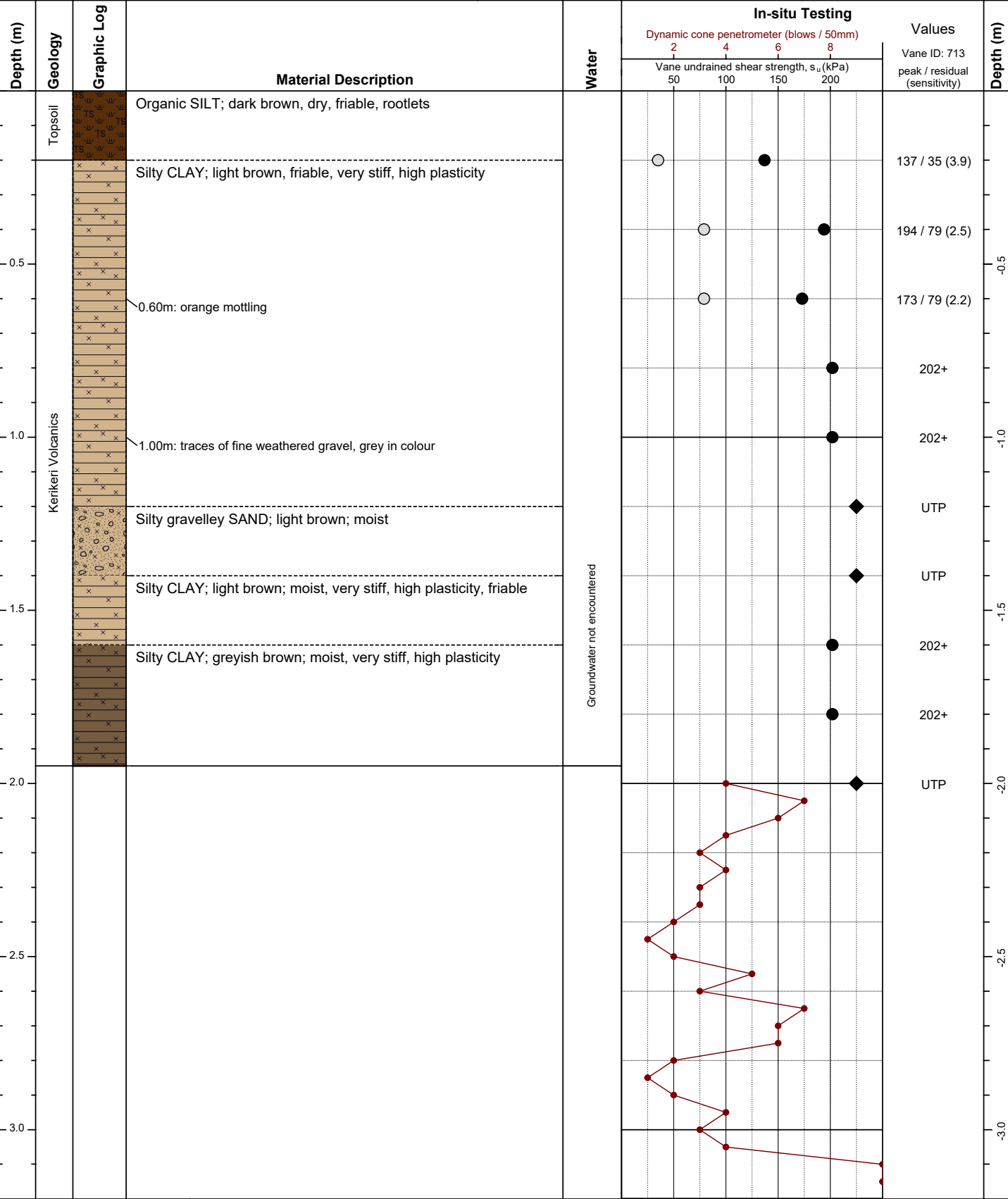
Located By: Phone GPS

Test Date: 14/11/2023

Logged By: CF

Prepared By: CF

Checked By: CP



Hole Depth: 1.95m

Termination: Auger unable to penetrate

Remarks:

Materials are described in general accordance with NZGS 'Field Description of Soil and Rock' (2005).
No correlation is implied between shear vane and DCP values.

● Vane peak

○ Vane residual

◆ Vane UTP

▼ Standing water level

⏏ Groundwater inflow

▷ Groundwater outflow

UTP = Unable to Penetrate



Hand Auger Borehole Log

Method: 50mm Hand Auger

Test ID: HA12
Project ID: 25575
Sheet: 1 of 1

Client: Quirino Limited

Project: Geotechnical Investigation

Location: 484 Kerikeri Road, Kerikeri

Test Site: 482/484 Kerikeri Road, Kerikeri

Coordinates: 6099461mN, 1684915mE

System: NZTM

Elevation: Ground

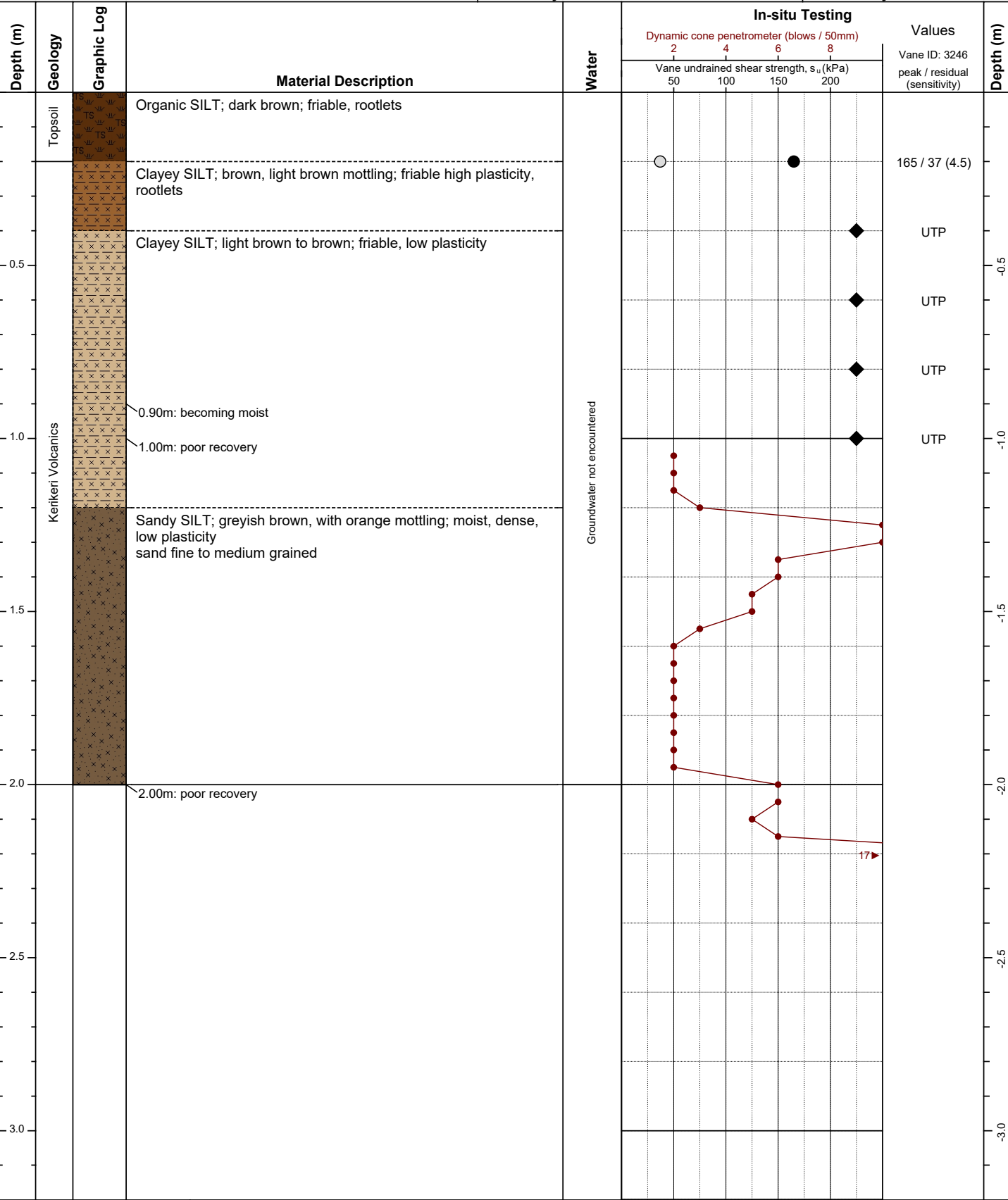
Located By: Phone GPS

Test Date: 14/11/2023

Logged By: CF

Prepared By: CF

Checked By: CP



Hole Depth: 2.00m

Termination: Auger unable to penetrate

Remarks:

Materials are described in general accordance with NZGS 'Field Description of Soil and Rock' (2005).
No correlation is implied between shear vane and DCP values.

● Vane peak
○ Vane residual
◆ Vane UTP

▼ Standing water level
◁ Groundwater inflow
▷ Groundwater outflow

UTP = Unable to Penetrate

		Hand Auger Borehole Log				Test ID: HA14 Project ID: 25575 Sheet: 1 of 1					
Method: 50mm Hand Auger											
Client: Quirino Limited Project: Geotechnical Investigation Location: 484 Kerikeri Road, Kerikeri Test Site: 482/484 Kerikeri Road, Kerikeri			Coordinates: 6099459mN, 1684946mE System: NZTM Elevation: Ground Located By: Phone GPS			Test Date: 14/11/2023 Logged By: MJL Prepared By: MJL Checked By: CP					
Depth (m)	Geology	Graphic Log	Material Description	Water	In-situ Testing				Values	Depth (m)	
					Dynamic cone penetrometer (blows / 50mm)						
					Vane undrained shear strength, s_u (kPa)						
					2	4	6	8	Vane ID: 1945 peak / residual (sensitivity)		
					50	100	150	200			
	Topsoil		Organic SILT (Topsoil); dark brown; moist, loose, non plastic, minor fine grass rootlets								
			Clayey SILT; brown, minor small yellow lenses; moist, firm, high plasticity							222 / 59 (3.8)	
0.5			Fine sandy SILT; brownish grey; moist, medium dense, non plastic							243+	-0.5
			Fine sandy SILT; brown; moist, medium dense, non plastic							243+	
			Fine sandy SILT; brown; moist, medium dense, non plastic							243+	
1.0			Fine sandy SILT; brown; moist, medium dense, non plastic							132 / 10 (13.2)	-1.0
			Fine sandy SILT; brown; moist, medium dense, non plastic							139 / 7 (19.9)	
			Fine sandy SILT; brown; moist, medium dense, non plastic							232 / 10 (23.2)	-1.5
1.5			Fine sandy SILT; brown; moist, medium dense, non plastic							243+	
			Fine sandy SILT; brown; moist, medium dense, non plastic							219 / 10 (21.9)	-2.0
2.0			Fine sandy SILT; brown; moist, medium dense, non plastic							243+	
			Clayey SILT, with minor gravel; orangish brown, minor yellow lenses; moist, firm, low plasticity							160 / 42 (3.8)	
			gravel clasts: fine to medium sized, sub angular, moderately weathered, grey							215 / 38 (5.7)	-2.5
			Fine sandy SILT, trace clay content ; brown, with faint grey and black lenses; moist, firm, low plasticity							167 / 24 (7.0)	
2.5			Fine sandy SILT; brown; moist, medium dense, non plastic							236 / 38 (6.2)	-3.0
3.0			Fine sandy SILT; brown; moist, medium dense, non plastic							243+	
Hole Depth: 3.00m			Termination: Target Depth Reached								
Remarks:						● Vane peak ○ Vane residual ◆ Vane UTP ▼ Standing water level ⏏ Groundwater inflow ⏏ Groundwater outflow UTP = Unable to Penetrate					
Materials are described in general accordance with NZGS 'Field Description of Soil and Rock' (2005). No correlation is implied between shear vane and DCP values.											



Hand Auger Borehole Log

Method: 50mm Hand Auger

Test ID: HA16
Project ID: 25575
Sheet: 1 of 1

Client: Quirino Limited

Project: Geotechnical Investigation

Location: 484 Kerikeri Road, Kerikeri

Test Site: 482/484 Kerikeri Road, Kerikeri

Coordinates: 6099485mN, 1684930mE

System: NZTM

Elevation: Ground

Located By: Phone GPS

Test Date: 14/11/2023

Logged By: MJL

Prepared By: MJL

Checked By: CP

Depth (m)	Geology	Graphic Log	Material Description	Water	In-situ Testing				Values	Depth (m)			
					Dynamic cone penetrometer (blows / 50mm)								
					Vane undrained shear strength, s _u (kPa)								
					2	4	6	8	Vane ID: 1945 peak / residual (sensitivity)				
					50	100	150	200					
	Tops oil		Organic SILT (Topsoil); dark brown; dry, medium dense, non plastic	Groundwater not encountered									
			Clayey SILT; orangish brown; moist, firm, low plasticity								201 / 38 (5.3)		
0.5											198 / 42 (4.7)	-0.5	
			Fine sandy SILT, trace clay content ; grey with faint brown mottling, and minor small black lenses; moist, soft, low plasticity								222 / 80 (2.8)		
1.0											236 / 10 (23.6)		
	Kerikeri Volcanics											243+	-1.0
												243+	
												243+	
					Fine sandy SILT, trace clay content ; greyish brown, with minor small black lenses; moist, soft, low plasticity							243+	
1.5												222 / 17 (13.1)	-1.5
												229 / 28 (8.2)	
2.0												243+	-2.0
												243+	
												243+	
2.5												243+	-2.5
											243+		
3.0										243+	-3.0		

Hole Depth: 3.00m

Termination: Target Depth Reached

Remarks:

Materials are described in general accordance with NZGS 'Field Description of Soil and Rock' (2005).
No correlation is implied between shear vane and DCP values.

● Vane peak
○ Vane residual
◆ Vane UTP

▼ Standing water level
↙ Groundwater inflow
↘ Groundwater outflow

UTP = Unable to Penetrate



Hand Auger Borehole Log

Method: 50mm Hand Auger

Test ID: HA17
Project ID: 25575
Sheet: 1 of 1

Client: Quirino Limited

Project: Geotechnical Investigation

Location: 484 Kerikeri Road, Kerikeri

Test Site: 482/484 Kerikeri Road, Kerikeri

Coordinates: 6099495mN, 1684897mE

System: NZTM

Elevation: Ground

Located By: Phone GPS

Test Date: 14/11/2023

Logged By: GG

Prepared By: GG

Checked By: CP

Depth (m)	Geology	Graphic Log	Material Description	Water	In-situ Testing				Values	Depth (m)			
					Dynamic cone penetrometer (blows / 50mm)								
					Vane undrained shear strength, s_v (kPa)								
					2	4	6	8	Vane ID: 2864 peak / residual (sensitivity)				
	Topsoil	TS	SILT (Topsoil); brown; moist, non plastic, rootlets	Groundwater not encountered									
	Kerikeri Volcanics		Silty CLAY, with minor fine to medium grained sand; brown, with yellowish brown streaks; moist, high plasticity							188+			
											188+		
0.5												188+	-0.5
					0.80m: becomes mottled grey and orangish brown							188+	
												188+	
1.0										188+	-1.0		
			Silty CLAY, with traces of fine grained sand; brown, mottled grey; moist, high plasticity							188+			
1.5											-1.5		
2.0											-2.0		
2.5											-2.5		
3.0											-3.0		

Hole Depth: 1.25m

Termination: Auger unable to penetrate

Remarks:

Materials are described in general accordance with NZGS 'Field Description of Soil and Rock' (2005).
No correlation is implied between shear vane and DCP values.

● Vane peak
○ Vane residual
◆ Vane UTP

▼ Standing water level
↗ Groundwater inflow
↘ Groundwater outflow

UTP = Unable to Penetrate



Hand Auger Borehole Log

Method: 50mm Hand Auger

Test ID: HA18
Project ID: 25575
Sheet: 1 of 1

Client: Quirino Limited
Project: Geotechnical Investigation
Location: 484 Kerikeri Road, Kerikeri
Test Site: 482/484 Kerikeri Road, Kerikeri

Coordinates: 6099510mN, 1684905mE
System: NZTM
Elevation: Ground
Located By: Phone GPS

Test Date: 14/11/2023
Logged By: CF
Prepared By: CF
Checked By: CP

Depth (m)	Geology	Graphic Log	Material Description	Water	In-situ Testing				Values	Depth (m)	
					Dynamic cone penetrometer (blows / 50mm)				Vane ID: 3246 peak / residual (sensitivity)		
					Vane undrained shear strength, s _u (kPa)						
					2	4	6	8			
					50	100	150	200			
	Topsoil		Gravelly organic SILT (Topsoil); dark brown; dry gravel clasts: medium sized (10-15mm), very weak, light brown	Groundwater not encountered						15 / 49 (0.3)	
	Kerikeri Volcanics		Clayey SILT; orangish brown; friable, high plasticity								210+
0.5											210+
											15 ▶
1.0											
1.5											
2.0											
2.5											
3.0											

Hole Depth: 0.80m

Termination: Auger unable to penetrate

Remarks:

Materials are described in general accordance with NZGS 'Field Description of Soil and Rock' (2005).
No correlation is implied between shear vane and DCP values.

● Vane peak

○ Vane residual

◆ Vane UTP

▼ Standing water level

↗ Groundwater inflow

↘ Groundwater outflow

UTP = Unable to Penetrate



Hand Auger Borehole Log

Method: 50mm Hand Auger

Test ID: HA19
Project ID: 25575
Sheet: 1 of 1

Client: Quirino Limited

Project: Geotechnical Investigation

Location: 484 Kerikeri Road, Kerikeri

Test Site: 482/484 Kerikeri Road, Kerikeri

Coordinates: 6099507mN, 1684889mE

System: NZTM

Elevation: Ground

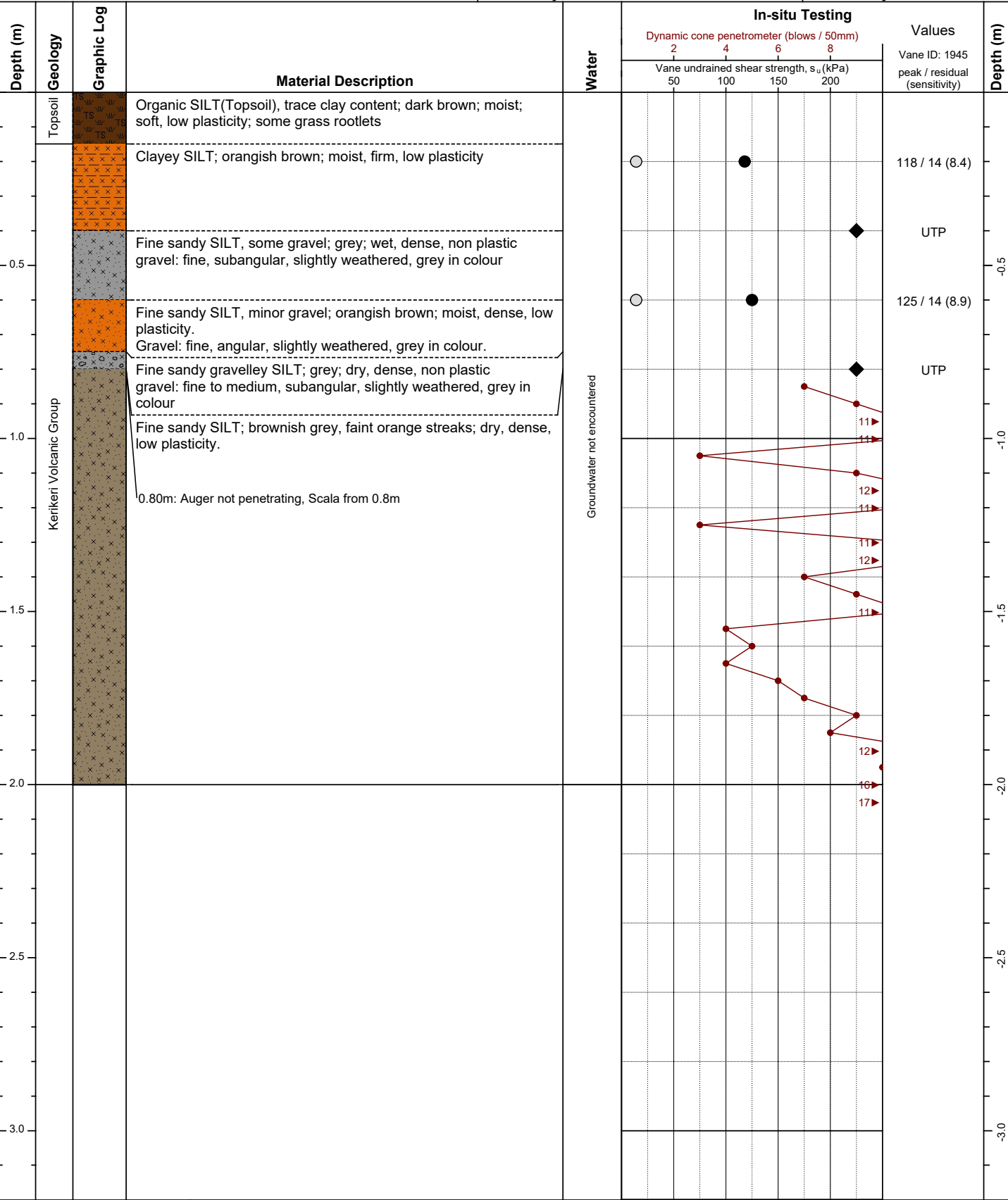
Located By: Phone GPS

Test Date: 14/11/2023

Logged By: MJL

Prepared By: MJL

Checked By: CP



Hole Depth: 2.00m

Termination: Auger unable to penetrate

Remarks:

Materials are described in general accordance with NZGS 'Field Description of Soil and Rock' (2005).
No correlation is implied between shear vane and DCP values.

● Vane peak

○ Vane residual

◆ Vane UTP

▼ Standing water level

↗ Groundwater inflow

↘ Groundwater outflow

UTP = Unable to Penetrate



Hand Auger Borehole Log

Method: 50mm Hand Auger

Test ID: HA20
Project ID: 25575
Sheet: 1 of 1

Client: Quirino Limited

Project: Geotechnical Investigation

Location: 484 Kerikeri Road, Kerikeri

Test Site: 482/484 Kerikeri Road, Kerikeri

Coordinates: 6099495mN, 1684889mE

System: NZTM

Elevation: Ground

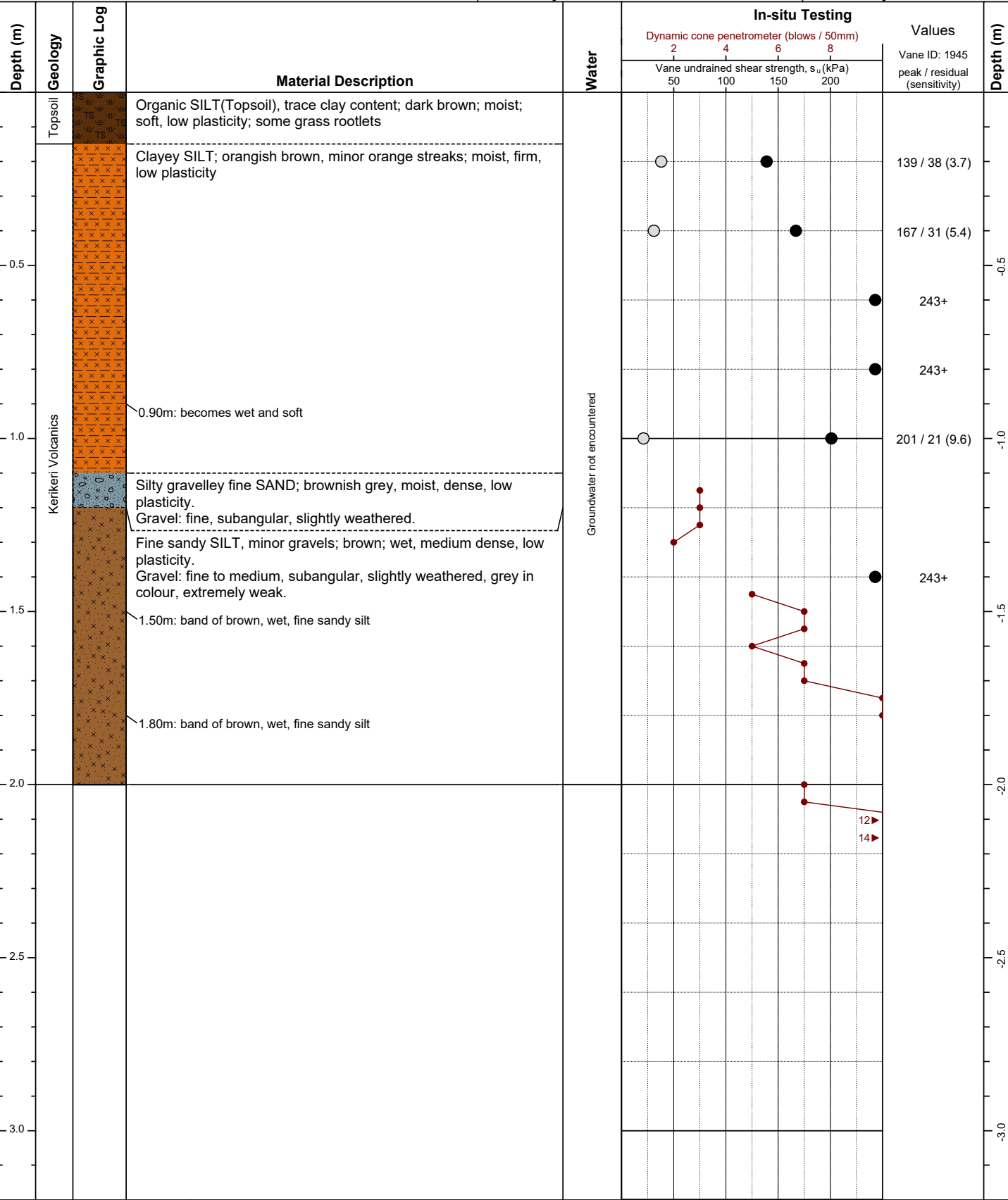
Located By: Phone GPS

Test Date: 14/11/2023

Logged By: MJL

Prepared By: MJL

Checked By: CP



Hole Depth: 2.00m

Termination: Auger unable to penetrate

Remarks:

Materials are described in general accordance with NZGS 'Field Description of Soil and Rock' (2005).
No correlation is implied between shear vane and DCP values.

● Vane peak
○ Vane residual
◆ Vane UTP

▼ Standing water level
⏏ Groundwater inflow
⏏ Groundwater outflow

UTP = Unable to Penetrate



Hand Auger Borehole Log

Method: 50mm Hand Auger

Test ID: HA21
Project ID: 25575
Sheet: 1 of 1

Client: Quirino Limited

Project: Geotechnical Investigation

Location: 484 Kerikeri Road, Kerikeri

Test Site: 482/484 Kerikeri Road, Kerikeri

Coordinates: 6099504mN, 1684871mE

System: NZTM

Elevation: Ground

Located By: Phone GPS

Test Date: 14/11/2023

Logged By: MJL

Prepared By: MJL

Checked By: CP

Depth (m)	Geology	Graphic Log	Material Description	Water	In-situ Testing				Values	Depth (m)	
					Dynamic cone penetrometer (blows / 50mm)						
					Vane undrained shear strength, s _u (kPa)						
					2	4	6	8	Vane ID: 1945 peak / residual (sensitivity)		
	Topsoil		Organic SILT(Topsoil); dark brown, minor yellowish white lenses of fine sandy silt; moist; medium dense, non plastic; some grass rootlets	Groundwater not encountered							
	Kerikeri Volcanics		Fine sandy SILT,trace clay content, and minor gravel; orangish brown; moist, firm, low plasticity Gravel: fine, angular, highly weathered			50	100	150	200	222 / 56 (4.0)	
			Fine sandy gravelley SILT; grey, with orange mottling; dry, dense, low plasticity. Gravel: fine to medium, subangular, moderately weathered, grey in colour.							243+	-0.5
-0.5			Fine sandy SILT; orangish brown, with grey bands; moist, dense, low plasticity.							243+	
			Fine sandy gravelley SILT; grey, with orange mottling; dry, dense, low plasticity. Gravel: medium, subangular, moderately weathered, grey in colour.							243+	-1.0
-1.0			Fine sandy SILT, minor fine gravel; bluish grey; wet, dense, low plasticity. Gravel: fine to medium, subangular, slightly weathered, grey in colour.							243+	
-1.5										-1.5	
-2.0										-2.0	
-2.5										-2.5	
-3.0										-3.0	

Hole Depth: 1.30m

Termination: Auger unable to penetrate

Remarks:

Materials are described in general accordance with NZGS 'Field Description of Soil and Rock' (2005).
No correlation is implied between shear vane and DCP values.

● Vane peak
○ Vane residual
◆ Vane UTP

▼ Standing water level
↙ Groundwater inflow
↘ Groundwater outflow

UTP = Unable to Penetrate

		Hand Auger Borehole Log				Test ID: HA23 Project ID: 25575 Sheet: 1 of 1					
Method: 50mm Hand Auger											
Client: Quirino Limited Project: Geotechnical Investigation Location: 484 Kerikeri Road, Kerikeri Test Site: 482/484 Kerikeri Road, Kerikeri			Coordinates: 6099484mN, 1684859mE System: NZTM Elevation: Ground Located By: Phone GPS			Test Date: 14/11/2023 Logged By: MJL Prepared By: MJL Checked By: CP					
Depth (m)	Geology	Graphic Log	Material Description	Water	In-situ Testing				Values	Depth (m)	
					Dynamic cone penetrometer (blows / 50mm)						
					Vane undrained shear strength, s_u (kPa)						
					2	4	6	8	Vane ID: 1945 peak / residual (sensitivity)		
					50	100	150	200			
	Tops oil		Organic SILT(Topsoil); dark brown; dry, loose, non plastic, some grass rootlets								
	Kerikeri Volcanics		Fine sandy SILT, trace clay content; orangish brown, some small white flecks; moist, stiff, low plasticity	Groundwater not encountered						170 / 52 (3.3)	
0.5			0.40m: lense fine sandy silt, brownish grey							UTP	-0.5
			Silty GRAVEL; pinkish grey silt matrix, bluish grey gravel clasts; dry, dense, low plasticity. Gravel: fine to medium, angular, slightly weathered, blue grey in colour.							UTP	
1.0											-1.0
1.5											-1.5
2.0											-2.0
2.5											-2.5
3.0											-3.0
Hole Depth: 0.75m			Termination: Auger unable to penetrate			● Vane peak ▼ Standing water level ○ Vane residual ↗ Groundwater inflow ◆ Vane UTP ↘ Groundwater outflow UTP = Unable to Penetrate					
Remarks:											
Materials are described in general accordance with NZGS 'Field Description of Soil and Rock' (2005). No correlation is implied between shear vane and DCP values.											

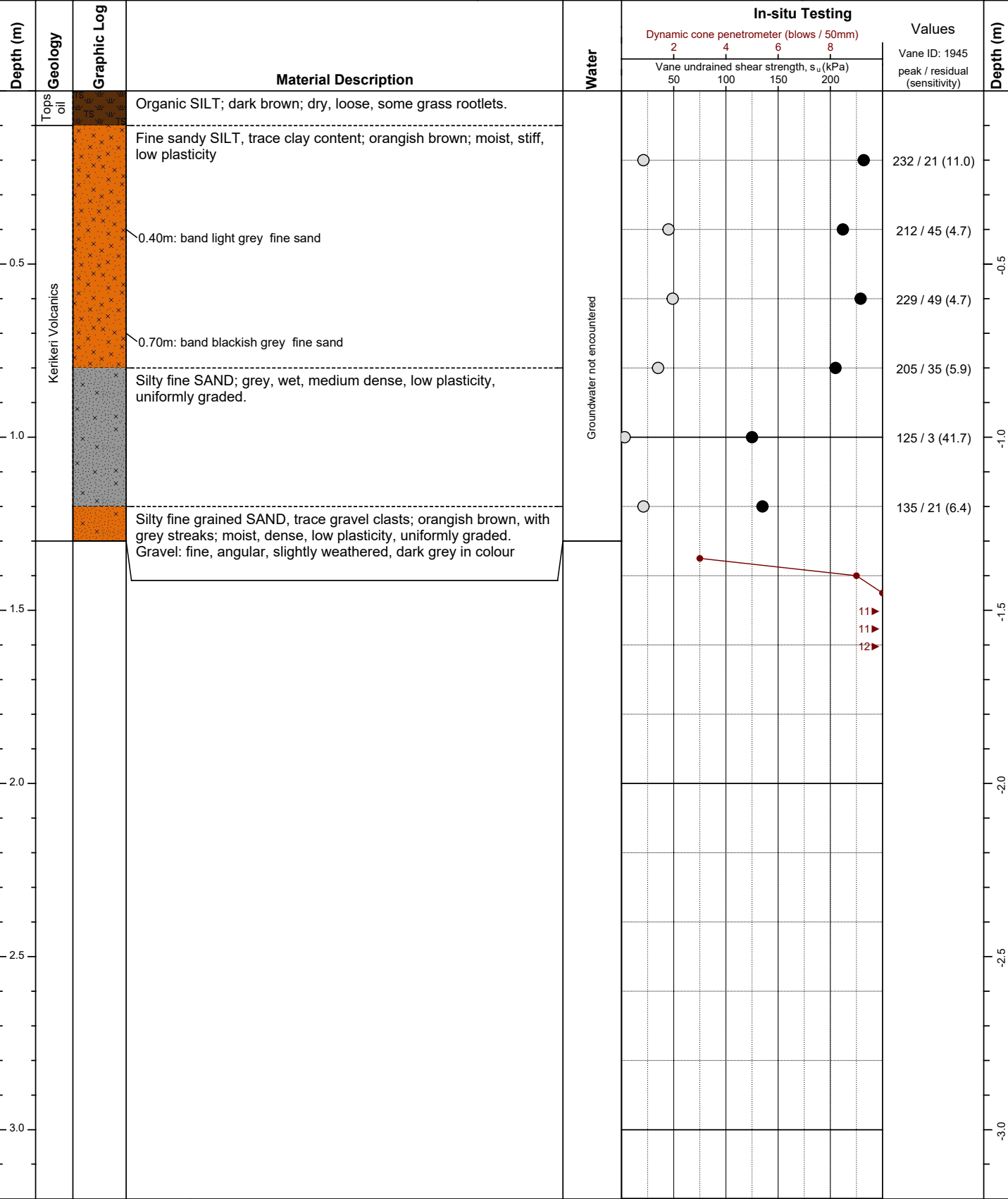


Hand Auger Borehole Log

Method: 50mm Hand Auger

Test ID: HA24
Project ID: 25575
Sheet: 1 of 1

Client: Quirino Limited	Coordinates: 6099485mN, 1684858mE	Test Date: 14/11/2023
Project: Geotechnical Investigation	System: NZTM	Logged By: MJL
Location: 484 Kerikeri Road, Kerikeri	Elevation: Ground	Prepared By: MJL
Test Site: 482/484 Kerikeri Road, Kerikeri	Located By: Phone GPS	Checked By: CP



Hole Depth: 1.30m	Termination: Auger unable to penetrate	● Vane peak	▼ Standing water level
Remarks:	Materials are described in general accordance with NZGS 'Field Description of Soil and Rock' (2005). No correlation is implied between shear vane and DCP values.	○ Vane residual	⋈ Groundwater inflow
		◆ Vane UTP	▷ Groundwater outflow
		UTP = Unable to Penetrate	



Hand Auger Borehole Log

Method: 50mm Hand Auger

Test ID: HA25
Project ID: 25575
Sheet: 1 of 1

Client: Quirino Limited

Project: Geotechnical Investigation

Location: 484 Kerikeri Road, Kerikeri

Test Site: 482/484 Kerikeri Road, Kerikeri

Coordinates: 6099371mN, 1685148mE

System: NZTM

Elevation: Ground

Located By: Phone GPS

Test Date: 14/11/2023

Logged By: CF

Prepared By: CF

Checked By: CP

Depth (m)	Geology	Graphic Log	Material Description	Water	In-situ Testing				Values	Depth (m)			
					Dynamic cone penetrometer (blows / 50mm)								
					Vane undrained shear strength, s_u (kPa)								
					2	4	6	8	Vane ID: 3246 peak / residual (sensitivity)				
					50	100	150	200					
	Topsoil		Organic SILT; brown; moist, friable, rootlets										
	Kerikeri Volcanics		Clayey SILT; brown; moist, friable, low plasticity	Groundwater not encountered						187 / 40 (4.7)			
									210+				
-0.5									210+				
					0.60m: Orange specks				210+				
									210+				
-1.0									210+				
					Clayey SILT; light brown, with orange specks; moist, high plasticity				210+				
									210+				
-1.5									210+				
					Clayey SILT; greyish brown; moist, low plasticity				210+				
					1.60m: becoming greyish brown				210+				
					1.80m: fine to medium sized, slightly weathered, grey, gravel clasts				210+				
-2.0												180 / 49 (3.7)	
												180 / 82 (2.2)	
-2.5									202 / 63 (3.2)				
		2.40m: light grey mottling encountered							210+				
									180 / 52 (3.5)				
-3.0			2.80m - 3.00m: orange mottling encountered						210+				

Hole Depth: 3.00m

Termination: Target Depth Reached

Remarks:

Materials are described in general accordance with NZGS 'Field Description of Soil and Rock' (2005).
No correlation is implied between shear vane and DCP values.

● Vane peak
○ Vane residual
◆ Vane UTP

▼ Standing water level
⏏ Groundwater inflow
▷ Groundwater outflow

UTP = Unable to Penetrate



Hand Auger Borehole Log

Method: 50mm Hand Auger

Test ID: HA26
Project ID: 25575
Sheet: 1 of 1

Client: Quirino Limited
Project: Geotechnical Investigation
Location: 484 Kerikeri Road, Kerikeri
Test Site: 482/484 Kerikeri Road, Kerikeri

Coordinates: 6099356mN, 1685155mE
System: NZTM
Elevation: Ground
Located By: Phone GPS

Test Date: 14/11/2023
Logged By: GG
Prepared By: GG
Checked By: CP

Depth (m)	Geology	Graphic Log	Material Description	Water	In-situ Testing				Values Vane ID: 2864 peak / residual (sensitivity)	Depth (m)		
					Dynamic cone penetrometer (blows / 50mm)							
					Vane undrained shear strength, s _u (kPa)							
					2	4	6	8				
					50	100	150	200				
	Topsoil		SILT; brown; moist, non plastic, rootlets									
	Kerikeri Volcanics		Silty CLAY, with some fine to medium grained sand; brown; moist, low plasticity	Groundwater not encountered						121 / 27 (4.5)		
-0.5												188+
												188+
												188+
-1.0												188+
												188+
												188+
-1.5												188+
												188+
-2.0												188+
												188+
-2.5												
			Silty CLAY, with minor fine sand; brown; moist, high plasticity							148 / 73 (2.0)		
											142 / 75 (1.9)	
-3.0												113 / 62 (1.8)

Hole Depth: 3.00m	Termination: Target Depth Reached	● Vane peak ▼ Standing water level ○ Vane residual ◁ Groundwater inflow ◆ Vane UTP ▷ Groundwater outflow UTP = Unable to Penetrate
Remarks:		
Materials are described in general accordance with NZGS 'Field Description of Soil and Rock' (2005). No correlation is implied between shear vane and DCP values.		



Hand Auger Borehole Log

Method: 50mm Hand Auger

Test ID: HA27

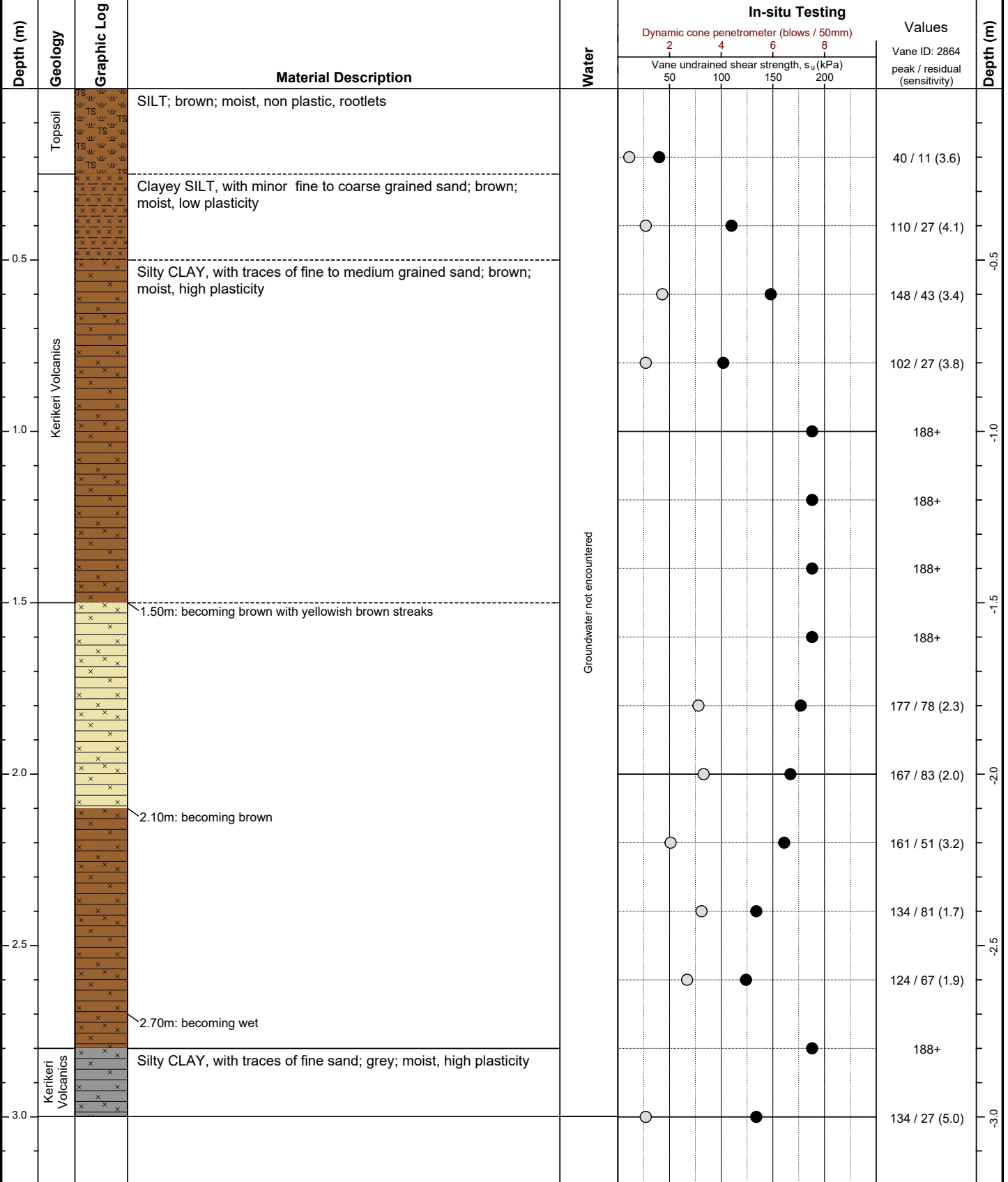
Project ID: 25575

Sheet: 1 of 1

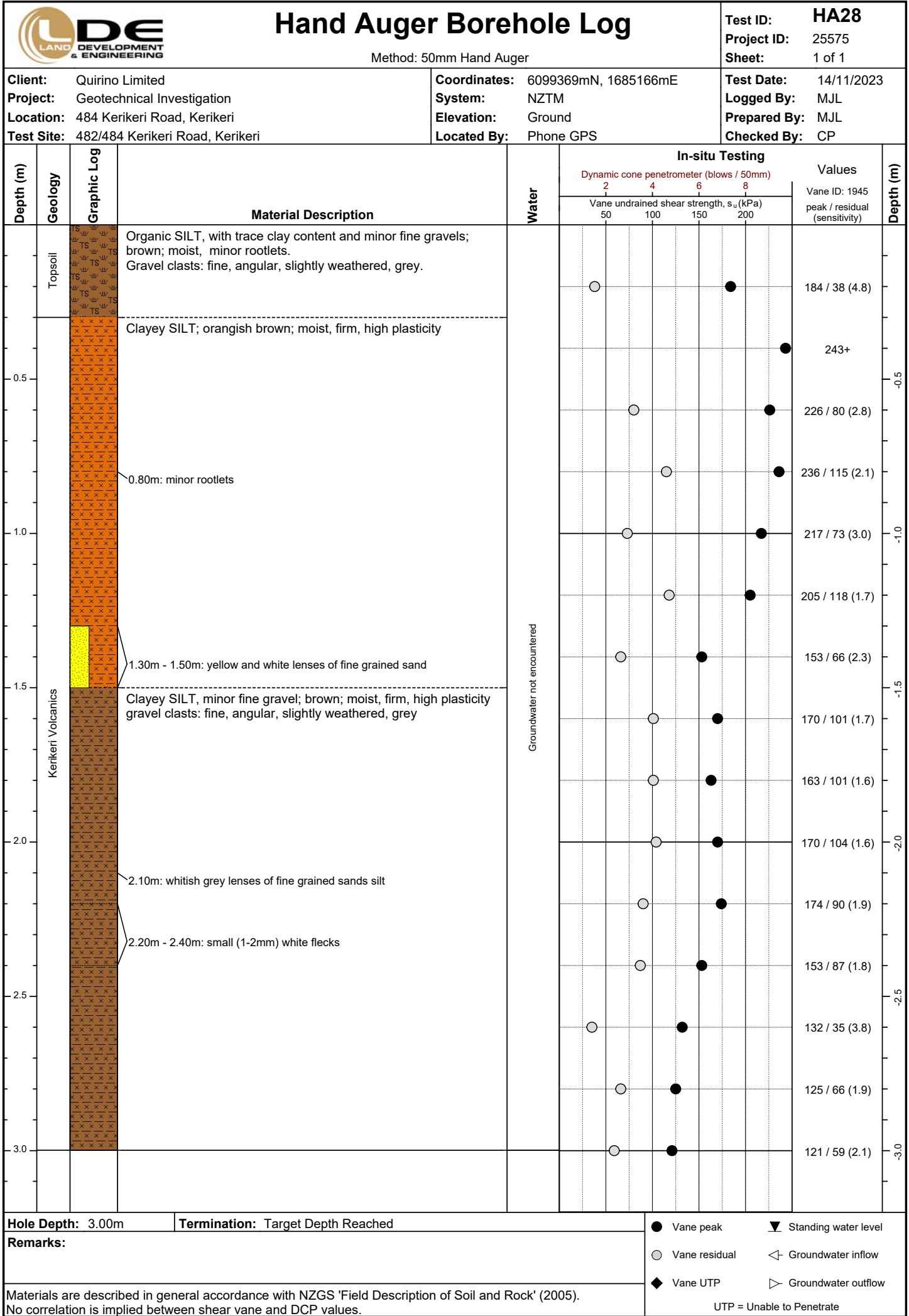
Client: Quirino Limited
Project: Geotechnical Investigation
Location: 484 Kerikeri Road, Kerikeri
Test Site: 482/484 Kerikeri Road, Kerikeri

Coordinates: 6099354mN, 1685166mE
System: NZTM
Elevation: Ground
Located By: Phone GPS

Test Date: 14/11/2023
Logged By: GG
Prepared By: GG
Checked By: CP



Hole Depth: 3.00m	Termination: Target Depth Reached	● Vane peak ▼ Standing water level ○ Vane residual ◁ Groundwater inflow ◆ Vane UTP ▷ Groundwater outflow UTP = Unable to Penetrate
Remarks:		
Materials are described in general accordance with NZGS 'Field Description of Soil and Rock' (2005). No correlation is implied between shear vane and DCP values.		



APPENDIX D: HEC-HMS OUTPUTS

Project: Kerikeri Road Simulation Run: WQV				
Start of Run: 01Jan2023, 12:00		Basin Model: WQV		
End of Run: 02Jan2023, 12:00		Meteorologic Model: 1/3 2 Year		
Compute Time: 18Apr2024, 11:39:49		Control Specifications: Control 1		
Show Elements:	All Elements	Volume Units:	☐ MM ☒ 1000 M3	Sorting: Watershed Explorer
Hydrologic Element	Drainage Area (KM2)	Peak Discharge (M3/S)	Time of Peak	Volume (1000 M3)
Area Into Pond	0.00418	0.01192	1 January 2023, 20:...	0.18044
Sink-1	0.00418	0.01192	1 January 2023, 20:...	0.18044

Project: Kerikeri Road Simulation Run: Pre - 2 Year				
Start of Run: 01Jan2023, 12:00		Basin Model: Predevelopment		
End of Run: 02Jan2023, 12:00		Meteorologic Model: Pre 2 Year		
Compute Time: 22Apr2024, 12:52:46		Control Specifications: Control 1		
Show Elements:	All Elements	Volume Units:	☐ MM ☒ 1000 M3	Sorting: Watershed Explorer
Hydrologic Element	Drainage Area (KM2)	Peak Discharge (M3/S)	Time of Peak	Volume (1000 M3)
Pre-Pervious	0.00334	0.01323	1 January 2023, 20:00	0.21519
Pre-Impervious	0.00212	0.01572	1 January 2023, 20:00	0.24287
Sink-1	0.00546	0.02895	1 January 2023, 20:00	0.45807

Project: Kerikeri Road Simulation Run: Pre 5 Year				
Start of Run: 01Jan2023, 12:00		Basin Model: Predevelopment		
End of Run: 02Jan2023, 12:00		Meteorologic Model: Pre 5 Year		
Compute Time: 22Apr2024, 12:53:39		Control Specifications: Control 1		
Show Elements:	All Elements	Volume Units:	☐ MM ☒ 1000 M3	Sorting: Watershed Explorer
Hydrologic Element	Drainage Area (KM2)	Peak Discharge (M3/S)	Time of Peak	Volume (1000 M3)
Pre-Pervious	0.00334	0.02037	1 January 2023, 20:00	0.32126
Pre-Impervious	0.00212	0.02079	1 January 2023, 20:00	0.32301
Sink-1	0.00546	0.04116	1 January 2023, 20:00	0.64427

Project: Kerikeri Road Simulation Run: Pre - 10 Year				
Start of Run: 01Jan2023, 12:00		Basin Model: Predevelopment		
End of Run: 02Jan2023, 12:00		Meteorologic Model: Pre 10 Year		
Compute Time: 22Apr2024, 12:54:02		Control Specifications: Control 1		
Show Elements:	All Elements	Volume Units:	☐ MM ☒ 1000 M3	Sorting: Watershed Explorer
Hydrologic Element	Drainage Area (KM2)	Peak Discharge (M3/S)	Time of Peak	Volume (1000 M3)
Pre-Pervious	0.00334	0.02595	1 January 2023, 20:00	0.40310
Pre-Impervious	0.00212	0.02451	1 January 2023, 20:00	0.38209
Sink-1	0.00546	0.05046	1 January 2023, 20:00	0.78519

Project: Kerikeri Road Simulation Run: Pre - 100 Year				
Start of Run: 01Jan2023, 12:00		Basin Model: Predevelopment		
End of Run: 02Jan2023, 12:00		Meteorologic Model: Pre 100 Year		
Compute Time: 22Apr2024, 12:54:28		Control Specifications: Control 1		
Show Elements:	All Elements	Volume Units:	☒ MM ☐ 1000 M3	Sorting: Watershed Explorer
Hydrologic Element	Drainage Area (KM2)	Peak Discharge (M3/S)	Time of Peak	Volume (MM)
Pre-Pervious	0.00334	0.04627	1 January 2023, 20:00	209.40214
Pre-Impervious	0.00212	0.03739	1 January 2023, 20:00	276.80267
Sink-1	0.00546	0.08366	1 January 2023, 20:00	235.55794

Project: Kerikeri Road Simulation Run: Post 2 Year

Start of Run: 01Jan2023, 12:00 Basin Model: Post Development
End of Run: 02Jan2023, 12:00 Meteorologic Model: Post 2 Year
Compute Time: 22Apr2024, 13:12:27 Control Specifications: Control 1

Show Elements: All Elements

Volume Units: ☐ MM ☒ 1000 M3

Sorting: Watershed Explorer

Hydrologic Element	Drainage Area (KM2)	Peak Discharge (M3/S)	Time of Peak	Volume (1000 M3)
Post-Imperv Captured	0.00418	0.03733	1 January 2023, 20:00	0.57907
Pond	0.00418	0.01188	1 January 2023, 21:15	0.56660
Post-Imperv Not Captured	0.00128	0.01142	1 January 2023, 20:00	0.17720
Sink-1	0.00546	0.02147	1 January 2023, 20:00	0.74379

Project: Kerikeri Road Simulation Run: Post 5 Year

Start of Run: 01Jan2023, 12:00 Basin Model: Post Development
End of Run: 02Jan2023, 12:00 Meteorologic Model: Post 5 Year
Compute Time: 22Apr2024, 13:12:56 Control Specifications: Control 1

Show Elements: All Elements

Volume Units: ☐ MM ☒ 1000 M3

Sorting: Watershed Explorer

Hydrologic Element	Drainage Area (KM2)	Peak Discharge (M3/S)	Time of Peak	Volume (1000 M3)
Post-Imperv Captured	0.00418	0.04931	1 January 2023, 20:00	0.76889
Pond	0.00418	0.02135	1 January 2023, 20:45	0.74448
Post-Imperv Not Captured	0.00128	0.01509	1 January 2023, 20:00	0.23528
Sink-1	0.00546	0.02987	1 January 2023, 20:15	0.97976

Project: Kerikeri Road Simulation Run: Post - 10 Year

Start of Run: 01Jan2023, 12:00 Basin Model: Post Development
End of Run: 02Jan2023, 12:00 Meteorologic Model: Post 10 year
Compute Time: 22Apr2024, 13:13:23 Control Specifications: Control 1

Show Elements: All Elements

Volume Units: ☐ MM ☒ 1000 M3

Sorting: Watershed Explorer

Hydrologic Element	Drainage Area (KM2)	Peak Discharge (M3/S)	Time of Peak	Volume (1000 M3)
Post-Imperv Captured	0.00418	0.05811	1 January 2023, 20:00	0.90880
Pond	0.00418	0.02913	1 January 2023, 20:30	0.87249
Post-Imperv Not Captured	0.00128	0.01778	1 January 2023, 20:00	0.27809
Sink-1	0.00546	0.04012	1 January 2023, 20:15	1.15058

Project: Kerikeri Road Simulation Run: Post - 100 Year

Start of Run: 01Jan2023, 12:00 Basin Model: Post Development
End of Run: 02Jan2023, 12:00 Meteorologic Model: Post 100 year
Compute Time: 22Apr2024, 13:13:50 Control Specifications: Control 1

Show Elements: Initial Selection

Volume Units: ☐ MM ☒ 1000 M3

Sorting: Watershed Explorer

Hydrologic Element	Drainage Area (KM2)	Peak Discharge (M3/S)	Time of Peak	Volume (1000 M3)
Post-Imperv Captured	0.00418	0.08858	1 January 2023, 20:00	1.39363
Pond	0.00418	0.04450	1 January 2023, 20:30	1.30558
Post-Imperv Not Captured	0.00128	0.02711	1 January 2023, 20:00	0.42645
Sink-1	0.00546	0.06592	1 January 2023, 20:00	1.73204