REPORT

Tonkin+Taylor

13-15 Trig Road, Whenuapai

Site Feasibility Assessment - Civil Infrastructure

Prepared for
Ministry of Education
Prepared by
Tonkin & Taylor Ltd
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Executive summary

The Ministry of Education (MoE) is seeking to designate a site at 15 Trig Rd, Whenuapai for education purposes. Tonkin & Taylor Ltd (T+T) have been engaged to provide a civil infrastructure assessment to support the designation application.

This report discusses the available connections to existing public services and potential solutions to stormwater management, wastewater disposal and water supply.

There is no public wastewater or stormwater reticulation near the site. The option to provide an onsite wastewater disposal system has been reviewed and so are options for stormwater management.

An indicative bulk and location feasibility plan has been prepared and a suitable area for stormwater management and onsite wastewater disposal can be accommodated within the bulk and location feasibility plan.

1 Introduction

Tonkin & Taylor Ltd (T+T) have been engaged by the Ministry of Education (MoE) to provide a civil infrastructure assessment of a site at 13-15 Trig Rd, Whenuapai. We have been advised by MoE that the site is to be developed for educational purposes in two phases:

- Phase 1 – Overflow school to serve a shortfall in the school network capacity in Whenuapai North, Redhills and Hobsonville.
- Phase 2 – Primary School and Early Childhood Education (ECE) to serve the long-term needs of the local adjacent school catchment as the adjacent area is developed and demand increases (Years 0-8).

The proposed school site ('the site') is approximately 4.05 hectares (ha) and is located off State Highway 18 on Trig Rd, Whenuapai, Auckland. The site is currently zoned Residential – Large Lot zone.

The site also lies within the proposed plan change PC5: Whenuapai Plan Change (PC5) where a zone change is proposed to Residential – Mixed Housing Urban (refer to Figure 1-1 below). MoE is seeking to designate the site for education purposes.

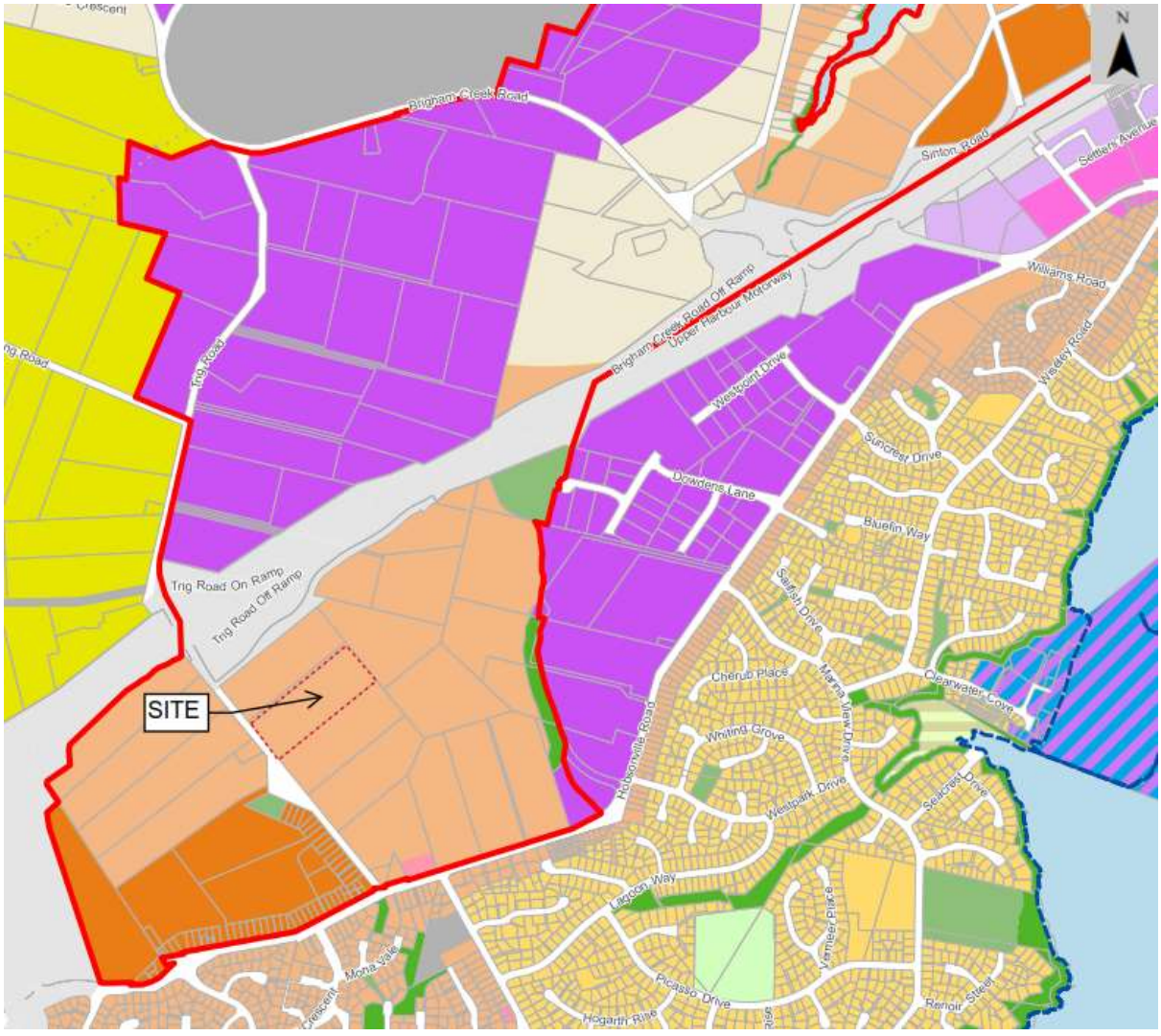


Figure 1-1 Proposed Plan Change 5 Zoning

A bulk and location plan has been developed by Jasmax with input from Ably Ltd, Morphum Environmental Ltd and T+T. To support the designation process, a civil infrastructure feasibility assessment has been prepared to inform the suitability of the site to be developed for a primary school.

2 Site description and layout

The site is located at 13-15 Trig Rd, Whenuapai, Auckland and is legally described as LOT 5 DP 66045. The proposed school site is located on the eastern side of Trig Road and has an overall site area of approximately 4.05 ha (refer to Figure 2-1 below).

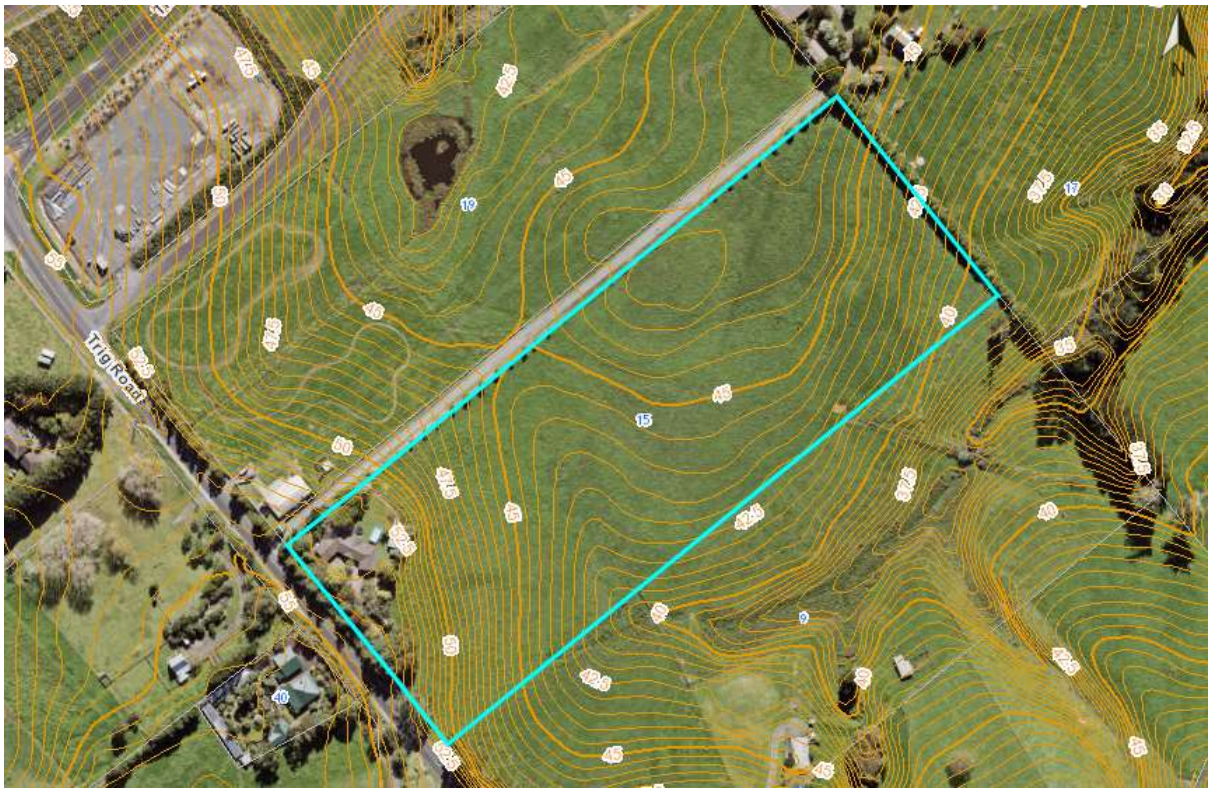


Figure 2-1: Site layout with contours, Source Auckland Council Geomaps 15/04/2021

The site and adjacent properties are predominantly large lots between 4-5 ha with single dwellings.

No topographical survey has been undertaken to date and contours shown on Geomaps have been used as the basis of assessment. The site has a high point of RL 54.0 m in the western corner adjacent to Trig Road and another high point of RL 47 m part way along the northern boundary. The site generally falls from west to east, with a low point of RL 41 m in the eastern corner of the site. The western side of the site is reasonably steep (up to approximately 16% slope). The western corner of the site is currently occupied by one dwelling and two sheds. The remainder of the site is utilised as pasture for grazing.

A wetland has been identified part way along the southern boundary of the site (refer to the ecological impact assessment prepared by Morphum Environmental Ltd[1]) which extends into 9 Trig Road to the south, which is at the headwater of the Trig Stream discharging northeast.

[1] Morphum Environmental Ltd. Ecological Impact Assessment 13-15 Trig Road Rev 2 dated 30 May, 2021.

3 Proposed development

We understand that the MoE is seeking to designate the site for education purposes. Phase 1 of the proposed development will include an overflow primary school with a temporary bulk and location feasibility plan roll of 600. For Phase 2, the bulk and location feasibility plan roll for the primary school is intended to expand to 1000 students and include an early childhood centre (ECE) facility with capacity for 50 children.

A bulk and location feasibility plan has been prepared by Jasmax (refer to Appendix A).

4 Flood hazard

This section of the report discusses the proposed flood hazard management approach for the site.

Plan Change 5 proposes different flood management practices than provided by the AUP. Whenuapai 3 Precinct: Stormwater Management Plan was prepared by 4Sight Consulting Ltd on behalf of Auckland Council Healthy Waters in September 2017 (SMP) to support the plan change.

The plan change has yet to be approved but the SMP has been used as the basis of this assessment.

The site is at the top of the Trig Stream catchment which is part of the Waiarohia Stream sub-catchment. A rapid flood hazard assessment (RFHA) model can be viewed on the Auckland Council GIS. The RFHA was prepared by Auckland Council Healthy Waters to inform the plan change process and shows no flood plains within the site. An overland flow path is shown to originate within the site and this coincides with the location of the wetland identified in the ecological assessment prepared by Morphum Environmental Ltd.

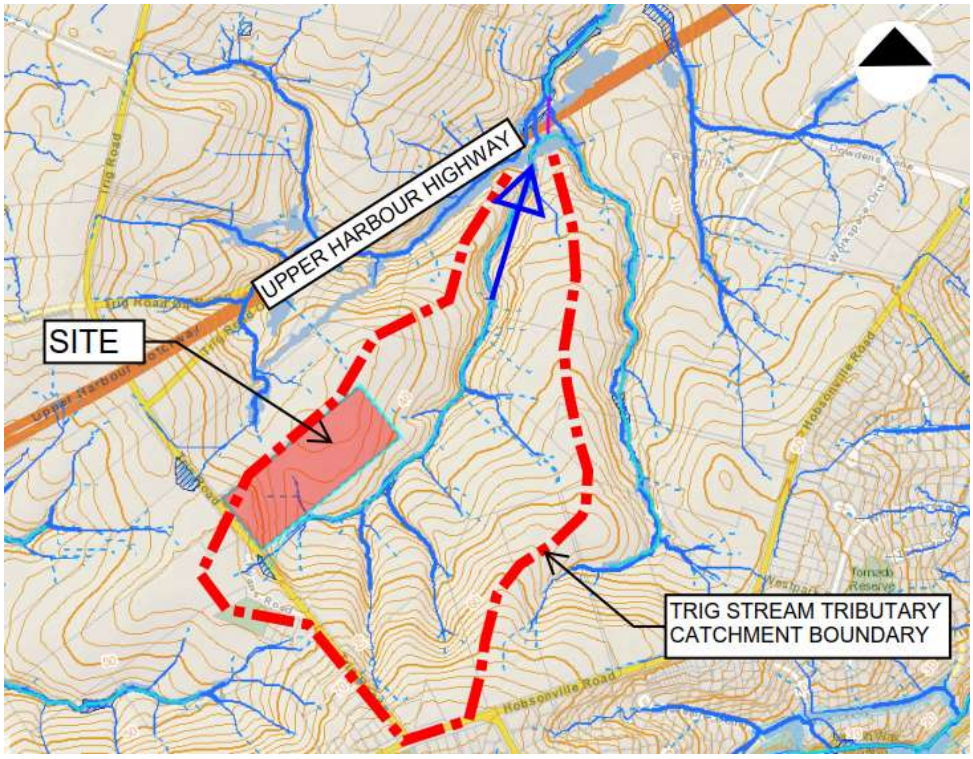


Figure 4-1 Annotated extract from Auckland Council GIS catchment and hydrology layers

The SMP identifies that flood hazard is not a key constraint in the catchment provided flood plains and overland flow paths are managed.

The stormwater management requirements for flooding are replicated in Table 4.1 below.

Table 4.1: Stormwater management requirements

Principle/ Approach	Minimum Requirements	Desirable
New flood risk is not created; and existing flood risk is not increased and where possible, is reduced.	Development shall not create, or exacerbate existing, flooding of any habitable floor the 1 % AEP (incorporating climate change) MPD flood plains. New buildings shall be located outside the 1% AEP (incorporating climate change) MPD flood plain; and any overland flow path. Overland flow paths shall be retained/provided to convey the 1% AEP (incorporating climate change) event from the contributing catchment (MPD) without creating flood risk. All overland flow paths shall be mapped and provided to Council on GIS. Overland flow paths on private property shall be protected from development.	Infrastructure and overland flow paths are designed to reduce existing habitable floor flooding where possible. Riparian margins provided and protected to safely convey flood flows.

The SMP for the plan change was based on the *Whenuapai Stormwater Management Plan (SMP) Update – Final* prepared by AECOM New Zealand Ltd for Healthy Waters in July 2017. This report included a rapid flood hazard assessment (RFHA) completed by AECOM in June 2016 which is the same available for viewing through Auckland Council GIS.

The RFHA was completed based on a catchment wide impervious area of 80%. The proposed zoning for the site in the plan change is for Mixed Housing Urban which allows 60% impervious area. A Special Purpose – School Zone Designation would be required to develop a school which limits the maximum impervious area to 70% of the site area (H29.6.5).

The bulk and location feasibility plan indicates the school development could have between 25%-45% impervious area. Therefore, the development is within the SMP modelled parameters for flooding and it is expected that no additional flood mitigation measures will be required.

The proposed school buildings are to be located outside the identified flood area and existing flow paths including the existing wetland are to be maintained.

A pre-application meeting was held with Auckland Council on 28th April. Council's catchment management planner provided advice via email that a pass-through methodology is appropriate for the site.

We note resource consents will not be applied for at this time however, the Auckland Council catchment planner noted Plan Change 5 is currently being amended and the latest floodplain information will need to be reviewed when resource consents are sought for the site. A site-specific assessment will be undertaken when an application for resource consent is made.

5 Stormwater

5.1 Existing stormwater system

The Auckland Council GIS system shows no existing public infrastructure within the site. There are no private drainage records available in the property file.

A site walkover was completed on 23rd February and downpipes were observed on the existing dwelling however no obvious discharged point was observed. It has been assumed that the pipes discharge to ground or daylight without a headwall structure away from the dwelling.

5.2 Proposed stormwater management

There are no new public stormwater assets required to support the development. The existing private pipes associated with the existing dwelling and livestock water troughs will be removed.

A low impact design approach will be undertaken with a focus on at-source treatment and management across the site in line with the requirements of the SMP (refer to Stormwater management requirements Table 11 of Appendix B).

The bulk and location feasibility plan has been used as the basis of the assessment.

We note a school zone designation allows up to 70% impervious area and this has also been included to provide an understanding of a potential maximum probable development scenario (MPD). The following impervious area distribution has been assumed based on similar school sites for the 70% MPD scenario:

- Roading and car parking 25%
- Buildings (roof area) 30%
- Hard landscaping (possible all-weather playing surface) 45%

As part of the Plan Change 5 application it is proposed that the Stormwater Management Area – Flow 1 controls are applied to the catchment to maintain and enhance the existing stream hydrology.

Table 5.1: Extract from AUP Table E10.6.3.1.1 Hydrology mitigation requirements

Stormwater management area control	Hydrology mitigation requirements
Stormwater management area – Flow 1	(a) provide retention (volume reduction) of at least 5mm runoff depth for the impervious area for which hydrology mitigation is required; and (b) provide detention (temporary storage) and a drain down period of 24 hours for the difference between the predevelopment and post-development runoff volumes from the 95th percentile, 24-hour rainfall event minus the 5 mm retention volume or any greater retention volume that is achieved, over the impervious area for which hydrology mitigation is required.

Various options to achieve these controls have been assessed to ensure sufficient space has been allowed for within the bulk and location plan to accommodate stormwater management.

5.2.1 Onsite Retention

Onsite retention of the first 5 mm of runoff will be provided for the runoff from all impervious surfaces.

It is noted that the SMP expresses a preference for infiltration devices in the upper catchment areas as a means to maintain stream base flows and encourage aquifer recharge. Rainwater harvesting has been reviewed as an option however the water would need to be used for irrigation to provide any infiltration.

The retention volumes are summarised in Table 5.2 below.

Table 5.2: Retention volume by source

Development	Indicative bulk and location feasibility plan (stage 1)			MPD
Source	Buildings	PUDO/Carpark	Total	70% impervious site
Area (m^2)	3,405	4,880	8,285	28,350
Volume (m^3)	17	24.4	41.4	70 (rounded)

Retention options reviewed are listed below and shown in Figure 5-1. We note there are other options such as tree pits or proprietary products such as GRAF Ecoblocks which could also be considered however, we have limited our assessment to four simple options:

1 Permeable paving in carparking bays (sized for carpark, PUDO and access roads).

2 Gravel storage trenches adjacent to paved areas.

3 Raingardens adjacent to paved areas and a separate device for roof runoff.

4 Rainwater harvesting storage tanks (for roof runoff).

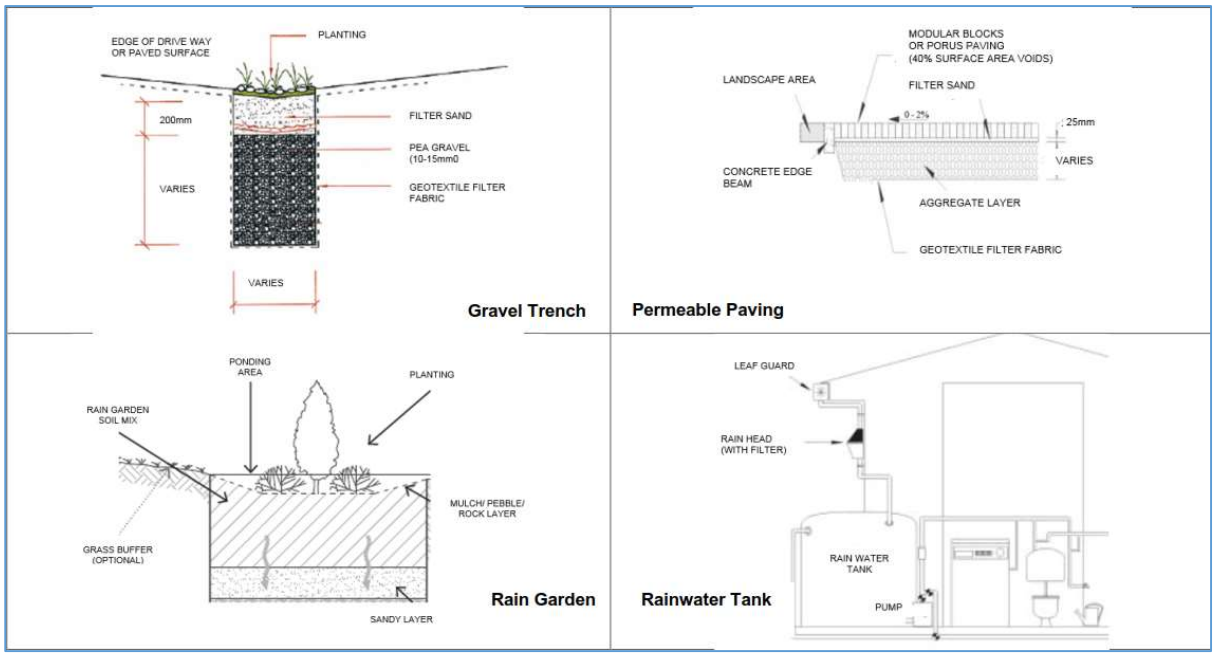


Figure 5-1 Retention device options

A summary of device sizes for different sources across the site can be found in Appendix C.

5.2.2 Onsite Detention

Detention and release of the 95th percentile storm event over 24hrs will be provided for the runoff from all impervious surfaces.

A single end of pipe device is not proposed for the site. Instead, a series of devices as close to the source as possible is proposed.

The detention volumes are summarised in Table 5.3 below.

Table 5.3: Detention volume by source

Development	Indicative bulk and location feasibility plan (stage 1)			MPD
Source	Buildings	PUDO/Carpark	Total	70% impervious site
Area (m²)	3,405	4,880	8,285	28,350
Volume (m³)	119.1	115.5	234.6	865 (rounded)

Detention options reviewed are listed below and shown in Figure 5-2. We note there are other options such as proprietary products such as GRAF Ecoblocks which could also be considered however, we have limited our assessment to four simple options:

1 Permeable paving in carparking bays (sized for carpark, PUDO and access roads).

2 Oversized underground pipes.

3 Raingardens adjacent to paved areas and a separate device for roof runoff.

4 Rainwater harvesting storage tanks (for roof runoff).

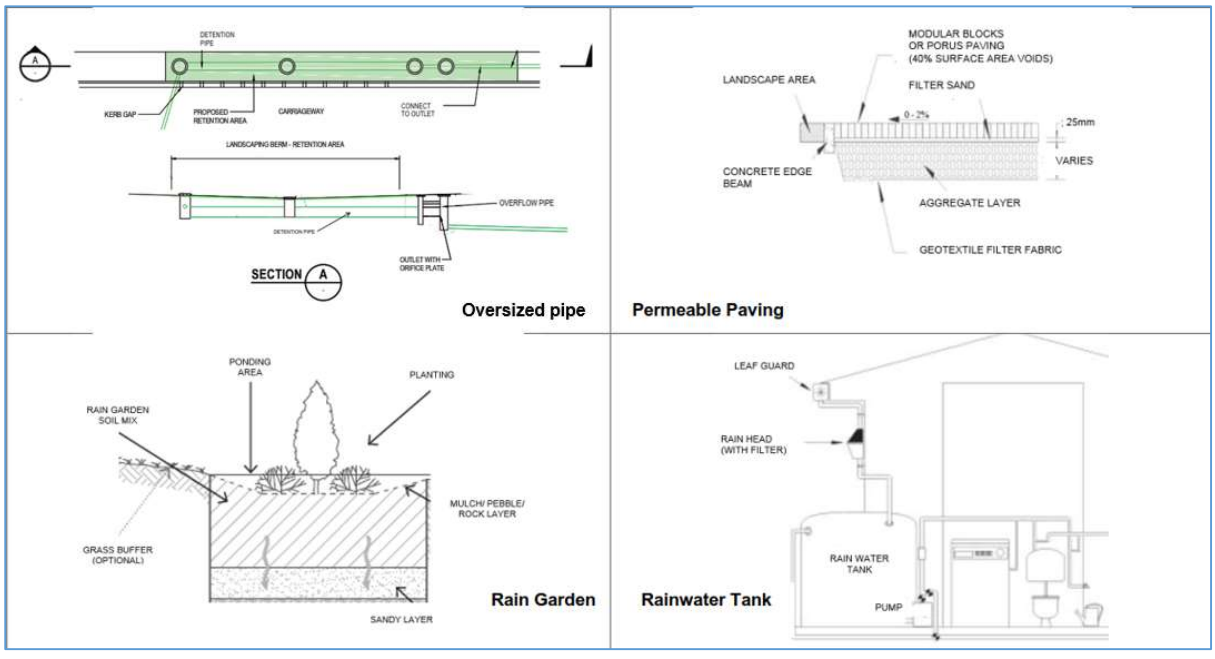


Figure 5-2 Detention device options

A summary of device sizes for different sources across the site can be found in Appendix C.

5.2.3 Treatment

There will be carparking and pick up drop off (PUDO) area required within the site to support the school activities. The carpark is likely to service more than 30 vehicles. Provisions for "high contaminant generation carparks[2]" have been included in this assessment.

Staff carparking, PUDO areas and associated access requirements are expected to be between 1,000 m²-5,000 m² and stormwater treatment devices will be required.

A number of devices have been assessed to ensure adequate area is set aside in the bulk and location feasibility plan to accommodate stormwater management. The largest footprint for treatment is for swales (allowing for some battering/earth working). A 12 m strip has been set aside for swales.

In a preapplication meeting held on 28th April 2021 at Auckland Council Offices, the council stormwater specialist requested a discussion on the potential contaminants be included in technical reports supporting the designation.

Auckland Regional Council Technical Publication 10 – Stormwater Management Devices: Design Guidelines Manual, (Auckland Regional Council, 1992 and 2003) provides guidance on the expected contaminants from various land use activities. Total Suspended Solids (TSS), Zinc and Total Petroleum Hydrocarbons (TPH) are identified as the contaminants commonly associated with asphalt paved surfaces. Infiltration, filtration and biofiltration practices are considered the most appropriate for this land use type.

Auckland Council GD01 is an update of TP10 and supersedes that document. The guideline is a technical design guide which provides stormwater options and design advice based on current good practice specific to the requirements of the Auckland Unitary Plan. Treatment devices will be sized and in accordance with GD01.

5.2.4 Summary

Devices for retention, detention and treatment have been investigated to determine if the site could accommodate the impervious development associated with a school. It is noted that the designer may choose individual devices or a single device for each impervious area type (i.e., raingarden) to manage stormwater.

A 12 m strip adjacent to the carpark and PUDO has been provided in the bulk and location feasibility plan. This area can accommodate swales and/or raingardens to treat stormwater runoff. Devices servicing the buildings or hard landscaping areas are likely to be smaller and can be included into the landscaping design and have therefore not been specifically denoted on the bulk and location feasibility plan.

Device options are summarised in Appendix C.

5.3 Protection of existing wetland

It is proposed that all new stormwater piped outlets are constructed a minimum of 20 m from the wetland with flow then travelling overland to the wetland to allow riparian and enhancement planting.

Discussion of the protection and enhancement of the existing wetland is contained in ecological assessment prepared by Morphum Environmental Ltd.

[2] Auckland Unitary Plan Chapter E9

6 Wastewater

6.1 Existing reticulation

6.1.1 Private drainage

The existing residential dwelling is currently serviced by a private on-site disposal system. Based on the information available in the property file, we understand there is an underground precast concrete septic tank (2000 litre) which discharges to an effluent field.

The location of the disposal field and septic tank is not shown in the property file. Location and removal of the disposal field will be required prior to earth working the site.

6.1.2 Public drainage

Auckland Council Geomaps identifies the nearest public reticulation is a 355 mm diameter polyethylene (PE) public wastewater rising main line along Spedding Road. This rising main runs east towards Trig Road and discharges into the Brigham Creek Road pump station approx. 2.5 km from the site.

Currently there is limited public infrastructure servicing the Whenuapai area. Watercare is in the process of constructing a new wastewater trunk called the Northern Interceptor. This trunk line is intended to increase the public wastewater capacity of the Whenuapai catchment area. The first stage of the Northern Interceptor will divert flow north east to the Rosedale Wastewater Treatment Plant and is planned to be completed in 2021. Future stages of the northern interceptor (2025 to 2035) are expected to provide additional trunk capacity to service the ultimate future development of Whenuapai.

There is currently no public wastewater infrastructure along Trig Road in the vicinity of the site. Therefore, no public wastewater connection is available to the site. Alternative disposal options will need to be implemented to accommodate Phase 1 of the school development. These are discussed in the following sections.

Phase 2 of the school development will not occur until a public connection is available to the site and the on-site wastewater disposal system will be removed. Phase 2 has not be considered further in this section of the report.

6.2 Interim disposal option

As stated in Section 6.1.2 above, there is currently no public reticulation within the vicinity of the site and therefore it is unlikely that public wastewater infrastructure will be in place prior to the school opening. It is proposed that onsite wastewater disposal is incorporated into the development as an interim solution until a public connection is available for the future roll of 1000 students and provision for an early childhood centre.

Concept level calculations have been undertaken to understand if a bulk and location feasibility plan for the school can accommodate an onsite disposal field system for Phase 1 of the proposed school development. These calculations have been based on Auckland Council Guideline Document: On-site Wastewater Management GD06 (GDO6). GD06 provides technical guidance for on-site wastewater systems for households and institutions in the Auckland region and replaces Auckland Regional Council Technical Publication TP58, On-site Wastewater Systems: Design and Management Manual. It is intended for smaller occupancies and flow (up to 15 people or 3 m^3/day) but sections of the document are applicable for treatment of domestic wastewater for institutions such as schools.

6.2.1 Design Assumptions

The following design parameters have been used for the concept design:

- Average unit wastewater generation 15-30 l/person/day (low and high usage);
- Infiltration - Category 5 as per GD06 (assuming low permeability soils);
- Design loading rate and design irrigation rates 3.0 mm/day (assuming PCDI system);

Table 6.1: Concept number of students

Stage	No. Primary students	No. ECE children
2022 Initial Roll- Primary	600	-

School roll information provided by the Ministry of Education

Table 6.2: Concept staff numbers

Stage	No. Staff
2022 Initial Roll- Primary	33

Staff numbers based on MoE guidance: https://www.education.govt.nz/school/funding-and-financials/resourcing/school-staffing/entitlement-staffing/#Curr

Concept calculations are presented in Appendix C.

6.2.2 On-site disposal flows

The design unit wastewater generation has been based on the domestic wastewater flow allowances per capita outlined in GD06 - Table 24.

A daily use per person has then been calculated at 15 litres/person/day for low water usage and 30 litres/person/day for high water usage.

We note that the following assumptions have been made in using these values for assessment purposes:

- Assumes that all potable water is converted to wastewater;
- No allowance has been made for cafeterias (with on-site catering); and
- No allowance has been made for gyms with shower facilities.

Design volumes utilised and the possible volume ranges are shown in Table 6.3 below:

Table 6.3: Unit wastewater generation

Phase	School Roll		Effluent volume (m^3/day)
	Students	Staff	Low and high-water use (based on GD06 Table 24 flow allowances)
Phase 1	600	33	9.5-19.0

6.2.3 Primary treatment (settlement tanks)

Primary treatment is the separation of suspended material from wastewater by settlement.

The minimum requirement (GD06) is three to five days of average daily volume. This can be reduced if the secondary treatment can be shown to meet the required discharge standards. This should be

reviewed in future resource consent application design phases.

The minimum tank volumes based on the low and high daily design flows are shown in Table 6.4 below. The number of storage tanks shown in Table 6.4 is based on three days of average daily volume.

Table 6.4: Primary storage volume requirements – low and high-water usage

Phase	Effluent storage volume (m^3)		Approximate number of storage tanks (assume 6 m^3 per tank)	
	Low usage	High usage	Low usage	High usage
Phase 1	28.5	57	5	10

6.2.4 Secondary treatment

The AUP requires secondary treatment for the onsite disposal to be considered a permitted activity and the quality of the discharge is a consideration for restricted discretionary status. Although GD06 gives reference to a range of land application systems, the requirements in the AUP lead to pressure compensating drip lines as the preferred system which requires a secondary level of treatment.

Secondary treatment will likely be required and investigation on the type of treatment should be included in any future resource consent application.

6.2.5 Disposal field size

As mentioned in Section 6.2.4 above, the AUP leans towards a PCDI as the preferred system. Assuming a PCDI land application system is adopted, the required disposal field area is likely to be between 3,200 m^2 and 6,300 m^2. Refer to Table 6.5 below.

Disposal field areas have been calculated based on low and high daily use per person (15 litres/person/day and 30 litres/person/day respectively). We note the high daily use is particularly conservative, however we have adopted this "worst case scenario" to understand space constraints and demonstrate feasibility of a concept on-site disposal field for Phase 1 of the proposed development.

PCDI systems distribute evenly and higher application rates can be accommodated however, 3 mm/day[3] has been adopted for this assessment as no geotechnical testing has been undertaken. It is recommended that geotechnical investigations are undertaken prior to any future resource consent application to confirm the infiltration rates of the existing soils.

Table 6.5: Summary of disposal field area – low and high usage

Stage	School roll		Land application area (m^2 rounded) required for discharge of full volume – low usage	Land application area (m2 rounded) required for discharge of full volume – high usage
	Students	Staff		
Phase 1	600	33	3,200	6,300

[3] 3mm/day based on GD06 – Table 42 assuming PCDI system and soil category 5.

For infrequent but higher loading events such as school fairs and sports days, it is likely that potaloos or similar are used to manage the increased demand and avoid overloading of the on-site wastewater disposal system.

6.2.6 Disposal field location

GD06 notes secondary treated effluent should not be disposed within the 20-year flood plain and that pressure compensating dripper irrigation (PCDI) should not be disposed of at a rate greater than 3 mm/day. Accordingly, the disposal field should be located outside the flood plain extents and set back a minimum of 20 m from streams and waterbodies and 1.5 m minimum from the property boundary. The main minimum setbacks are provided in GD06 and summarised in Table 6.6 below.

Table 6.6: Minimum setback distance from land application area to site feature for different effluent treatment levels

Site feature	Soil category	Primary effluent treatment level	Advanced secondary effluent treatment level
Buildings	5[4]	3 m	1.5 m – 3 m
Property boundaries		1.5 m	1.5 m
Surface waters (including wetlands and overland flow paths etc.)		20 m	15 m
Groundwater		1.2 m	0.6 m
Floodplain (located outside of X% AEP)[5]		1% AEP	5% AEP

The site was reviewed and a constraints plan prepared. The site constraints are shown in Figure 6-1 below.

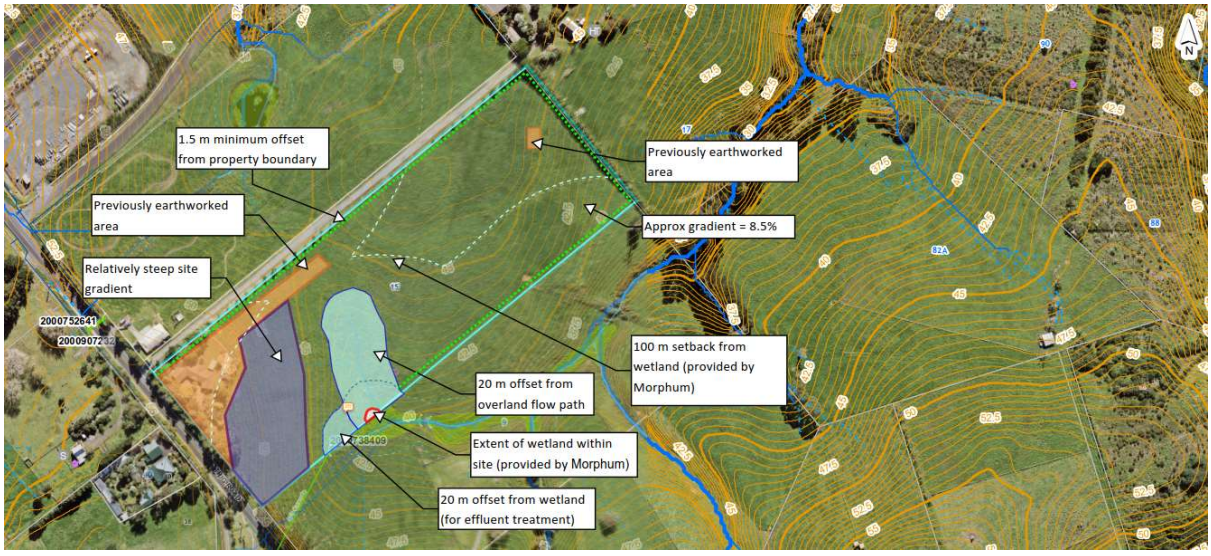


Figure 6-1: Site constraints relating to on-site wastewater disposal field location

[4] Conservatively assumed Soil Category 5, it is recommended this is confirmed during preliminary design.
[5] Land application areas must be outside of the 1 in 20 year (5% AEP) coastal inundation areas (or equivalent).

Areas that have been previously earth worked (shown in orange in Figure 6-1 below) are considered unsuitable for wastewater disposal. This is because the soil has been densely compacted, making it difficult to adequately infiltrate treated effluent into the soil.

Based on Auckland Council Geomaps, the site gradient is largely 3% – 8%. On the south-western side, the gradient reaches up to 15% (shown in purple) and so this area has been identified as not preferred.

While there is no evidence of an incised overland flow path on the site, a portion of the site is likely to flow towards the wetland through a low section of the site. A 20 m setback has also been conservatively applied to this area as well as the wetland.

The location options for the disposal field were balanced with other architectural, traffic planning and landscaping constraints in the master planning of the school layout. Other considerations include site contouring (limiting earthworks and allowing for simple foundations), allowing for future expansion and separation between the school and potential early childhood education building. The optimal site configuration balancing these requirements led to the grey areas shown on the bulk and location feasibility plan (refer to Appendix A) as the preferred location for the wastewater disposal field and reserve areas.

Due to the site constraints and very conservative daily use per person adopted values, it is noted the entire high usage disposal field area may require splitting into two smaller disposal field areas totalling 6,300 m^2.

Prior to the resource consent application, it is recommended that ground investigations are undertaken to confirm infiltration and flow rates from an equivalent school are evaluated to reduce conservatism built into this assessment.

6.2.7 Reserve area

GD06 requires land to be set aside for potential use as a disposal field as a contingency. We understand that reserve areas up to 100% of the design disposal area can be required for resource consent applications. Assuming low flow usage, 100% of the design disposal area can be achieved. If high flow usage is required, there is limited space for a 100% sized reserve area, however 60% sized reserve area may be possible if required.

GD06 provides guidelines for reducing the reserve area by up to 50%, depending on the level of treatment, slope of the original field, water saving fixtures and other considerations. Auckland Council should be consulted during the resource consent process to confirm reserve requirements once further investigations are complete.

6.3 Summary

Secondary treatment of wastewater effluent is likely to be required prior to discharge to a disposal field. A disposal field will likely be accommodated within the site to support the Phase 1 school development.

The following further work is recommended to be undertaken to support the resource consent application once the designation has been approved. We envisage this work to include the following:

- Infiltration testing of the site soils.
- Boreholes to confirm ground water table level.
- Refine expected flow rates by obtaining water usage from a similar school;
- Consider water saving practices;
- Consider grey water separation;

- Determine options for secondary treatment; and
- Discuss timing of future infrastructure upgrades with Watercare and future connection opportunities.

7 Potable water and fire supply

Auckland Council Geomaps shows two public watermains near the site:

- A 225 mm diameter concrete watermain running along the eastern side of Trig Road.
- A 150 mm diameter asbestos cement watermain running along the western side of Trig Road.
- A 15 mm diameter PE water lateral line enters the site, approximately 20 m west of the south-eastern site boundary.
- Three hydrants within 100 m of the site.

The locations of the pipelines are shown in Figure 7-1.

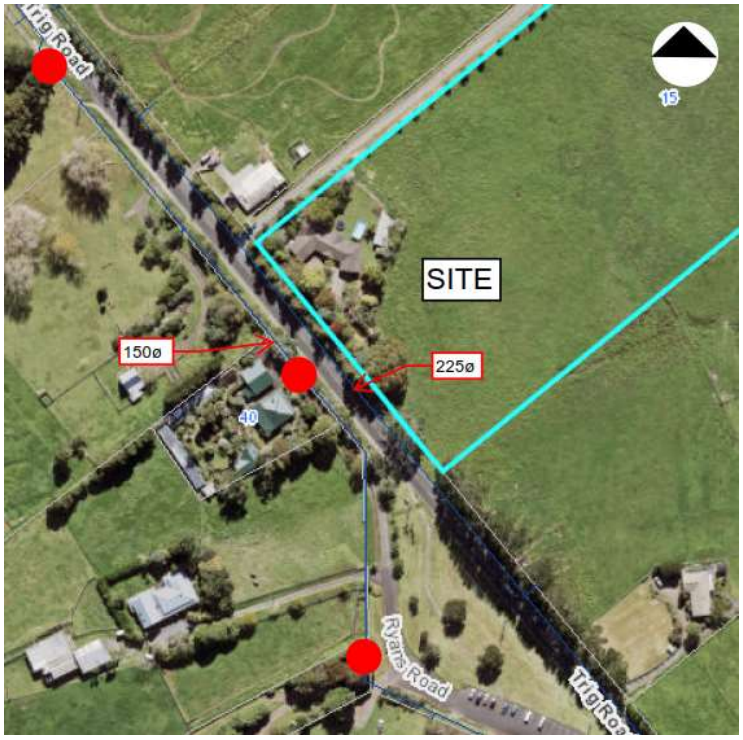


Figure 7-1 Public water supply lines (AC GIS)

MoE has advised that Phase 1 of the school development will comprise of single storey modular buildings. Once the public wastewater reticulation has been constructed and a connection is available to the site, Phase 2 of the development is intended to be constructed.

We understand that the modular buildings will be kept on-site and a new multi-storey building will be constructed to accommodate the increased master roll (1000 students).

Flow and pressure testing has not been completed on the existing network and will need to be undertaken at a future stage of the development. A fire engineer will need to provide advice on whether a sprinkler system will be required. However, we note pumps and tank storage may be required to achieve the required operating pressures.

The high use aquifer management area overlay, as per the AUP planning maps, is highlighted across the entire site. Refer to Appendix A**Error! Reference source not found.**. As there is a connection to the public reticulation there is no intention to take or use groundwater for the development.

8 Utilities

Before-U-dig records have been obtained for existing network utilities in Trig Road. Refer to Appendix D for further information.

8.1 Communications

The Vodafone BeforeUDig plans show a fibre cable has been installed along the western side of Trig Road. It is unknown if a connection has been made to the site.

There is an underground communications line running alongside the southern property boundary, east of Trig Road. This network is owned and operated by Vector.

Based on site observations, three telegraph poles were identified along the Trig Road property boundary. It is likely these poles will be made redundant and removed during construction of Phase 1 of the development.

8.2 Electricity

Overhead power supply runs along the western side of Trig Road. Based on the Vector plans, there is a distribution substation opposite the site within the Ryan's Road reserve area.

8.3 Gas

The BeforeUdig inquiry received from Vector advised that there are currently no gas pipelines within the vicinity of the site.

If gas is required for the development, Vector should be contacted once the demand for the development is known to confirm the design and possibility of a new connection.

9 Summary

The findings of the infrastructure services report are summarised as follows:

- The Ministery of Education is seeking to designate the site for education purposes. It envisages that the school development will roll out in two phases, where phase 2 will be developed when public infrastructure within the area has been constructed and connections to the site are available.
- There is currently no public stormwater infrastructure servicing the site. Stormwater Management Area – Flow 1 controls are proposed to be applied to the catchment to maintain and enhance the existing stream hydrology.
- Detention of higher storm events is not proposed. This is in accordance with a draft stormwater management plan for a plan change in progress for the area.
- There is no public wastewater reticulation to the site and on-site wastewater disposal will be required for Phase 1 school development.
- Onsite wastewater disposal has been investigated for Phase 1 of the development. A treatment field to support the primary school will likely be accommodated.
- Phase 2 of the development will not be constructed until a public connection to the reticulated wastewater network is available.
- A public water supply connection is available to the site. Flow and pressure testing has not been completed on the existing network.
- There is no gas connection available to the site.
- There are power and telecommunication utility services in the vicinity of the site. The services are expected to be able to service the proposed development.

10 Applicability

This report has been prepared for the exclusive use of our client Ministry of Education, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

We understand and agree that our client will submit this report as part of an application for a designation for educational purposes and that Auckland Council as the consenting authority will use this report for the purpose of assessing that application.

We understand and agree that this report will be used by Auckland Council in undertaking its regulatory functions in connection with the school development.

Tonkin & Taylor Ltd

Report prepared by:

....

Ashleigh Frew Nicola Morrice

Civil Engineer Senior Civil Engineer

Authorised for Tonkin & Taylor Ltd by:

.....

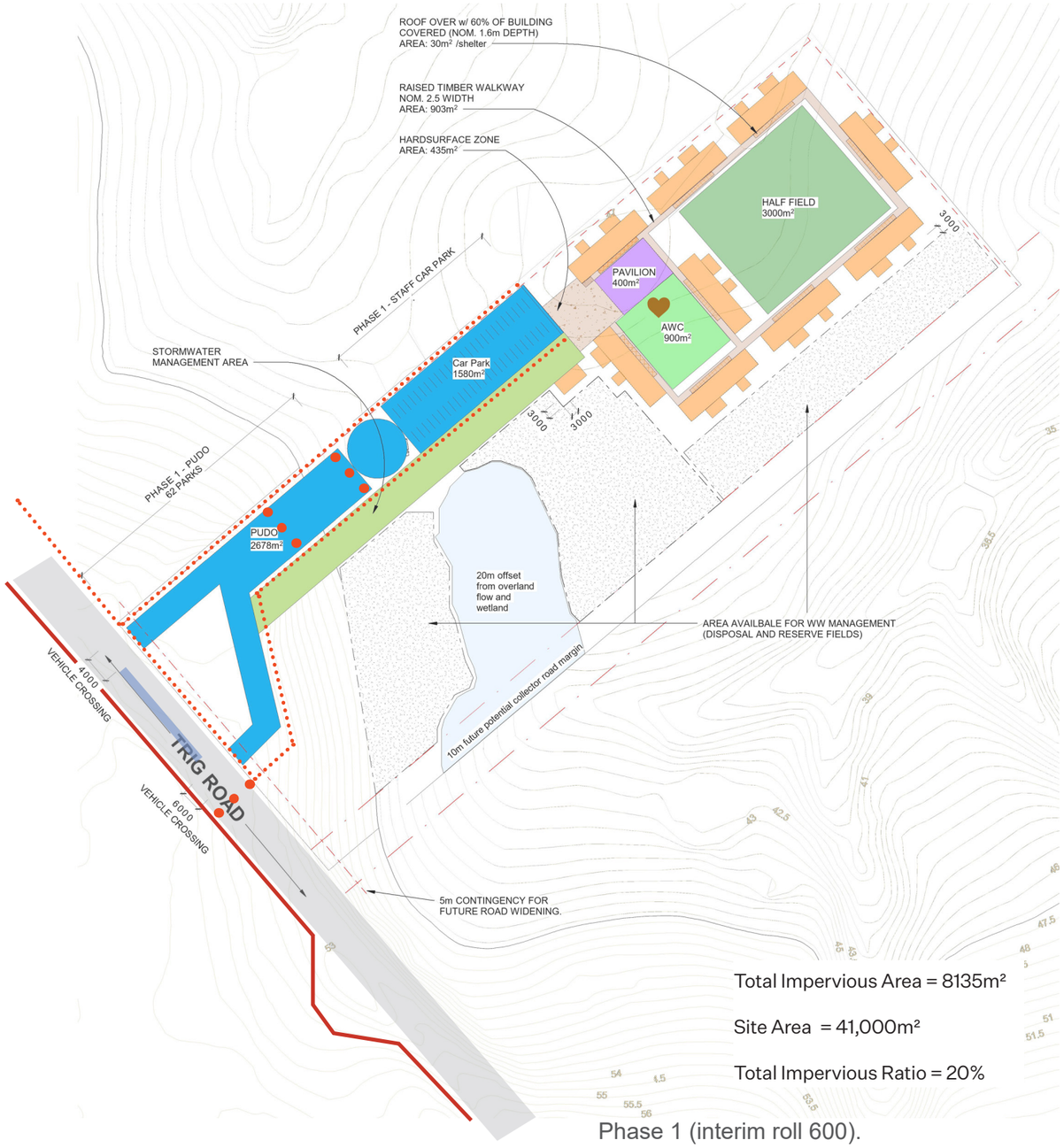
Glen Nicholson

Project Director

NMOR
\\ttgroup.local\files\aklprojects\1016524\issueddocuments\2021-06-04 civil feasibility report\20210609-1016524-civ-rpt-01 civil feasibility for 13-15 trig road, whenuapai.docx

Appendix A: Development Plan

1.4 Phase 1 & 2 Siting Study

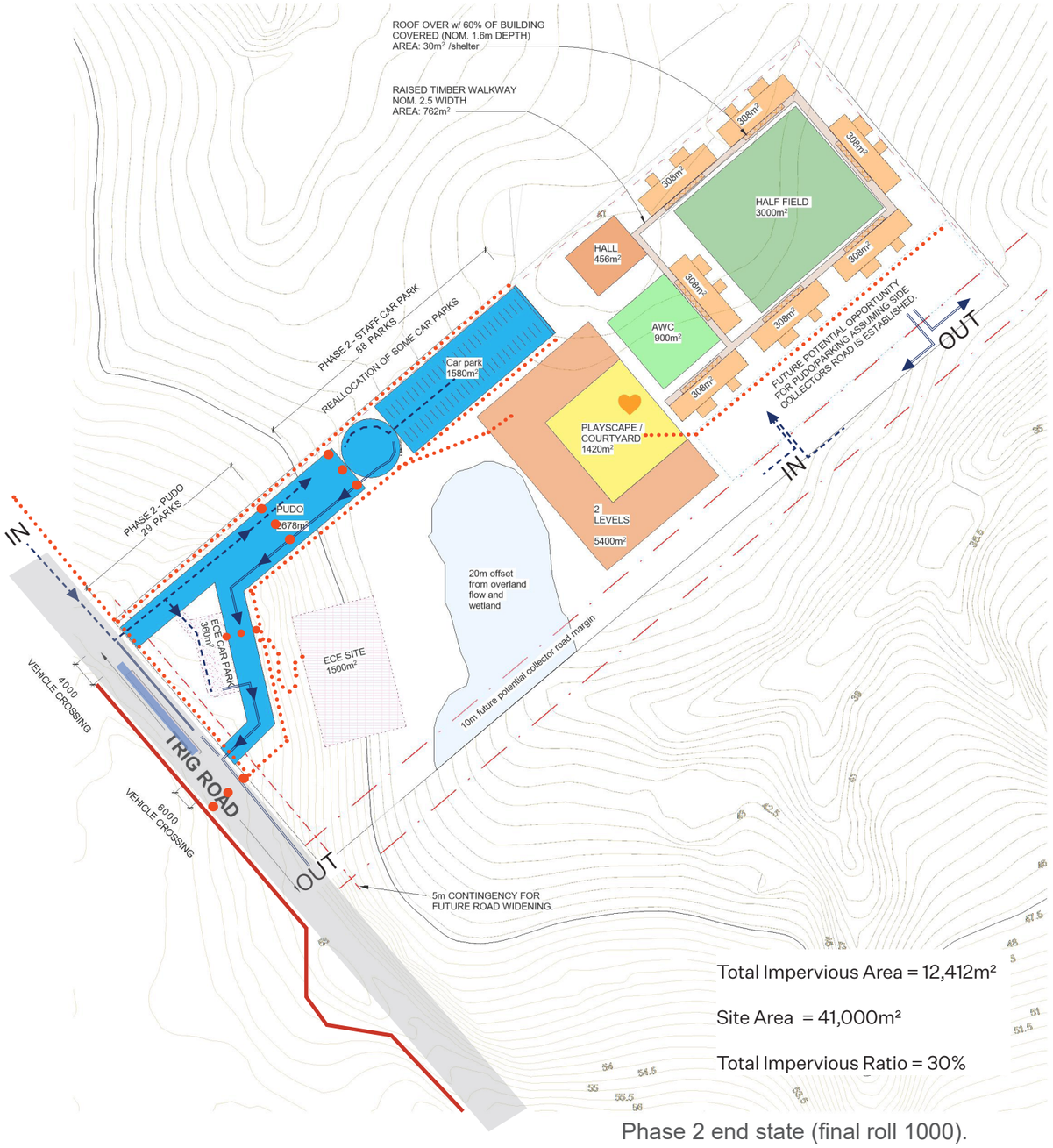


Total Impervious Area = 8135m²

Site Area = 41,000m²

Total Impervious Ratio = 20%

Phase 1 (interim roll 600).



Total Impervious Area = 12,412m²

Site Area = 41,000m²

Total Impervious Ratio = 30%

Phase 2 end state (final roll 1000).

Modular Buildings
Conceptual PUDO including footpaths
Right turn bay/flush median for entry and exit
Stormwater management Area

Adjacent Road
Traffic Flow: Vehicle-in
Traffic Flow: Vehicle-out
Existing Pedestrian Pathways

Proposed Pedestrian Pathways (Indicative Only)
Proposed Pedestrian Crossing (Raised)

Appendix B: Stormwater Management Plan

- Stormwater contaminants from legacy document Auckland Council Technical Publication 10

Table 4-6
Industrial activity and commonly found contaminants

Activity	Contaminant
Wood preserving activities	Arsenic, Copper, TSS, Oil and Grease
Industrial inorganic chemicals	Aluminium, Iron, Nitrate + Nitrite
Plastics, synthetic resins	Zinc
Soaps, detergents, cosmetics, perfumes	Nitrate + Nitrite, Zinc
Agricultural chemicals	Nitrate + Nitrite, Lead, Iron, Zinc, Phosphorus
Asphalt paving and roofing materials	TSS, Zinc, TPH
Concrete products	TSS, Iron, pH
Steel works	Aluminium, Zinc
Iron and steel foundaries	Aluminium, TSS, Copper, Iron, Zinc
Landfills	Iron, TSS, Aluminium, Cadmium, COD, Copper, Cyanide, Lead, Magnesium, Nitrate + Nitrite
Automobile dismantler yards	TSS, Aluminium, Iron, Lead, Oil and Grease, Zinc, Cadmium
Scrap recycling	Copper, Aluminium, Iron, Lead, Zinc, TSS, COD, Cadmium, Arsenic, Magnesium, Selenium
Fabricated metal products except coating	Iron, Aluminium, Zinc, Nitrate + Nitrite
fabricated metal coating and engraving	Zinc, Nitrate + Nitrite

Table 4-9
Potential contaminant removal effectiveness of stormwater management practices

Practice	Suspended Solids	Oxygen Demand	Total Lead	Total Zinc	Total Phosphorus	Total Nitrogen	Bacteria
API separators	-	o	o	o	o	o	o
Extended detention dry pond	+	>	+	>	>	-	o
Wet pond	+	>	+	>	>	-	o
Constructed wetland	+	+	+	+	+	+	o
Infiltration practices	+	+	+	+	+	>	+
Revegetation	+	+	+	+	>	>	-
Sand filter	+	-	+	+	>	-	>
Biofiltration (swale, filter strip, rain garden)	+	-	+	>	-	-	o

\+ High potential for removal > Moderate potential for removal
\- Low potential for removal o Insufficient knowledge

· Stormwater management requirements

Table 11 Extract from Table 3: Stormwater Management Requirements for Subdivision and development form WP3 SMP

Component	Principle/Approach	Minimum Requirements	Desirable
Design Approach	All subdivisions and development must apply an integrated stormwater management/water sensitive design approach through all phases of development, from planning through to construction	WSD is implemented to the extent practicable across the development	
Streams/natural wetlands	Intermittent and permanent streams and natural wetlands are retained, enhanced, and protected from the adverse effects of development and stormwater runoff	The location of all intermittent and permanent streams and wetlands within a subdivision or development are to be mapped. All intermittent and permanent streams are to be retained Riparian planting is provided for all intermittent and permanent watercourses All outfalls into streams shall be protected against erosion and designed/constructed in accordance with the SWCoP	Existing barriers to fish migration are removed or mitigated in permanent watercourses Erosion protection incorporates green infrastructure where feasible Setback outfalls from edge of streams where appropriate and practicable
Hydrology	Changes to natural hydrology are minimised in areas where developments discharge to permanent or intermittent streams Aquifer recharge and stream baseflows are retained	A SMAF control is applied to the W3P area	Stormwater retention is achieved by infiltration where it is feasible to do so
Water quality	Water quality impacts on streams and the coastal environment are minimised and water quality is enhanced through development	All new impervious areas over 1,000m2 shall be treated by a treatment device designed in accordance with TP10/GD012 Runoff from: • Commercial/industrial waste storage/handling or loading/unloading areas · Communal waste storage areas in apartments and multi-unit developments shall be treated by gross pollutant traps designed in accordance with GD01 unless otherwise treated by a stormwater device	The generation and discharge of contaminants is reduced at source as far as practicable. Low contaminant building products are utilised Water quality treatment shall be achieved on site unless there is a communal device, acceptable to Council

· Stormwater management options summary

Building roof runoff management

Location	Roof Area	Retention Volume (5mm runoff)	95th %ile detention volume (35mm rainfall depth)	Treatment volume	Retention device size: Gravel underdrain storage			Permeable Paving		Raingarden	Rainwater harvesting	Living roof (area available)	95th Percentile detention device size: Permeable Paving		Raingarden	Rainwater harvesting	Pipe detention storage	
					Length	Depth	Width	Area	Depth	Area	Tank size		Area	Depth	Area	Tank size	No. and ø	Length
	(m²)	(m³)	(m³)	(m³)	(m)	(m)	(mm)	(m³)	(mm)	(m²)	(L)	(m³)	(m³)	(mm)	(m²)	(L)	(mm)	(m)
Building 1	305	1.5	11		30	0.5	300	-	-	-	3500	305	-	-	-	15000	1 No. 675	30
Building 2	345	1.7	12		30	0.5	300	-	-	-	3500	345	-	-	-	15000	1 No. 750	30
Building 3	340	1.7	12		30	0.5	300	-	-	-	3500	340	-	-	-	15000	2 No. 750	30
Building 4	345	1.7	12		30	0.5	300	-	-	-	3500	345	-	-	-	15000	3 No. 750	30
Building 5	350	1.8	12		30	0.6	300	-	-	-	3500	350	-	-	-	15000	4 No. 750	30
Building 6	345	1.7	12		30	0.5	300	-	-	-	3500	345	-	-	-	15000	5 No. 750	30
Building 7	340	1.7	12		30	0.5	300	-	-	-	3500	340	-	-	-	15000	6 No. 750	30
Building 8	330	1.7	12		30	0.5	300	-	-	-	3500	330	-	-	-	15000	7 No. 750	30
Building 9	305	1.5	11		30	0.5	300	-	-	-	3500	305	-	-	-	15000	1 No. 675	30
Buildings Combined	3005	15.0	105		120	0.6	600	-	-	154	25000	3005	-	-	154	4 No 30000	2 No. 750	120
Pavillion	400	2.0	2.0		20	1.0	300	-	-	-	3500	400	-	-	-	15000	2 No. 675	20

Paved surface runoff management

Location	Area	Retention Volume (5mm runoff)	95th Percentile detention volume (35mm	Treatment volume	Retention device size: Gravel underdrain storage			Permeable Paving		Raingarden	Rainwater harvesting	Living roof (area available)	95th Percentile detention device size: Permeable Paving		Raingarden	Rainwater harvesting	Pipe detention storage		Treatment: Raingarden	Swale		
					Length	Depth	Width	Area	Depth	Area	Tank size		Area	Depth	Area	Tank size	No. and ø	Length	Area	Length	Top width	Grade
	(m²)	(m³)	(m³)	(m³)	(m)	(m)	(mm)	(m³)	(mm)	(m²)	(L)	(m³)	(m³)	(mm)	(m²)	(L)	(mm)	(m)	(m²)	(m)	(m)	%
PUDO	3300	16.5	116	0.009	80	0.98	600	695	79	168.00	-	-	695	554	168	-	3 No. 825	80	70	116.00	3.48	4
Staff Carpark	1580	7.9	55	0.004	65	0.58	600	720	37	81.20	-	-	720	256	81	-	2 No.750	65	30	86.00	3.12	4

Maximum probable development of the site (70% impervious area)

Location	Area	Retention Volume (5mm runoff)	95th Percentile detention volume (35mm	Treatment volume	Retention device size: Gravel underdrain storage			Permeable Paving		Raingarden	Rainwater harvesting	Living roof (area available)	95th Percentile detention device size: Permeable Paving		Raingarden	Rainwater harvesting	Pipe detention storage		Treatment: Raingarden	Swale		
					Length	Depth	Width	Area	Depth	Area	Tank size		Area	Depth	Area	Tank size	No. and ø	Length	Area	Length	Top width	Grade
	(m²)	(m³)	(m³)	(m³)	(m)	(m)	(mm)	(m³)	(mm)	(m²)	(L)	(m³)	(m³)	(mm)	(m²)	(L)	(mm)	(m)	(m²)	(m)	(m)	%
HCGA	7088	17.0	216	67.300	150	0.54	600	720	79	356	-	-	720	1000	356	-	3 No.825	150	142	150.0	4.1	4
Other	12758	31.0	389	121.200	200	0.74	602	720	144	640	-	-	720	1801	640	-	4 No.825	200	255	185.0	4.7	4

Appendix C: Onsite wastewater management

1016524
Concept WW Calculations

On site wastewater disposal site considerations

Tonkin+Taylor

1.0 Geotechnical Constraints

Ground water level:
Has not been assessed it is recommended this is confirmed during preliminary design

Soil Category:
Conservatively assumed | Category 4-6

Table 16: GD06 soil category description

Soil category	Soil texture [Note 1]	Soil structure [Note 2]	Typical clay content	Indicative permeability (K_{sat}) (m/d) [Note 3]
4	Sandy clay loam, fine sandy clay, clay loam, silty clay loam	High/moderate structure	20 – 30%	0.5 – 1.5
		Weakly structured	20 – 30%	0.12 – 0.5
		Massive	25 – 35%	0.06 – 0.12
5	Sandy clay, light clay, silty clay	Strongly structured	35 – 45%	0.12 – 0.5
		Moderately structured	35 – 40%	0.06 – 0.12
		Weakly structured or massive	40 – 50%	< 0.06
6	Clays (including swelling and grey) and hard pan	Strongly structured	40 – 55%	0.06 – 0.5
		Moderately structured	>50%	< 0.06
		Weakly structured or massive	>50%	< 0.06

3.0 Land Application Method

Suitable disposal for category 5

Shallow irrigation systems

Pressure compensating drip irrigaton (surface and subsurface)	PCDI
Needs secondary treatment	
Low pressure pipe subsurface irrigation	LPP
Low pressure effluent distribution subsurface irrigation	LPED
Low pressure effluent distibution surface trickle irrigation	LPED

*Note shading denotes applicable use in soil type 5. However special design precautions are required in these soil conditions

Concentional land application system
- Conventional trenches
- Shallow trenches

2.0 Land gradient

Table 18: Slope gradient limitations for various land application systems

Land application system	Slope gradient limitations*	Notes
Surface irrigation (spray, drip and low-pressure effluent distribution irrigation)	<5.7° (10%)	• Due to risks of effluent run-off during wet weather. • Assumes little disturbance occurs during construction. • This is limited by natural infiltration rate and even distribution.
Subsurface drip irrigation (i.e. pressure compensating drip irrigation)	<16.7° (30%)	• All irrigation lines should be installed along the land contours. • If this is not possible, and if the lines have non-leak emitters, then lines may run through contour lines in accordance with the manufacturer's specifications. • A copy of the specifications should be included with the system design for approval.
Subsurface low-pressure effluent distribution or low-pressure pipe	<8.5° (15%)	• Shallow and narrow trenches for low pressure effluent distribution or low-pressure pipe systems must be constructed along the contour.
Evapotranspiration beds	<5.7° (10%)	• High soil disturbance and erosion issues may arise during construction on steeper slopes.
Trenches and beds, including discharge control trenches and beds	<8.5° (15%)	• Construction becomes difficult and costly when slopes are high. • High soil disturbance and erosion issues may arise during construction on steeper slopes.
Mounds	<8.5° (15%)	• High soil disturbance and erosion issues may arise during construction on steeper slopes.

All slope gradients on the proposed site appear to be less than 30%, with the majority of the site less than 10%

Created by: AFRE 12/02/2021
Checked: JAAH 25/02/2021

4.0 Set backs

Table 20: Minimum setback distance from edge of land application area to edge of site feature for different effluent treatment levels

Site feature	Soil category	Primary treated (septic tank + effluent filter)	Secondary treated (e.g. AWTS)	Advanced secondary (e.g. Packed bed reactor)	Tertiary (disinfection) [Note 6]	Advanced tertiary (nutrient reduction and disinfection) [Note 7]	Notes
3: Surface waters [Note 3] including streams (to top of streambank), downslope stormwater drains or downslope drainage channels, wetlands, estuaries, coastal marine area at high tide mark, dams or lakes and overland flow paths	Soil category 1 Soil category 2 Soil category 3-5 Soil category 6	[Note 5] 20 m 20 m [Note 5]	15 m 15 m 15 m 20 m	12.5 m 12.5 m 15 m 15 m	10-12.5 m 10-12.5 m 10-15 m 10-15 m	10 m 10 m 10 m 10 m [Note 9]	Setbacks should be measured from the top edge of surface water. For steep sloping land (where only pressure compensating drip irrigation can be used), additional minimum setbacks for surface waters may be needed: ○ Add 1 m for every degree over 10° (17.6%) with no land steeper than 18° (33%) New subdivisions should have minimum setbacks of 15 m (with additional set back based on gradient) [Note 4]. For coastal marine areas setback distances should be a minimum of 15 m above mean high water spring.
4: Services							
4a: High risk underground pipework (trenched, downslope of land application area, etc.)		10 m	5 m	3 m	2 m	1.5 m	Pipes in trenches in gravel, sand or scoria can act as a conduit for wastewater and may require additional setback distances as applicable for surface water above.
6: Groundwater	Soil category 1 Soil category 2 Soil category 3-5 Soil category 6	[Note 5] 1.5 m 1.2 m [Note 5]	1.5 m 1.2 m 0.9 m 0.6 m	1.2 m 0.9 m 0.6 m 0.6 m	1.0 m 0.6 m 0.6 m 0.6 m	0.9 m 0.6 m 0.6 m 0.6 m	Measured vertical distance from base of land application system (e.g. pipes or trench) to seasonal high-water table. Groundwater setbacks for subdivisions should be greater than 1 m
7: Floodplain (located outside of % AEP floodplain) [Note 8]		1%	5%	5%	5%	5%	AEP is Annual Exceedance Probability and is equivalent to: 1% AEP (one in 100 year), 5% (one in 20 year).

5.0 Maximum Occupancy

School roll information provided by the Ministry of Education

We understand the site is intended to be developed for educational purposes in two phases:
Phase 1 – Overflow school to serve a shortfall in the school network capacity in Whenuapai North, Redhills and Hobsonville.
Phase 2 - School (Yrs 0-8) and Early Childhood Education (ECE) to serve the long term needs of the local adjacent school catchment as the adjacent area is live zoned and developed for urban purposes.

Based on discussions with the Ministry of Education (MOE), we understand Phase 1 of the development will include a primary school (Years 0 to 8) with a temporary master plan roll of 600 and is intended to be constructed during 2022. As there is currently no public stormwater and wastewater infrastructure in the vicinity of the site, on-site wastewater and stromwater will be required to service Phase 1. Once the public reticulation in the vicinity of the school has been confirmed and constructed, the MoE intends to construct Phase 2 of the development, expanding the master plan roll to 1000 students + ECE facility with capacity for 50 children.

The on-site wastewater calculations below are based solely on Phase 1 of the development (600 student

Phase	No. Primary Students
1	600

Assumed staff numbers (calculated based on the information provided on MoE website and tables below)

Whenuapai Campus	Staff (estimated)
	Phase 1
Primary	33

The following table shows the ratios we use to calculate curriculum staffing for all schools.

TEACHER TO STUDENT RATIOS BY YEAR LEVELS AND ROLL TYPE

YEAR OF SCHOOLING	MĀORI IMMERSION TEACHER TO STUDENT RATIO	NON-MĀORI IMMERSION TEACHER TO STUDENT RATIO
Year one	1:15	1:15
Year 2-3	1:18	1:23
Year 4-8	1:18	1:29
Year 9-10	1:20	1:23.5
Year 11	1:20	1:23
Year 12	1:18	1:18
Year 13 or above	1:17	1:17

ROLL WEIGHTING BY YEAR LEVEL

YEAR LEVEL	ROLL WEIGHTING
1-3	4.0
4-8	3.5
Technology education (7-8)	0.5
9-10	7.0
11	9.0
12	15.0
13+	16.0

https://www.education.govt.nz/school/funding-and-financials/resourcing/school-staffing/entitlement-staffing/#Curr

Estimated total population of Phase 1 (students + staff) 633

6.0 Design Parameters

GD06 - Table 24: Domestic wastewater flow allowances - per capita

Category	Source	Typical wastewater flow allowance per capita L/person/day	
		On-site roof water tank supply [Note 1]	Reticulated community or bore water supply
Schools (pupils plus staff) [Note 10]		15 – 30	15 – 30

10) Figures from the lower end of the range should be supported by actual water usage records. Additional allowances also need to be made in the design flows for schools that also have cafeterias (with on-site catering) and/or gyms with shower facilities.

Phase	1	
Low use	9,495	L/day
High use	18,990	L/day

AUP 5.6.2.1 - Permitted activity
Ratio of site area to discharge volume must be greater than **1.5m²** per litre per day.

Proposed development site area 40,469 m²

Phase	1	
Low use	4.3	m²/L/day
High use	2.1	m²/L/day

Calculations indicate the AUP requirement is met.

7.0 Design requirements

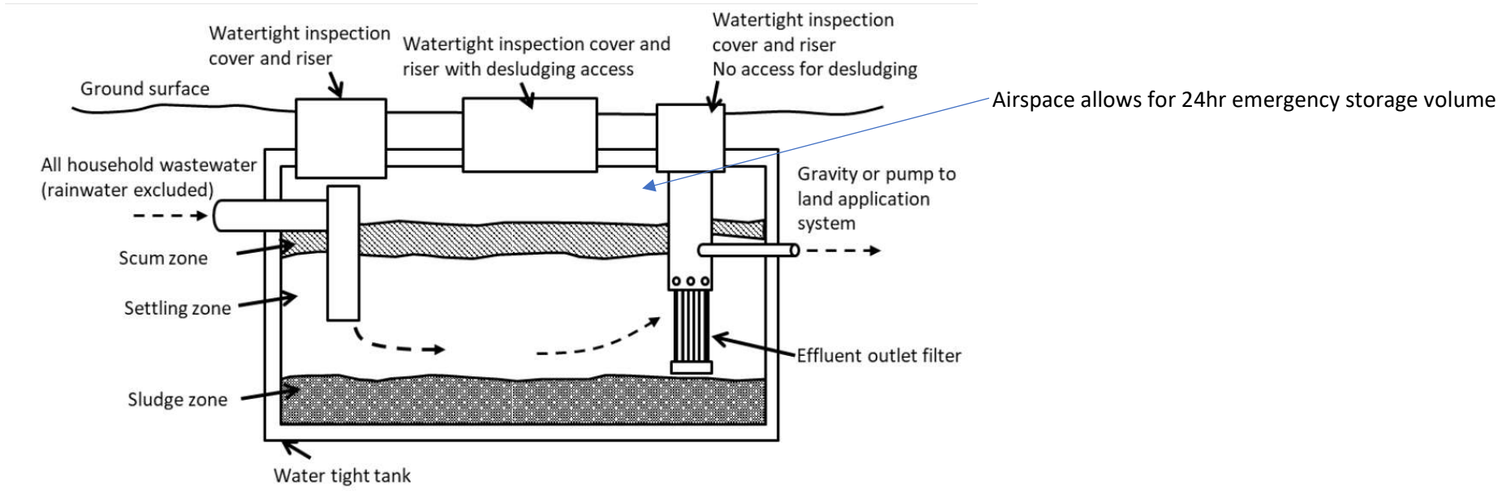


Figure 6: Conventional septic tank

Note:
Grease traps will reduce the storage required as the storage capacity should be two to three times the discharge from the kitchen.
This has not been included in the concept calculation

Minimum combined total retention capacity (prior to secondary treatment) of at least 3-5days of average flow volume as per GD06 Section D1.4.2

Phase 1	m^3/day
Daily flow (low value)	9.5
3 day volume	28.5
5 day volume	47.5
Daily flow (high value)	19.0
3 day volume	57.0
5 day volume	95.0

Phase 1 scenario		No. tanks
Based on daily flow low value	Hynds concrete tank 7.6 m^3	
	Number of tanks (3 day design flow)	4
	Number of tanks (5 day design flow)	7
	Promax plastic tank 6 m^3	
	Number of tanks (3 day design flow)	5
	Number of tanks (5 day design flow)	8
Based on daily flow high value	Hynds concrete tank 7.6 m^3	
	Number of tanks (3 day design flow)	8
	Number of tanks (5 day design flow)	13
	Promax plastic tank 6 m^3	
	Number of tanks (3 day design flow)	10
	Number of tanks (5 day design flow)	16

TABLE 1 **Septic Tanks North Island**

Product Code	Description	Dim A (mm)	Dim B (mm)	Dim C (mm)	Dim D (mm)	Dim E (mm)	Mass (kg)	Load case
7600 HAMILTON & AUCKLAND								
SEP7600T	Septic tank conc 7600L 1 chamber - no lid	2145	3240	1510	1330	1280	4260	1&2
SEP7600TFB	Septic tank conc 7600L 1 chamber, flange base - no lid	2425	3540	1510	1330	1280	5215	1&2
SEP7600L150	Septic tank lid conc 7600L 150mm thick (lid only)	2145	3240	160			2580	1&2

8.0 Design loading/irrigation rates

Table 42: Soil categories and recommended maximum design loading rate (DLR) or design irrigation rate (DIR) for treated wastewater land application

Soil category [Note 9]	Soil texture	Soil structure	Indicative permeability K_{sat} (m/d)	Recommended maximum design loading rate (DLR) or Design irrigation rate (DIR) – mm/day								
				Trenches [Note 7]		Beds [Note 8]		ETS beds and trenches	Sub-surface and surface irrigation (e.g. PCDI)	LPED	Mounds	Bottomless sand filter
				Primary treated effluent	Secondary treated effluent	Primary treated effluent	Secondary treated effluent					
4	Sandy clay-loam, clay-loam and silty clay-loam	High/moderate structured	0.5 – 1.5	10	30	Not advised	Not advised	12	3.5 [Note 3]	3	Not advised Note 2	
		Weakly structured	0.12 – 0.5	6	20			8		3		
		Massive	0.06 – 0.12	4	10			5		3		
5	Sandy clay, non-swelling clay and silty clay	Strongly structured	0.12 – 0.5	5 [Note 2]	12 [Note 2]	Not advised	Not advised	8	3 [Note 3]	2.5 [Note 5]		
		Moderately structured	0.06 – 0.12	Not advised	10 [Note 2]			5		2.5 [Note 5]		
		Weakly structured or massive	< 0.06		8 [Notes 2 & 6]			5 [Note 6]		2.5 [Note 5]		
6	Swelling clay, grey clay, hardpan	Strongly structured	0.06 – 0.5	Not advised	Not advised	Not advised	Not advised	Not advised	2 [Note 4]	Not advised		
		Moderately structured	< .06									
		Weakly structured or massive	< .06									

Basal loading

Areal loading

Basal loading

Notes:

3) PCDI systems should be installed at a depth of 100-150 mm into good quality *in-situ* or imported topsoil of depth 250 mm for all soil categories.

4) For Category 1 soils, recommended PCDI design irrigation rate (DIR) is 5 mm/d, into 250 mm good quality topsoil. If further groundwater protection is required, the DIR may be reduced to 4 mm/d or 3 mm/d, as a risk reduction measure. For Category 2 soils (free to good drainage characteristics), the drip irrigation system should be installed within an adequate depth of topsoil (minimum 250 mm of *in-situ* or imported topsoil) to slow the soakage and assist with nutrient reduction. For Category 1, 2 and 6 soils, drip irrigation systems should be installed at a depth of 100-150 mm, within good quality topsoil.

PCDI	**3 mm/day**

(Assuming category 5 soil)

Note: AUP E5.6.2.1 requirements

(c) the land disposal system must comprise pressure compensating dripper irrigation with an area loading rate dependant on soil category, but no greater than 5mm/day; and

9.0 Field Sizing

Note field size has been calculated based on the expected waste water generated. Refer to calculation 6.0. AUP indicates PCDI is the preferred treated wastewater land application method. Based on this, only the PCDI method has been considered in the following calculations.

Areal Loading

Based on Phase 1 of the development

PCDI - Design land application area (m^2)	
Low flow	**3,165 m^2**
High flow	**6,330 m^2**

Areal loading typically applied for shallow irrigation systems.

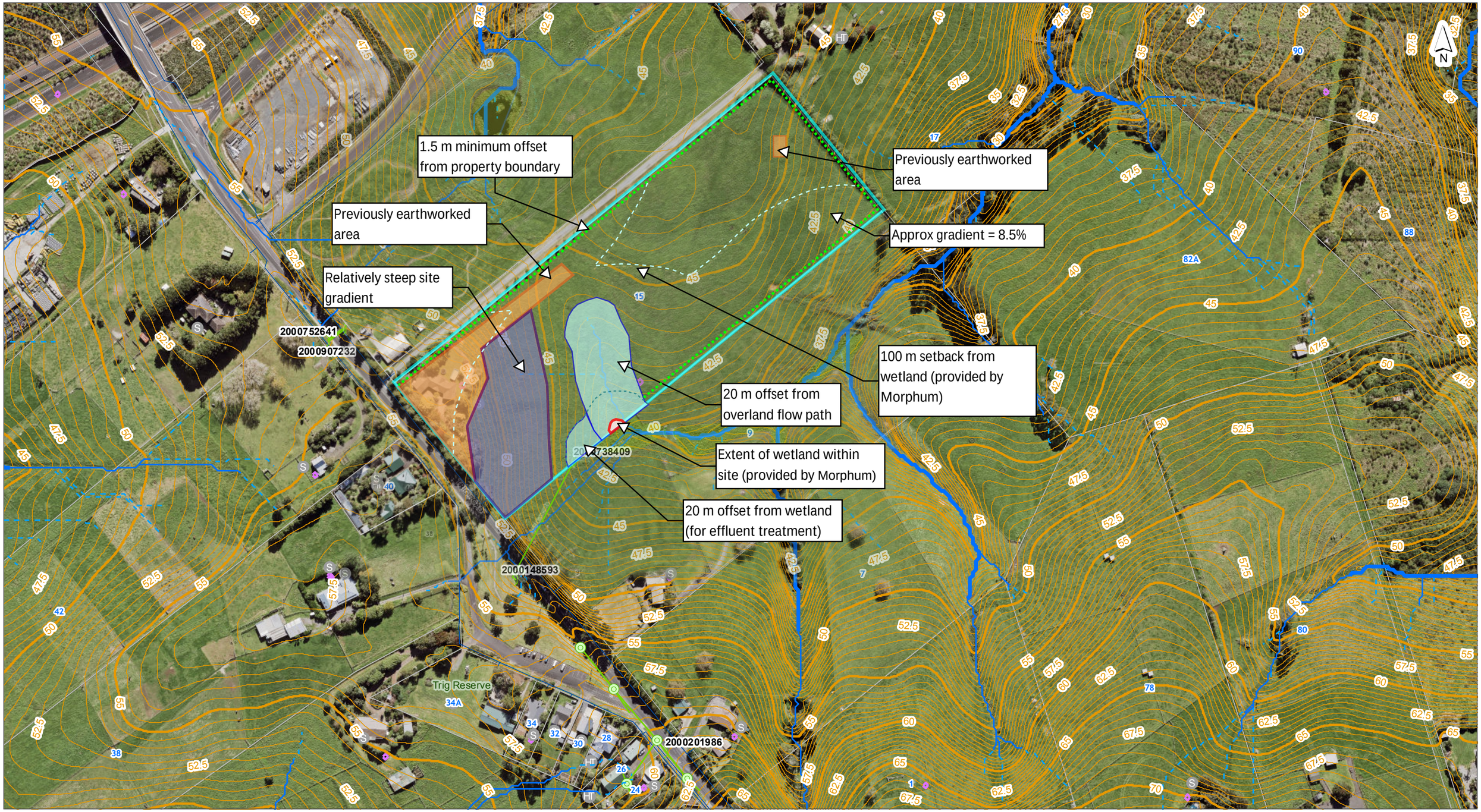


Figure 1 - Wastewater site constraints plan

0 25 50 75
Meters

Scale @ A3
= 1:2,500

Date Printed:
24/02/2021

Auckland Council
Te Kaunihera o Tāmaki Makaurau

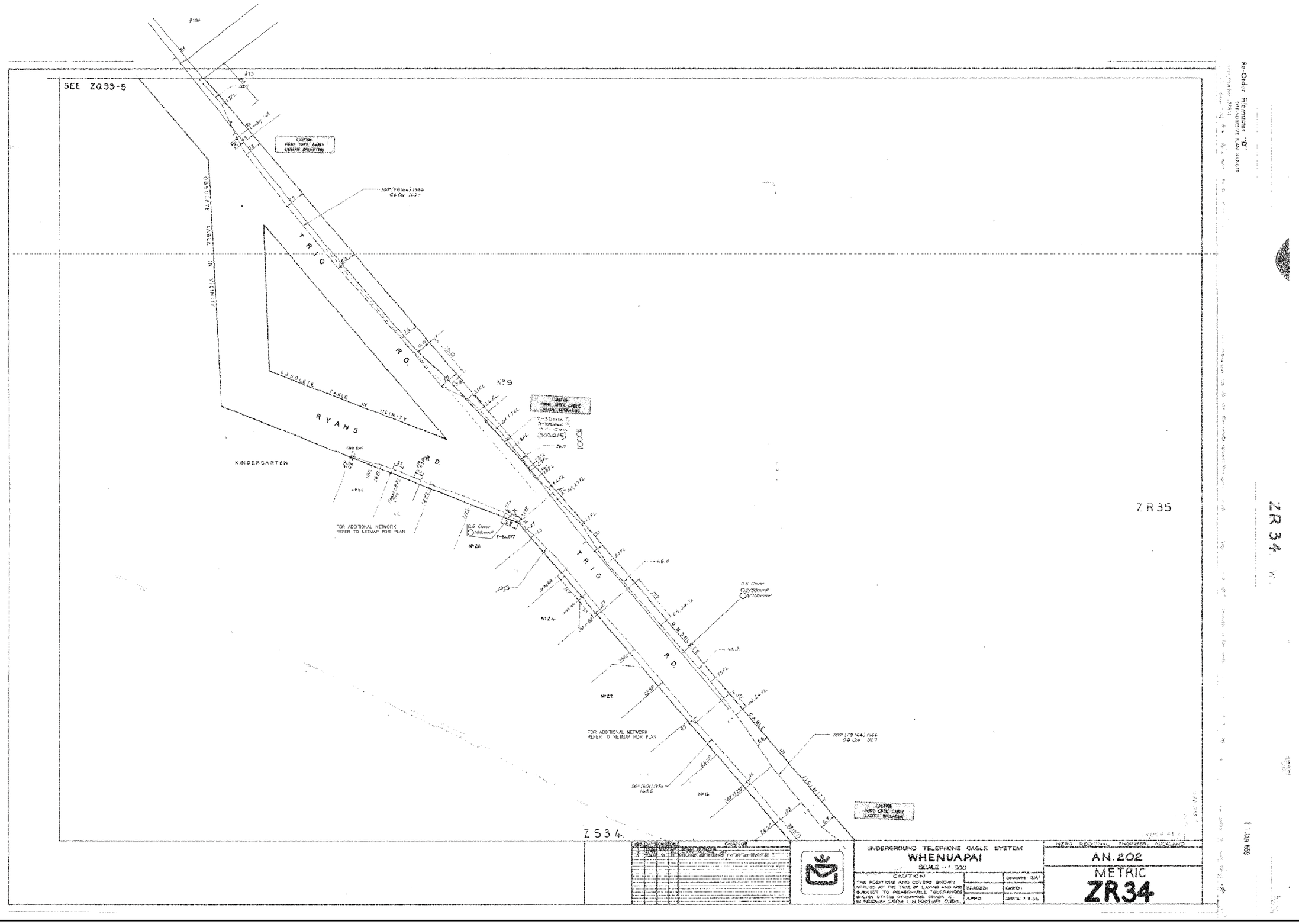
Appendix D: BeforeUDig Information

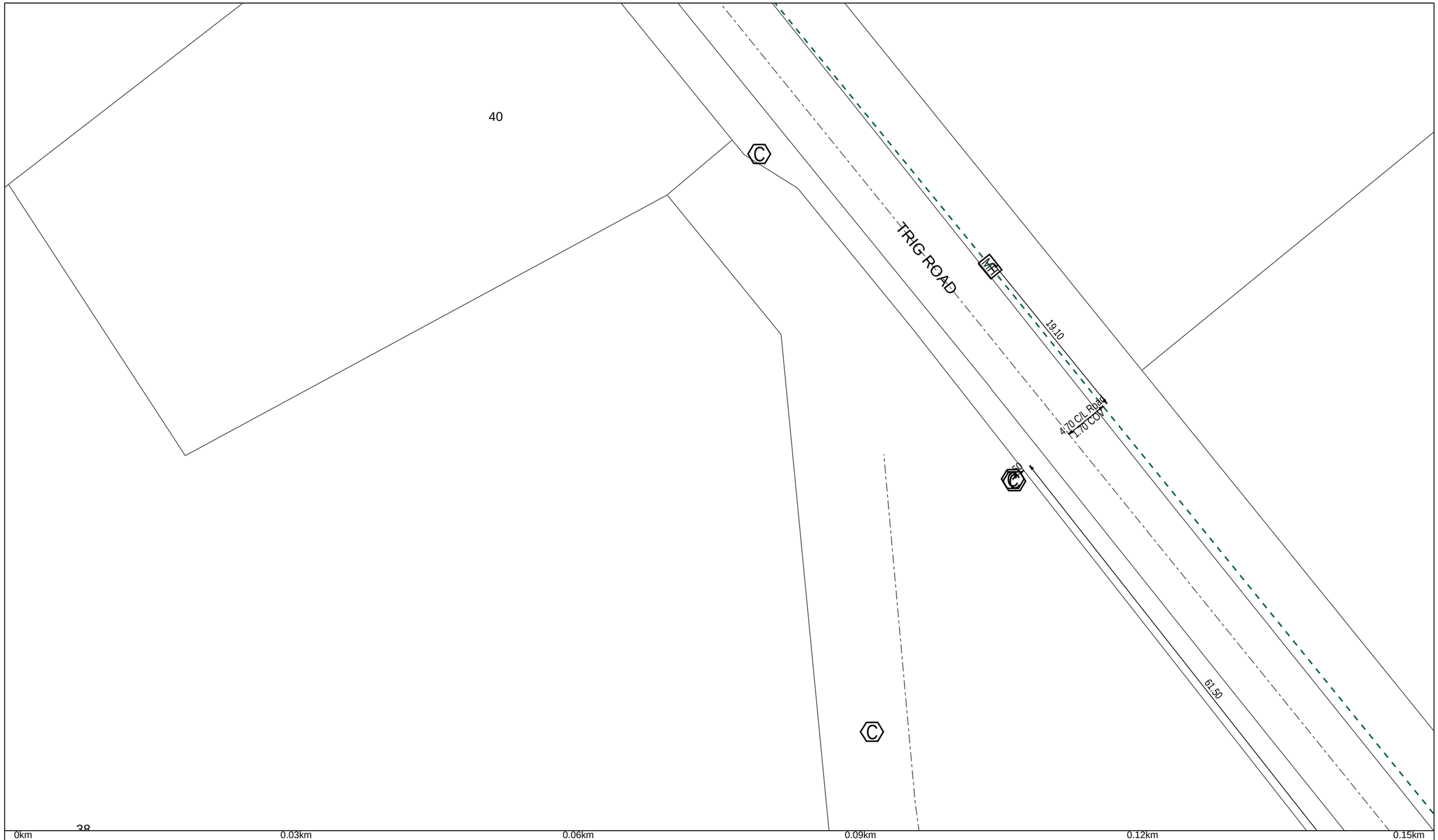
CHORUS

WARNING: Buried services are widespread and it should be assumed that they are present until it is proven otherwise.
Cables should be expected to be found at ANY depth.
In most instances Chorus plans do NOT show house service feeds on private property.
Refer to cover letter provided with your request for additional information - use all plans provided in conjunction with each other
You are responsible for interpreting the information provided and should refer to Worksafe.govt.nz for the 'Guide for safety with underground services'
For assistance contact Chorus Network Protection on 0800 822 003 or if you suspect damage has occurred contact 0800 463 896 opt 2

N

Plan Name	ZR34
Plan ID	90418
Version	GC
Current at	19/01/2021





Vector communications

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In the event of damage to equipment please remain clear of the area and immediately phone:

Electricity - 0508 VECTOR (0508 832 867)

Gas - Auckland area call us on 0800 764 764. If you hit a gas pipeline in the rest of the North Island call FIRST GAS on 0800 800 393. If you hit a gas transmission pipeline call FIRST GAS on 0800 734 567

Communication Cable - 0800 826 436

Title:

Company Name:

Customer Contact:

Output: Page 3 | Scale: 1:400

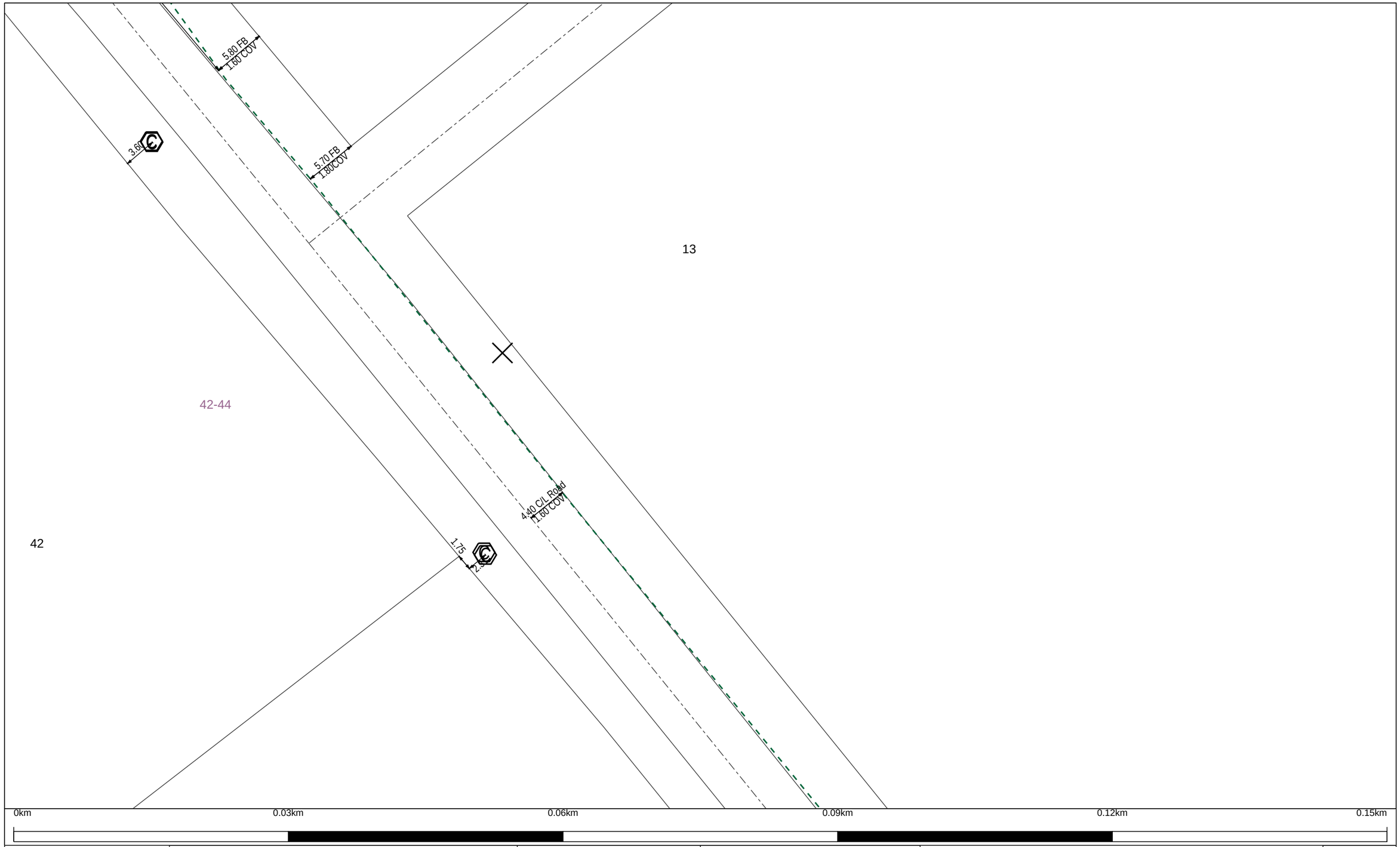
Printed by: swadmin | **Date printed: 19/01/2021**

Legend

Strand & Structure [Gis]

- Pole.Location Active Concrete
- Pole.Location Inactive Concrete
- Underground Route.Route Active
- MH Underground Utility Box.Location Active Manhole

N W E S



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Communication Cable - 0800 826 436

Title:

Company Name:

Customer Contact:

Output: Page 4 | Scale: 1:400

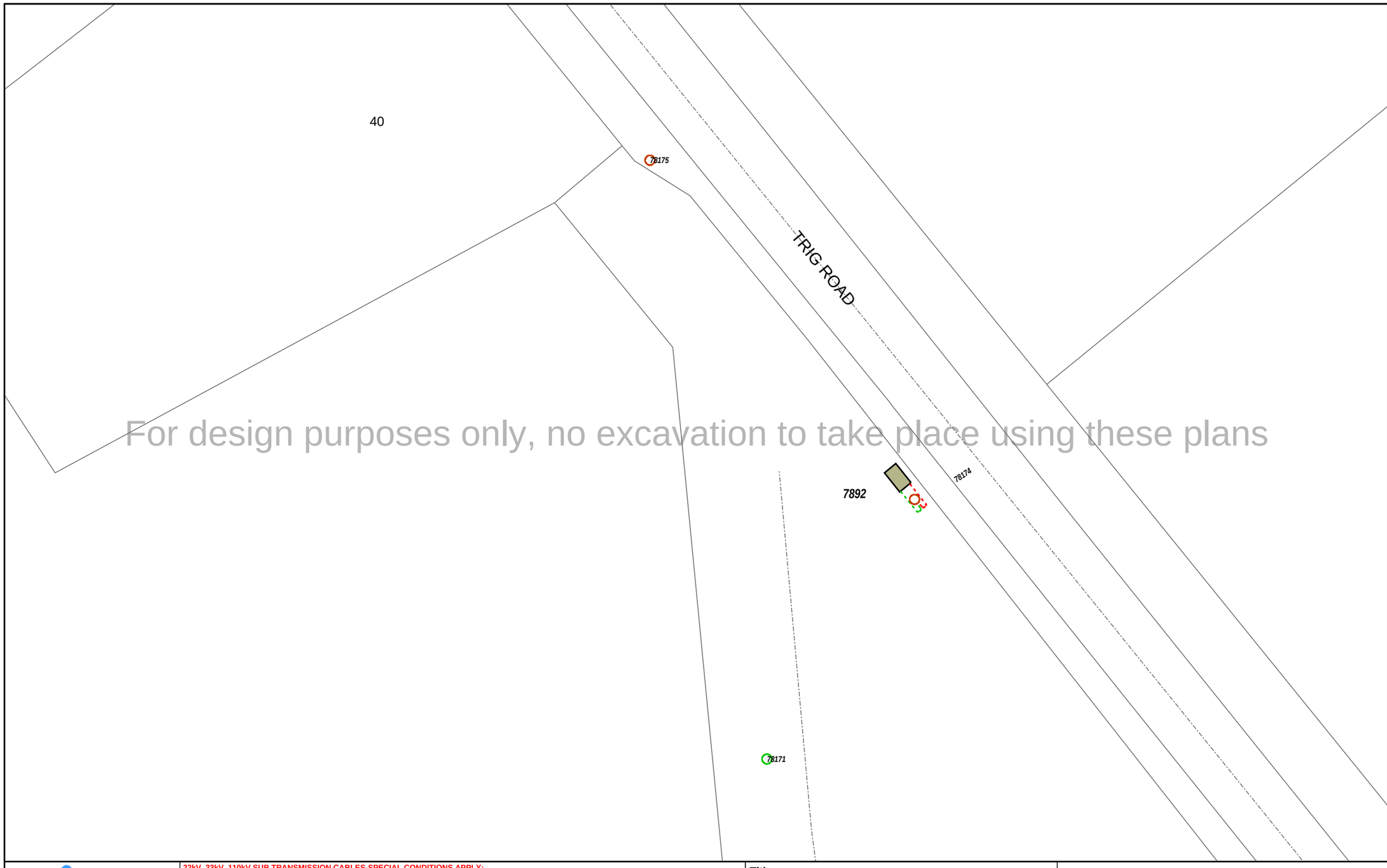
Printed by: swadmin | **Date printed: 19/01/2021**

Legend

Strand & Structure [Gis]

- Pole.Location Active Concrete
- Pole.Location Inactive Concrete
- Pole.Location Inactive Power
- Underground Route.Route Active

N W E S



CABLE COLOUR CODE

CABLES IN USE
- 110,000 - 22,000 volt subtransmission
- 22,000 volt
- 11,000 - 6,600 volt
- 400 volt
- Streetlight
- Pilot / Fibre Optic

CABLES NOT IN USE
- 110,000 - 22,000 volt subtransmission
- 22,000 volt
- 11,000 - 6,600 volt
- 400 volt
- Streetlight
- Pilot / Fibre Optic

JOINTS & SEALING ENDS
- 110,000 - 22,000 volt subtransmission
- 22,000 volt
- 11,000 - 6,600 volt
- 400 volt
- Streetlight
- Pilot / Fibre Optic
- NOT IN USE

SYMBOL LEGEND

- TUNNEL
- DUCT BANK
- FIBRE OPTIC DUCT
- TRENCH
- PILLAR
- PIT
- DISTRIBUTION SUBSTATION
- POLES
- LAMP
- CESSPIT
- MANHOLE
- FIRE HYDRANT
- DRAIN
- FIBRE OPTIC PIT
- EARTHWIRE & RODS

DUCT CROSS SECTIONS mm

25 50 80 100 150 200 250 300

WORK MANAGEMENT
- IN PROGRESS
- ON HOLD
- PLANNED

vector

22kV, 33kV, 110kV SUB TRANSMISSION CABLES-SPECIAL CONDITIONS APPLY:

Vector Limited provides a free standover service that requires 2 working days notice. Hand digging is required when excavating within 1 metre of the cable. Replacement trench backfill material must be the same as that removed and it must be replaced to the same level of compaction. Refer to attached covering letter for additional information.

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Vector reminds you of your responsibilities under the Health and Safety at Work Act 2015, whereby you must establish the location of underground services before commencing excavation.

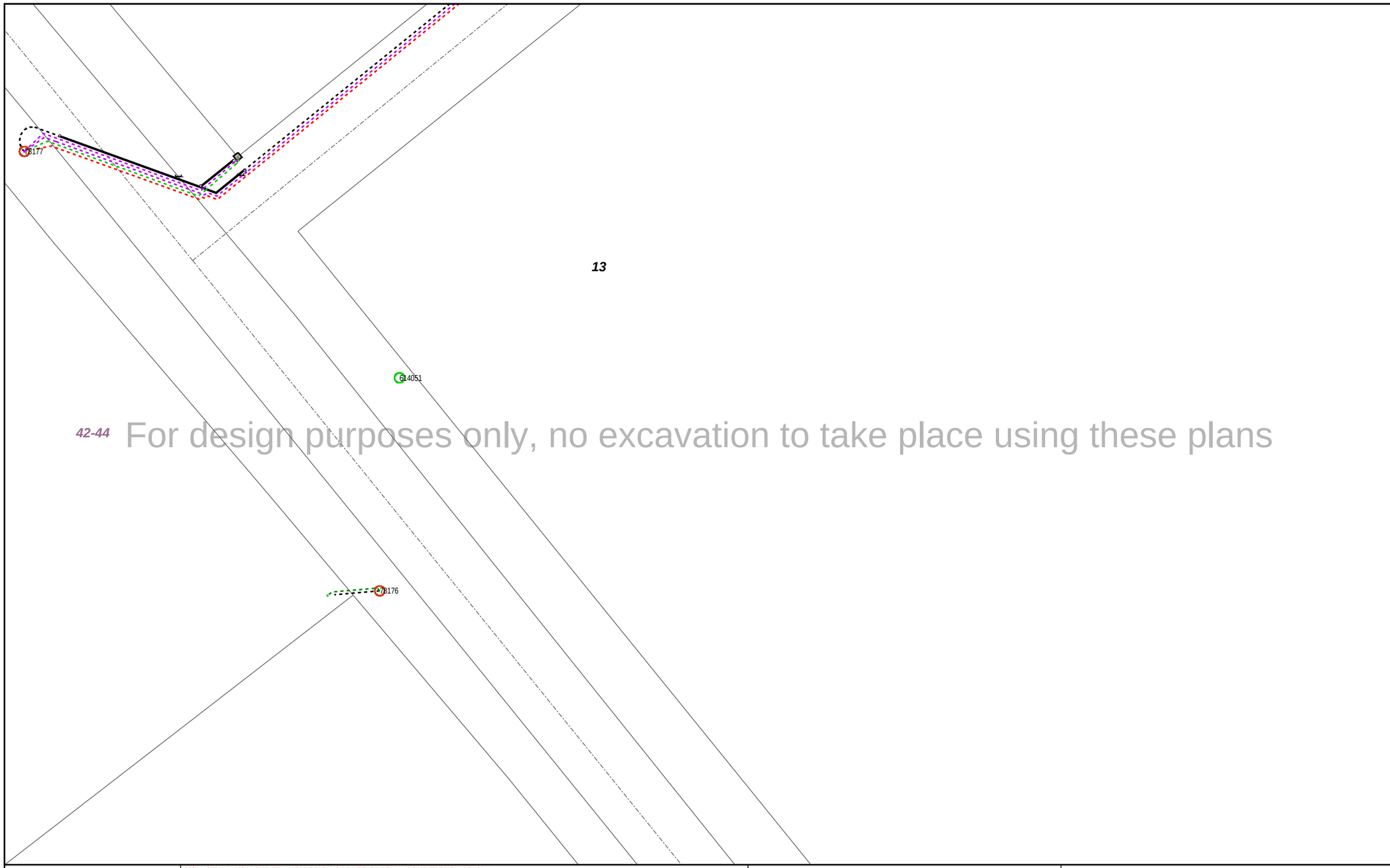
If you hit an electricity cable or overhead line please call us immediately on 0508 VECTOR (0508 832 867). If you hit any gas pipeline call the Fire Service first on 111. If you hit a gas distribution pipe in the Auckland area call us on 0800 764 764. If you hit a gas pipeline in the rest of the North Island call FIRST GAS on 0800 800 393. If you hit a gas transmission pipeline call FIRST GAS on 0800 734 567. If you hit a communications cable (all areas) call us immediately on 0800 826 436 (select option 1).

Title:

Request Title:	
Company Name:	
Usage:	Request ID: 9038714
Request for:	Scale: 1:400
Customer Contact:	Printed by: swadmin
Phone:	Date printed: 19. January 2021
Client Reference:	Page: 4 of 18

A3 ELECTRICITY OBSTRUCTION PLAN

N W E S



CABLE COLOUR CODE

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- 22,000 volt
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- Streetlight
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- NOT IN USE

SYMBOL LEGEND

- TUNNEL
- DUCT BANK
- FIBRE OPTIC DUCT
- TRENCH
- PILLAR
- PIT
- DISTRIBUTION SUBSTATION
- POLES
- LAMP
- CESSPIT
- MANHOLE
- FIRE HYDRANT
- DRAIN
- FIBRE OPTIC PIT
- EARTHWIRE & RODS

DUCT CROSS SECTIONS mm

25 50 80 100 150 200 250 300

WORK MANAGEMENT
- IN PROGRESS
- ON HOLD
- PLANNED

vector

22kV, 33kV, 110kV SUB TRANSMISSION CABLES-SPECIAL CONDITIONS APPLY:

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Title:

Request Title:	
Company Name:	
Usage:	Request ID: 9038714
Request for:	Scale: 1:400
Customer Contact:	Printed by: swadmin
Phone:	Date printed: 19. January 2021
Client Reference:	Page: 5 of 18

A3 ELECTRICITY OBSTRUCTION PLAN

N W E S

20/1/2021 kumar100 TOP

15 Trig Road

OVERVIEW

DATE	SCALE	vodafone
20/1/2021	1:3500	

ELIZABETH

CYRILL

LUCKENS

SH 18

TRIG RD

HOBSONVILLE RD

SEE GIS PLAN

NORTH

30F FIBRE OPTIC CABLE IN
1/50mm PVC DUCT 0.6cov

PIT
1200x600x600mmD

30F FIBRE OPTIC CABLE IN
1/50mm PVC DUCT

NOT TO SCALE

2 4" 6"

2.4 BL 2.3 Cov
2.6 BL 2.7 Cov
2.8 BL 2.6 Cov
2.6 BL 2.6 Cov
2.4 BL 2.4 Cov
2.6 BL 2.5 Cov
2.8 BL 2.5 Cov
2.2 BL 1.9 Cov
2.6 BL 2.7 Cov
2.6 BL 2.6 Cov
#5
2.5 BL 2.5 Cov
2.2 BL 2.8 Cov
1.8 BL 3.5 Cov
1.3 BL 3.3 Cov

5.5 eos 0.9 Cov
4.7 eos 2.1 Cov
5.1 eos 2.5 Cov
4.8 eos 2.7 Cov
5.0 eos 3.1 Cov
5.8 eos 0.9 Cov
5.9 eos 2.8 Cov
5.5 eos 4.0 Cov

#11
#13

0.3 BL 4.1 Cov
0.4 BL 4.2 Cov
0.3 BL 4.8 Cov
2.8 BL 3.5 Cov

TRIG RD

CHAMBER
1.2 x 0.6 x 0.9m D

THIS PHOTOGRAPH IS FROM THE
ORIGINAL ZEISS NEGATIVE
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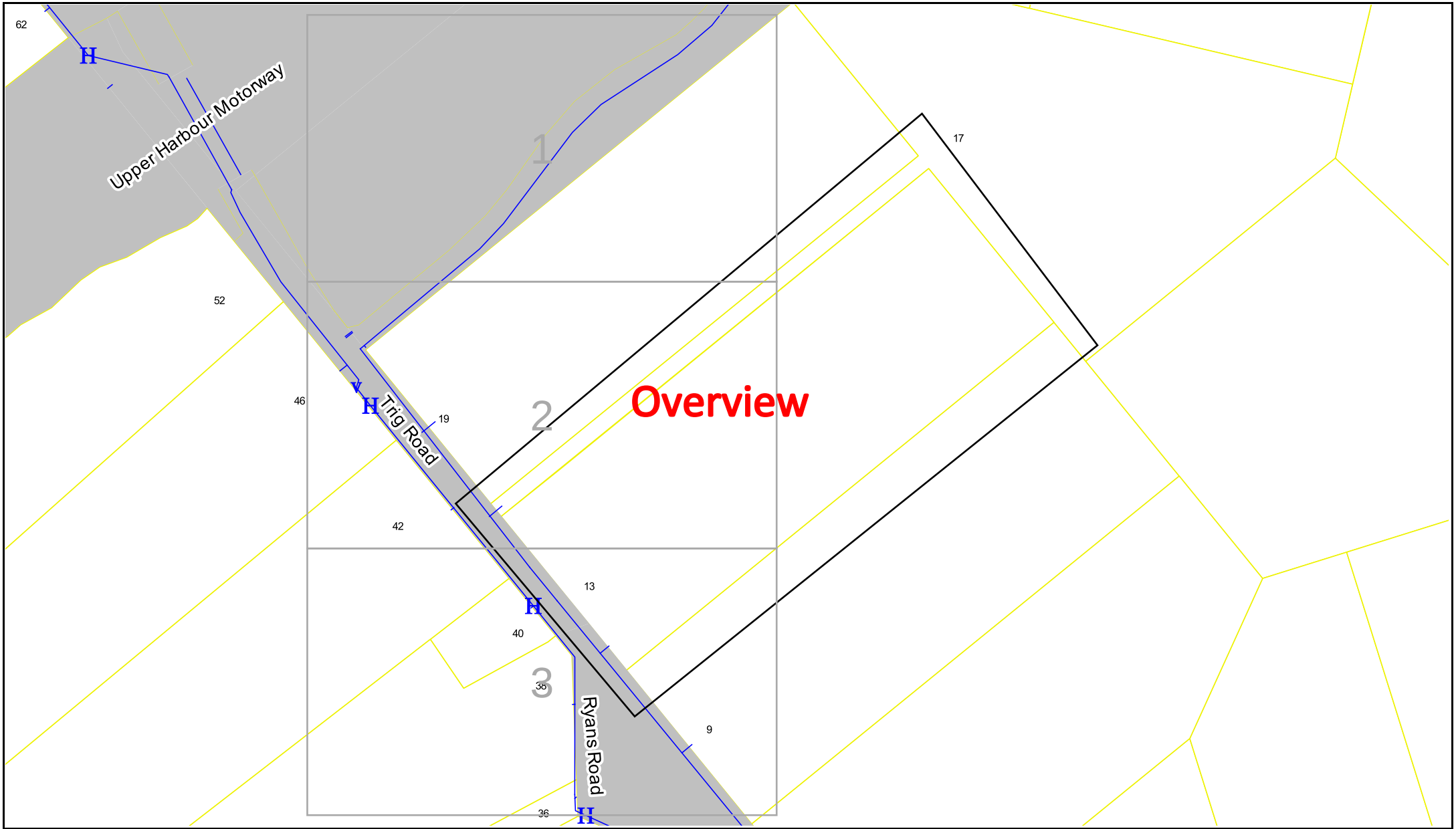
SN 9151 E/9 b

CLEAR
COMMUNICATIONS

CARLAW WHENUAPAI NORTHCOTE FIBRE
UPPER HARBOUR DRIVE ROUTE



Watercare
An Auckland Council Organisation

Sequence Number: 9038713

Address: 15 Trig Road
Whenuapai, Auckland, 0618

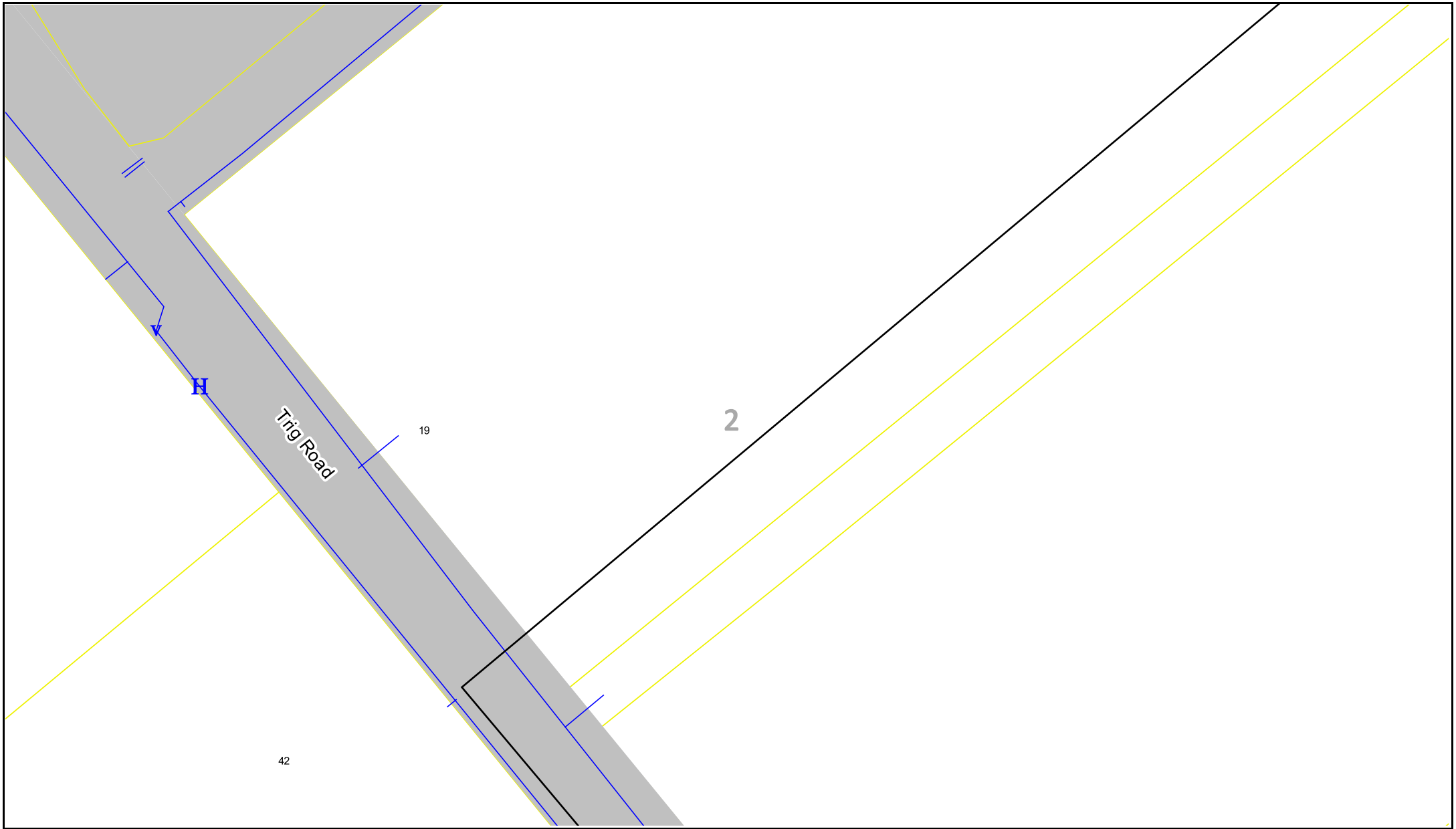
Waste Water
Water
Electrical/Cathodic Protection
Waste Water Proposed
Water Proposed

V Valve
H Hydrant
M Water Meter
Manhole

Scale: 1:3075

N

OVERVIEW NOT TO SCALE.



Watercare
An Auckland Council Organisation

Sequence Number: 9038713

Address: 15 Trig Road
Whenuapai, Auckland, 0618

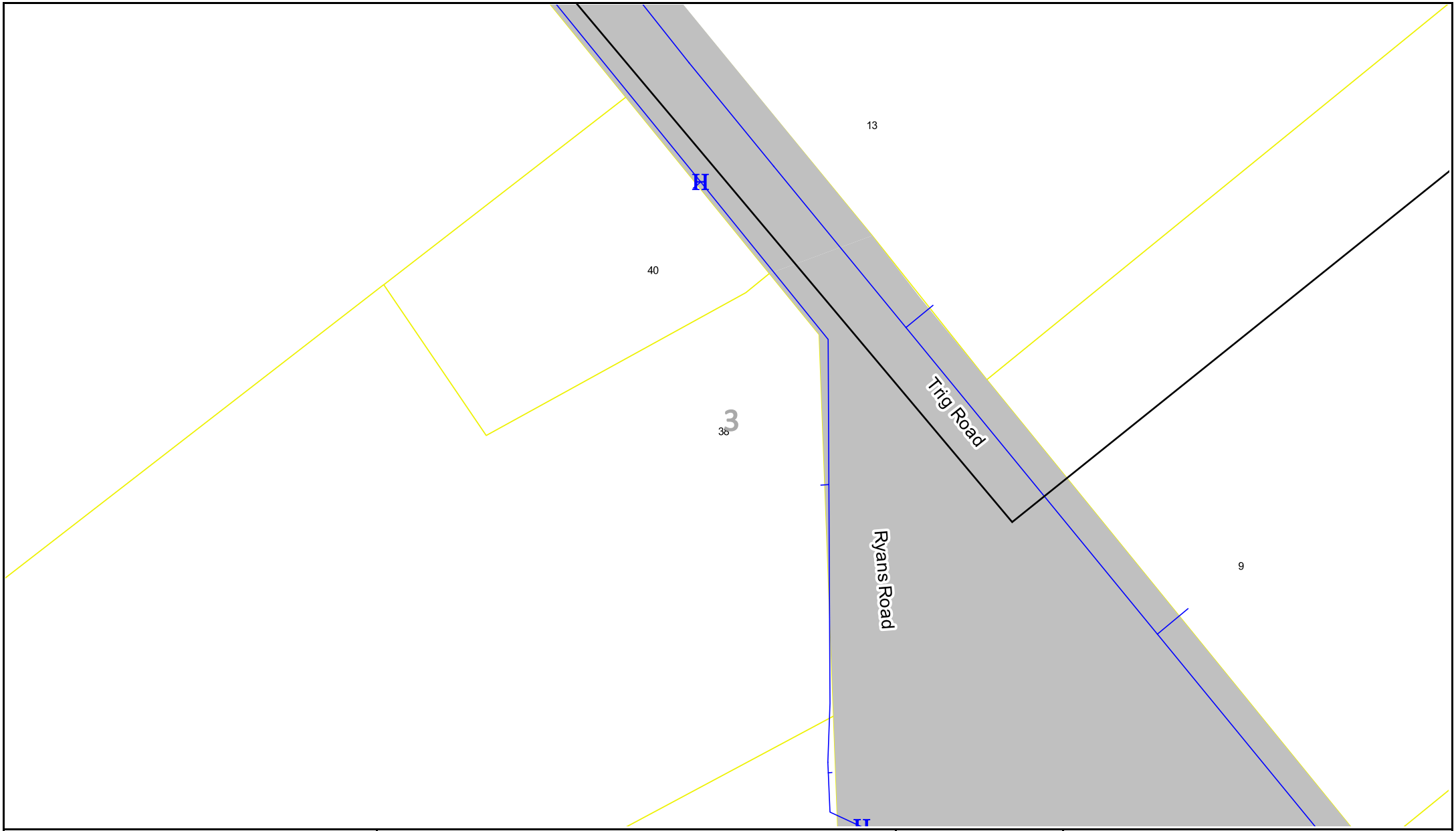
Waste Water
Water
Electrical/Cathodic Protection
Waste Water Proposed
Water Proposed

V Valve
H Hydrant
M Water Meter
Manhole

Scale: 1:1000

N

OVERVIEW NOT TO SCALE.



Watercare
An Auckland Council Organisation

Sequence Number: 9038713

Address: 15 Trig Road
Whenuapai, Auckland, 0618

Waste Water
Water
Electrical/Cathodic Protection
Waste Water Proposed
Water Proposed

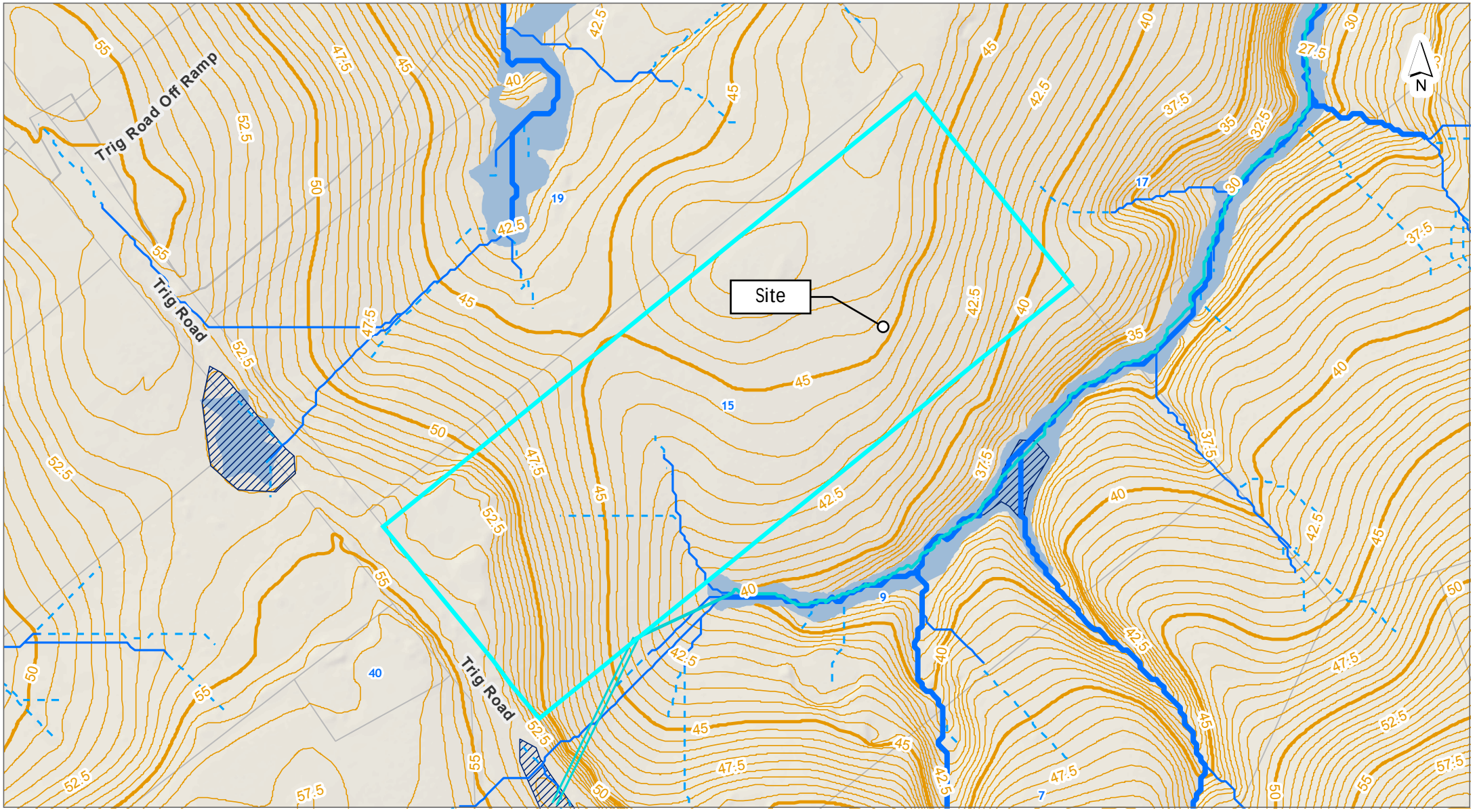
V Valve
H Hydrant
M Water Meter
Manhole

Scale: 1:1000

N

OVERVIEW NOT TO SCALE.

Appendix E: Auckland Council GIS Plans



15 Trig Road - Overland flowpaths

0 10 20 30
Meters

Scale @ A4
= 1:2,500

Date Printed:
22/01/2021

Auckland Council
Te Kaunihera o Tāmaki Makaurau

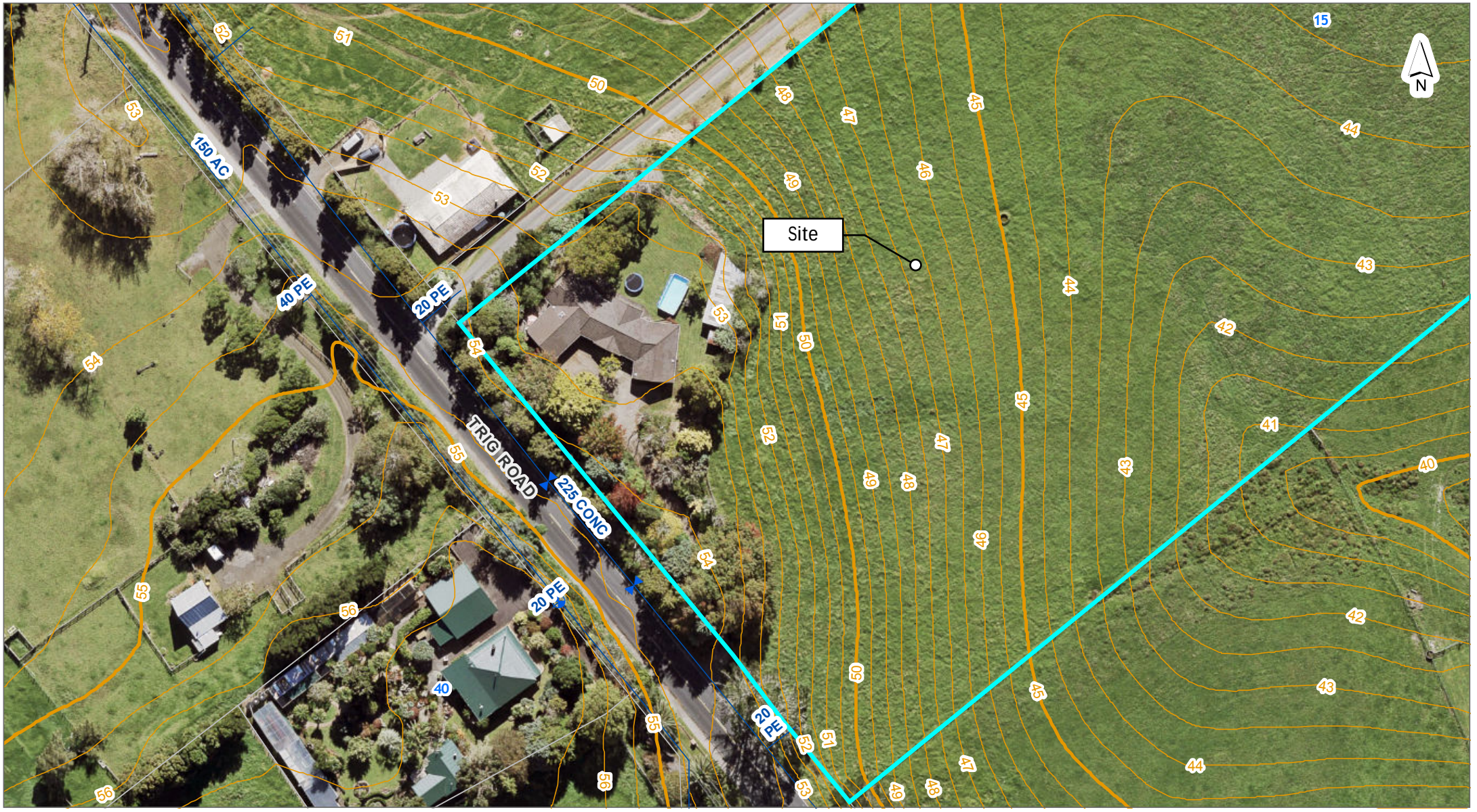
15 Trig Road - Hydrant Plan

0 10 20 30
Meters

Scale @ A4
= 1:2,500

Date Printed:
22/01/2021

Auckland Council
Te Kaunihera o Tāmaki Makaurau



15 Trig Road - Water supply

0 6.5 13 19.5
Meters

Scale @ A4
= 1:1,000

Date Printed:
22/01/2021

Auckland Council
Te Kaunihera o Tāmaki Makaurau

15 Trig Road - Wastewater

0 10 20 30
Meters

Scale @ A4
= 1:2,500

Date Printed:
22/01/2021

Auckland Council
Te Kaunihera o Tāmaki Makaurau

15 Trig Road - Stormwater

0 10 20 30
Meters

Scale @ A4
= 1:2,500

Date Printed:
22/01/2021

Auckland Council
Te Kaunihera o Tāmaki Makaurau

Wastewater Manhole GIS ID Label (Local)

Wastewater Manhole GIS ID Label (Local)

Wastewater Manhole (Local)

Wastewater Manhole (Local)

Wastewater Pipe GIS ID Label (Local)

Wastewater Pipe GIS ID Label (Local)

Wastewater Pipe (Local)

Operational

Operational Not Vested

Abandoned / Not Operational

Wastewater Other Structure (Local)

Wastewater Other Structure (Local)

Wastewater Pump Station (Local)

Wastewater Pump Station (Local)

Wastewater Manhole (Transmission)

Wastewater Manhole (Transmission)

Wastewater Pipe (Transmission)

Operational

Not Operational

Proposed

Other Watercare Linear Assets

Other Watercare Linear Assets

Other Watercare Structures and Areas

Other Watercare Structures and Areas

Non Watercare Pipe

Non Watercare Pipe

Non Watercare Structure

Non Watercare Structure

Address

Address

Rail Stations (8,000)

Rail Stations (8,000)

Railway (2,500)

Railway (2,500)

Auckland Council Boundary

Auckland Council Boundary

Roads (2,500)

ROADCODE, STATUS

Motorway

Motorway Under Construction

Secondary Arterial Road

Secondary Arterial Road Under Construction

Primary Arterial Road

Primary Arterial Road Under Construction

Collector Road

Collector Road Under Construction

Local Road

Local Road Under Construction

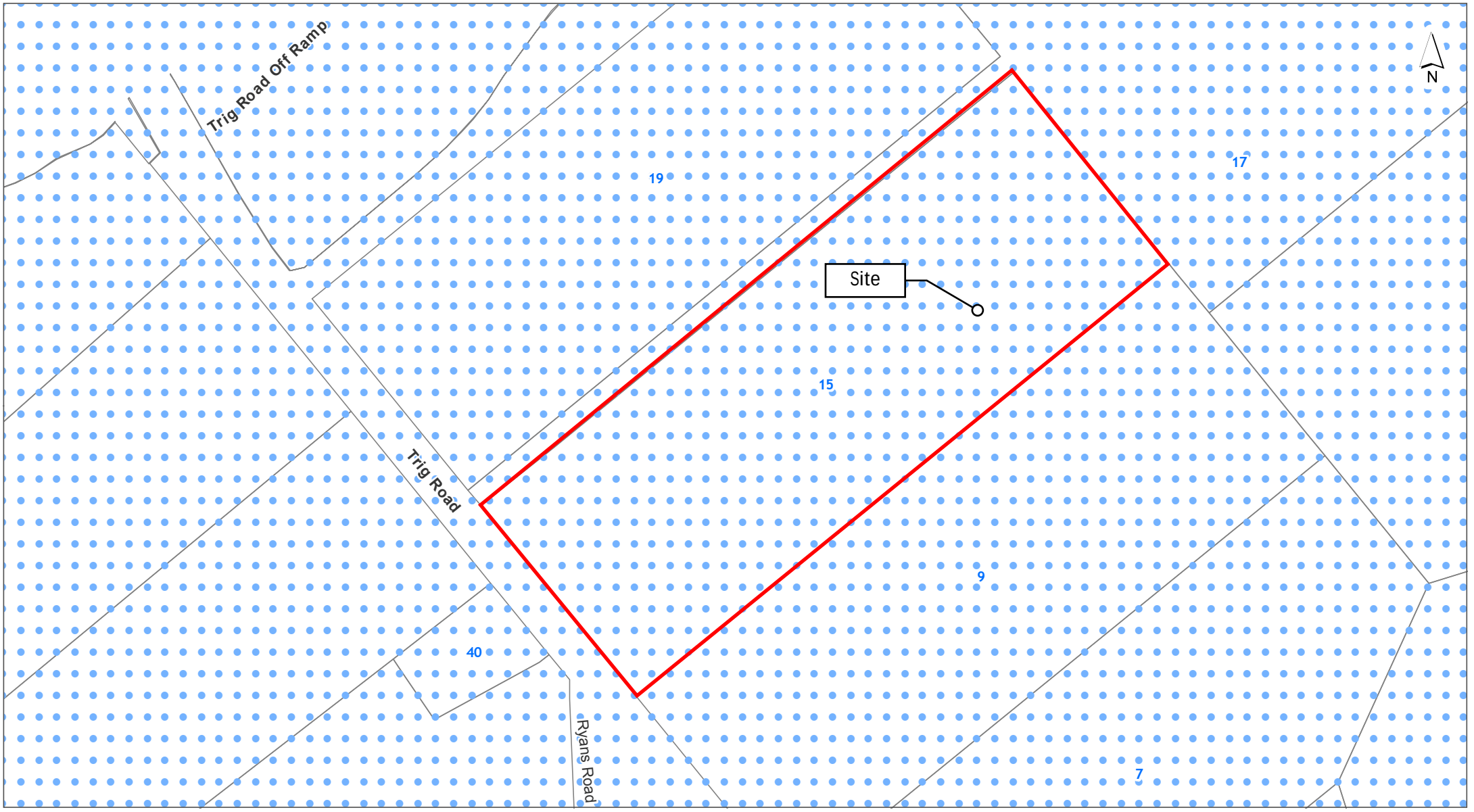
Parcels

Parcels

Legend

Date Printed:
22/01/2021

Auckland Council
Te Kaunihera o Tāmaki Makaurau



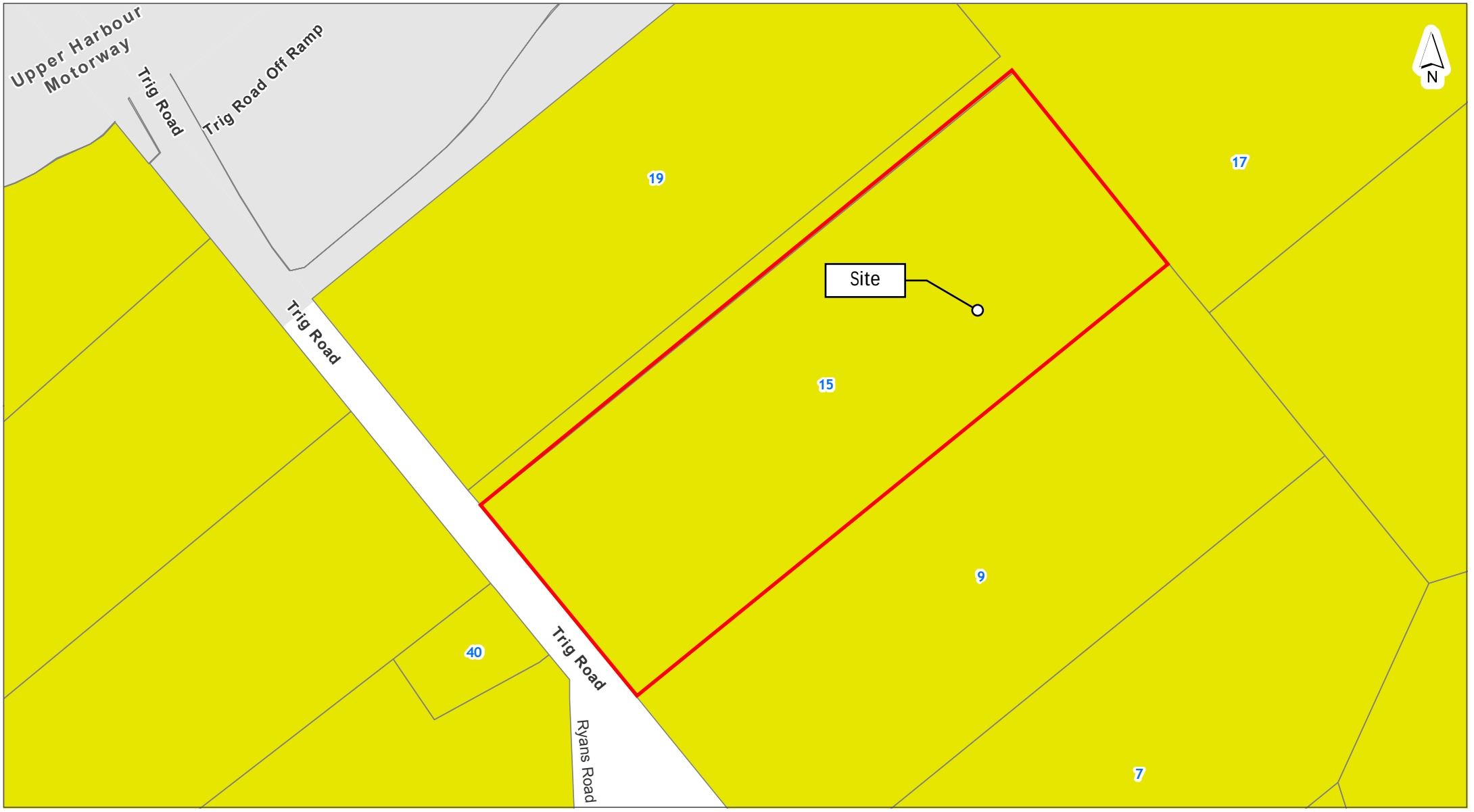
Natural Resources
Unitary Plan Maps

0 10 20 30
Meters

Scale @ A4
= 1:2,500

Date Printed:
13/05/2021

Auckland Council
Te Kaunihera o Tāmaki Makaurau



Zones and Rural Urban Boundary
Unitary Plan Maps

0 10 20 30
Meters

Scale @ A4
= 1:2,500

Date Printed:
13/05/2021

Auckland Council
Te Kaunihera o Tāmaki Makaurau

Auckland Unitary Plan Operative in part 15th November 2016 - LEGEND

Auckland Council
Te Kaunihera o Tāmaki Makaurau

Date: 15/07/2019

NOTATIONS

Appeals

Properties affected by Appeals seeking change to zones or management layers

Properties affected by Appeals seeking reinstatement of management layers

Proposed Plan Modifications

Notice of Requirements

Plan Changes

Tagging of Provisions:

[i] = Information only

[rp] = Regional Plan

[rcp] = Regional Coastal Plan

[rps] = Regional Policy Statement

[dp] = District Plan (only noted when dual provisions apply)

ZONING

Residential

- Residential - Large Lot Zone
- Residential - Rural and Coastal Settlement Zone
- Residential - Single House Zone
- Residential - Mixed Housing Suburban Zone
- Residential - Mixed Housing Urban Zone
- Residential - Terrace Housing and Apartment Buildings Zone

Business

- Business - City Centre Zone
- Business - Metropolitan Centre Zone
- Business - Town Centre Zone
- Business - Local Centre Zone
- Business - Neighbourhood Centre Zone
- Business - Mixed Use Zone
- Business - General Business Zone
- Business - Business Park Zone
- Business - Heavy Industry Zone
- Business - Light Industry Zone

Open space

- Open Space - Conservation Zone
- Open Space - Informal Recreation Zone
- Open Space - Sport and Active Recreation Zone
- Open Space - Civic Spaces Zone
- Open Space - Community Zone
- Water [i]

Rural

- Rural - Rural Production Zone
- Rural - Mixed Rural Zone
- Rural - Rural Coastal Zone
- Rural - Rural Conservation Zone
- Rural - Countryside Living Zone
- Rural - Waitakere Foothills Zone
- Rural - Waitakere Ranges Zone

Future Urban

- Future Urban Zone
- Green Infrastructure Corridor (Operative in some Special Housing Areas)

Infrastructure

- Special Purpose Zone - Airports & Airfields
  Cemetery
  Quarry
  Healthcare Facility & Hospital
  Tertiary Education
  Māori Purpose
  Major Recreation Facility
  School
- Strategic Transport Corridor Zone

Coastal

- Coastal - General Coastal Marine Zone [rcp]
- Coastal - Marina Zone [rcp/dp]
- Coastal - Mooring Zone [rcp]
- Coastal - Minor Port Zone [rcp/dp]
- Coastal - Ferry Terminal Zone [rcp/dp]
- Coastal - Defence Zone [rcp]
- Coastal - Coastal Transition Zone

Precincts

Rural Urban Boundary

Indicative Coastline [i]

Overlays

Natural Resources

- Terrestrial [rp/dp]
- Marine 1 [rcp]
- Marine 2 [rcp]

  → Significant Ecological Areas Overlay
- Water Supply Management Areas Overlay [rp]
- Natural Stream Management Areas Overlay [rp]
- High-Use Stream Management Areas Overlay [rp]
- Natural
- Urban

  → Lake Management Areas Overlay (Natural Lake and Urban Lake)
- High-Use Aquifer Management Areas Overlay [rp]
- Quality-Sensitive Aquifer Management Areas Overlay [rp]
- Wetland Management Areas Overlay [rp]

Infrastructure

- Airport Approach Surface Overlay
- Aircraft Noise Overlay
- City Centre Port Noise Overlay [rcp / dp]
- Quarry Buffer Area Overlay
- National Grid Subdivision Corridor
- National Grid Substation Corridor
- National Grid Yard Compromised
- National Grid Yard Uncompromised

  → National Grid Corridor Overlay

Mana Whenua

- Sites & Places of Significance to Mana Whenua Overlay [rcp/dp]

Built Environment

- Identified Growth Corridor Overlay

Natural Heritage

- Notable Trees Overlay
- Outstanding Natural Features Overlay [rcp/dp]
- Outstanding Natural Landscapes Overlay [rcp/dp]
- Outstanding Natural Character Overlay [rcp/dp]
- High Natural Character Overlay [rcp/dp]
- Viewshafts
- Height Sensitive Areas

  → Regionally Significant Volcanic Viewshafts & Height Sensitive Areas Overlay [rcp/dp]
- Regionally Significant Volcanic Viewshafts Overlay Contours [i]
- Locally Significant Volcanic Viewshafts Overlay [rcp/dp]
- Locally Significant Volcanic Viewshafts Overlay Contours [i]
- Modified
- Natural

  → Ridgeline Protection Overlay
- Local Public Views Overlay [rcp/dp]
- Extent of Overlay
- Subdivision Schedule

  → Waitakere Ranges Hertage Area Overlay

Historic Heritage & Special Character

- Historic Heritage Overlay Place [rcp/dp]
- Historic Heritage Overlay Extent of Place [rcp/dp]
- Special Character Areas Overlay Residential and Business
- Auckland War Memorial Museum Viewshaft Overlay [rcp/dp]
- Auckland War Memorial Museum Viewshaft Overlay Contours [i]
- Stockade Hill Viewshaft Overlay – 8m height area
- Stockade Hill Viewshaft [i]

Controls

- Key Retail Frontage
- General Commercial Frontage

  → Building Frontage Control
- Adjacent to Level Crossings
- General
- Motorway Interchange Control

  → Vehicle Access Restiction Control
- Centre Fringe Office Control
- Height Variation Control
- Parking Variation Control
- Level Crossings With Sightlines Control
- Arterial Roads
- Business Park Zone Office Control
- Hazardous Facilities
- Infrastructure

  → Emergency Management Area Control
- Macroinvertebrate Community Index
- Flow 1 [rp]
- Flow 2 [rp]

  → Stormwater Management Area Control
- Subdivision Variation Control
- Surf Breaks [rcp]
- Cable Protection Areas Control [rcp]
- Coastal Inundation 1 per cent AEP Plus 1m Control

Designations

- 123 Designations
- 200 Airspace Restriction Designations

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