

Site Suitability Report for Proposed Subdivision
of
Land at 594 Koutu Loop Road, Koutu
for
B & T Family Trust

Haigh Workman reference 18 173

September 2018



Revision History

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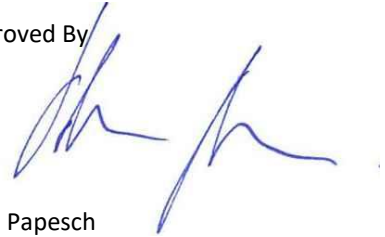
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Executive Summary

Haigh Workman Ltd was commissioned by B & T Family Trust to undertake a site suitability assessment of land at Land at 594 Koutu Loop Road, Koutu. The site was recently subdivided into three residential lots plus a balance lot (FNDC Resource Consent 2180188-RMAVAR/B).

It is understood that the client intends to further subdivide the balance lot (Lot 1 DP 519375) to create an additional seven residential lots of approximately 8,000 m² each, a road to vest or jointly owned access lot of 1295 m² and a balance lot of approximately 7.82ha. A proposed subdivision layout plan was made available to Haigh Workman at the time of writing.

The land is zoned Coastal Living. The subdivision has Restricted Discretionary Activity status under the District Plan.

Geotechnical

According to available geological plans and the Haigh Workman walkover survey, the underlying soil geology across the site comprises Kara clay and Kara silt loam, typically described and categorised as 'imperfectly to very poorly drained'; consistent with superficial soils. Superficial soil deposits are indicated to be underlain (at depth) by solid geology comprising Whangai Formation (Kkw) of the Mangakahia Complex, a subsidiary group of the Northland Allochthon Formation.

Fieldworks were undertaken by a Haigh Workman Geotechnical Engineer in a single stage on 20 February 2017 and comprised the drilling of five hand augured boreholes to profile shallow underlying stratum to depths ranging from 0.50 m to 1.00 m below ground level. Following interpretation of field data it is concluded and recommended that:

- All investigated house sites are suitable for a final low-rise residential end-use;
- Generally uniform strata was encountered across the seven proposed house sites conforming to available geological mapping. Stratigraphy generally included loose natural granular soils overlying a hard pan at shallow depth;

As soil properties did not meet the minimum requirement for bearing capacity in accordance with NZS3604 at founding depth or within influencing distance of shallow foundations it is recommended all proposed lots are subject to further geotechnical investigation and specific foundation design at the time of building consent. It is recommended that foundations take the form of either:

- Piled foundations extended through shallow soils and the hard pan layer founding within underlying natural soils of adequate strength/bearing capacity, or;
- Concrete slab on grade specifically designed for soils of 50 kPa allowable bearing capacity and with an allowance to minimise differential settlement across granular/cohesive soils for proposed lot 11.

To complete the subdivision process it is proposed to cut the existing bank to the north eastern face of the subdivision entrance. For this option it is recommended that the cut is retained by a specifically designed retaining wall. It is recommended the wall is designed as condition of consent.

Access

Access to the proposed subdivision is as follows:

- Lot 12 – existing vehicle crossing on Koutu Loop Road
- Lots 2 to 11 – new intersection on Koutu Loop Road and road to vest or jointly owned access lot
- Lots 3, 4 and 7 to 10 Rights of Way A and B.

The road intersection on Koutu Loop Road can be formed to Council standards. Widening is proposed in accordance with FNDC/S/6D.

A stub road 80m long is proposed to serve ten lots (Lots 2 to 11). The road will be formed to Council standards; in particular District Plan Appendix 3B-2 Type A rural road with a 6.0m carriageway and 16.0m legal width.

District Plan Rule specifies where a road serves 9 or more lots, access shall be by public road. Council engineers have indicated Council may prefer the road to remain private. If so, the road to vest would become a jointly owned access lot. If Council wishes the road to remain private, we request that a Jointly Owned Access Lot with a private road constructed to Council standards be accepted as compliance with District Plan permitted activity Rule 15.1.6C.1.1.

Rights of Way A and B will be constructed with a 5.0 m carriageway width and **10.0 m legal width**.

Earthworks

Earthworks consent is required as part of the subdivision.

The total volume over the site remains within the 5,000 m³ per year permitted under the Regional Water and Soil Plan for Northland rules and 5,000 m² per year permitted under the Proposed Regional Plan for Northland rules.

Excavated topsoil will be used to re-grass batters. Suitable excavated material may be used for fill for road formations. Imported fill and aggregate will be used to complete the road formation.

Stormwater

The site is generally formed by multiple flat areas linked by moderate slopes. Site drainage is generally via natural soakage into the underlying soil or as slow moving sheet flow. An existing excavated watercourse drains the low lying area on the balance lot (proposed Lot 12). Drainage from the site ultimately flows across crown land to the Hokianga Harbour to the north.

Stormwater management is proposed to avoid adverse effects from increased stormwater runoff in accordance with Auckland Council TP10 guidelines.

The road to vest will drain to existing roadside drains on Koutu Loop Road that discharge into the existing watercourse through proposed Lot 12. Given the small area of road involved, no stormwater attenuation is proposed.

Rights of Way A and B follow a broad ridge with negligible overland stormwater being intercepted. The primary stormwater system for the rights of way consists of a watertable drain on the southwest side of the carriageway, leading to a grassed swale drains through Lot 11. The swale drain on Lot 11 drains to an existing pond on the lot before overflowing to the existing watercourse on Lot 12.

A rock-lined swale drain on proposed Lot 10 was approved as part of the previous subdivision stage (Resource consent 2180188-RMAVAR/B). This is no longer required for right of way drainage and will not be constructed.

Lots 5 to 9 and 11 drain to the existing water course on proposed Lot 12. Lot 10 drains directly to the coast.

Rainwater from roofs will be collected in tanks for use. Roof tank overflow, together with yard and driveway runoff, should be discharged on to grassed surfaces in a dispersed manner.

There are no properties downstream that are at risk of flooding and the existing watercourse is not prone to erosion. Stormwater attenuation from the residential development is not necessary and is not proposed.

Impermeable surfaces on Lot 11 will exceed the 10% and 600m² thresholds as a result of the rights of way being within Lot 11. As part of the subdivision, consent is sought for exceeding the impermeable surfaces thresholds on proposed Lot 11.

Water Supply

Each lot will be dependent on roof run off collected in standard water tanks.

Each residential lot will be responsible for providing adequate on-site firefighting supply.

On-site Effluent Disposal

There is an existing wastewater system associated with the dwelling on Lot 12. It is understood the system is operating satisfactorily and will be contained within the boundaries of Lot 12.

Wastewater disposal systems on the proposed residential lots will need to take into account the shallow dense hard pan layer within close proximity to the surface. A typical wastewater system can be anticipated to comprise:

- A 400 m² dripper irrigation wastewater disposal field with a 100 % reserve area.
- Based upon the results of the intrusive investigation, soil category 7 should be adopted as defined within TP58 and can be expected to sustain a land loading rate of 2 mm/day.
- Disposal fields should be mounded with site-won topsoil materials from driveways and/or building platforms at the time of building consent with a minimum thickness of 600 mm to account for the slow draining soils and shallow, dense hard pan layer.

It would be prudent to note that no LIM report has been provided to supplement this assessment.

1 Introduction

Haigh Workman Ltd (Haigh Workman) was commissioned by B & T Family Trust (the client) to undertake a site suitability assessment of land at 594 Koutu Loop Road, Koutu (the 'site') for the purpose of subdivision. This report presents the factual information available during the appraisal, interpretation of data obtained during fieldworks with site specific recommendations relevant to the defined objectives.

The site currently comprises generally open land utilised for agricultural pasture with a single residential unit with associated out buildings to the southern portion of the site. Generally wire and post fencing and localised hedgerows divide the site into usable paddocks.

Consent for a 4 lot subdivision of Lot 1 DP 194427 into 3 lifestyle lots plus a balance lot was issued in February – March 2018 (Consent 2180188-RMAVAR/B). A survey plan DP 519375 has been issued.

It is understood that the client intends to further subdivide the balance lot (Lot 1 DP 519375) to create an additional seven residential lots of approximately 8,000 m² each, a jointly owned access lot of 1295 m² and a balance lot of approximately 7.82 ha.

A proposed subdivision layout plan was made available to Haigh Workman at the time of writing; included within Appendix A as Drawing No. 18 173/02, as reproduced from the Thomson Survey Ltd Drawing Ref. 8532, 'Scheme Plan' dated 12 July 2018.

This appraisal has been designed to assess the suitability of the site with regard to; general suitability of the ground, flood hazard risk, access to and within the site, earthworks required to complete the development, stormwater management, wastewater disposal, coastal erosion and water supply.

1.1 Objective and Scope

The objectives of this investigation were to:

- Establish the geological and environmental setting of the site;
- Visually assess the site and surrounding land;
- Investigate the near surface soil and groundwater conditions at the site, and;
- Provide engineering and site suitability recommendations for the proposed subdivision.

To achieve this, the scope of works conducted by Haigh Workman included:

- Review of geotechnical databases, available geological and topographical mapping;
- Site mapping;
- Intrusive site investigation for evaluation of subsurface conditions, and;
- Preparation of this report with site specific geotechnical, environmental, civil and water management recommendations.

1.2 Applicability

This report has been prepared for the use of the B & T Family Trust with respect to the particular brief outlined to us. This report is to be used by our Client and their Consultants and may be relied upon when considering site suitability advice. Furthermore this report may be utilised in the preparation of building and/or resource consent applications with local authorities. The information and opinions contained within this report shall not be used in other context for any other purpose without prior review and agreement by Haigh Workman Ltd.

2 Site Details and Description

Site Address: 594 Koutu Loop Road, Opononi

Legal Description: Lot 1 DP 519375

Area: 137,649 m²

2.1 Proposed Subdivision

At this stage it is understood the client intends to subdivide the property into eight lots. Proposed lots 5 to 11, inclusive are designated for residential development with lot 12 comprising the existing residential development and the balance of the farm. Table 2.1 details proposed subdivision works.

It is understood that the client intends to further subdivide the balance lot to create an additional seven residential lots of approximately 8,000 m² each, a jointly owned access lot of 1295 m² and a balance lot of approximately 7.82 ha. A proposed subdivision layout plan was made available to Haigh Workman at the time of writing.

Table 2.1 – Proposed subdivision

Proposed Lot ID	Area (m ²)	Intended final land-use
5	8,002	Low-rise residential
6	8,010	Low-rise residential
7	8,009	Low-rise residential
8	8,031	Low-rise residential
9	8,037	Low-rise residential
10	8,010	Low-rise residential
11	8,068	Low-rise residential, including rights of way
12	78,200	Existing residential unit and sheds and balance of the farm
100	1,295	Road to vest or jointly owned access lot

2.2 Site Description

The site comprises an irregular shaped parcel of Greenfield agricultural pasture land situated immediately north of Koutu Township. A site location plan is presented as Drawing No. 18 173/01 within Appendix A of this report.

The site measures approximately 520 m in length by 465 m in width at its largest points; aligned roughly north east to south west along its length. Topographically the site's highest elevation is a wide ridge feature situated centrally to the northern portion of the site aligned south east to north west across the width of the site. Generally from this feature the site dips to the north east and south west; shallowing out with distance from the ridge line, particularly evident to the south west of the property. Slopes of the ridge line dip to the north east, north west and south west at angles up to approximately 15°. The northern site boundary represents the crest of a coastal cliff face. Geology is further investigated within Section 3 of this report.

Generally hill slopes within the site boundaries were noted to be stable at the time of the Haigh Workman walkover survey. No visible evidence of instability including slumping or hummocky ground and/or tension cracks was noted.

Structures within the site boundaries include a single residential unit with associated sheds and tanks, situated to the southern corner of the site within proposed lot 12. The residential unit and associated outbuildings appeared in good condition at the time of the walkover survey with access to Koutu Loop Road at the south eastern site boundary.

Access is gained to the wider pasture land to the north east of the residential unit, at the eastern site corner with Koutu Loop Road which becomes metalled beyond the site to the north east.

Field investigations took place during summer months; no saturated and/or boggy ground conditions were noted across the site. A single watercourse trends through the centre to south western portion of the site flowing from south east to north west, discharging to coastal tidal waters to the north west. Flooding potential is evaluated within this report.

The site is bound to the north east and south east by similar large residential/agricultural properties; land to the south west and west included smaller, mostly developed residential properties and land highlighted for a future education facility. Although clearly defined by fencing, Koutu Loop Road and Koutu Point Road defines the south eastern and south western boundaries, respectively.

A topography and site features plan of relevant features is included within Appendix A of this report as Drawing No. 18 173/03. Relevant site photography is presented within Appendix C.

2.3 District Plan Zoning

According to the Far North District Council (FNDC) district plan the site is currently zoned as 'Coastal Living' according to zone map 108.

Each proposed lot provides at least 8,000 m² site area and it is intended that the subdivision comply with all permitted activity rules.

Based on this, it is considered the proposed subdivision meets the requirements of a restricted discretionary activity subdivision of the district plan.

3 Geology

3.1 Mapped Geology

Sources of Information:

- GNS Science Geological Memoir 1, 1996: "Geology of the Kaitaia Area";
- GNS Sciences 1:250,000 scale map Sheet 1, 1996: "Kaitaia" (Rocks);
- NZMS Sheet 290 O06/07, 1:100,000 scale map, Edition 1, 1980: "Waipoua - Aranga" (Soils);
- NZMS Sheet 290 P04/05, 1:100,000 scale map, Edition 1, 1982: "Whangaroa-Kaikohe" (Rocks).

Relevant geological mapping is presented within Appendix A as Drawing No. 17 029A/04.

3.1.1 *Superficial Geology (Soils)*

The site is shown to be mostly directly underlain by soils of the Undulating Terraces and Lowlands formation comprising Kara clay (KRe) and Kara silt loam (KR).

Similarly, the majority of the surrounding land and Koutu peninsula are formed of the same geological units; formed by superficial processes such as sand dune formation or low land flood/marine sediment deposition rather than weathering processes acting upon underlying solid geology.

Soil deposits at the site comprising KRe and KR are typically described and categorised as '*imperfectly to very poorly drained*'; consistent with superficial soils.

Consistent with this, the GNS Science solid and drift geology map indicates superficial deposits within and beyond the site boundaries. The GNS map indicates sand (OIS5+), described as '*partly consolidated sand, mud and peat of lacustrine, swamp, alluvial and colluvial origins*'.

3.1.2 *Bedrock Geology*

Superficial soil deposits are indicated to be underlain (at depth) by solid geology comprising Whangai Formation (Kkw) of the Mangakahia Complex, a subsidiary group of the Northland Allochthon Formation; Cretaceous to Late Pliocene (c. 90 to 55.5 million years). Kkw rocks are described by the GNS map as '*fissile, dark grey to white weathering siliceous mudstone, blue-grey calcareous mudstone, and minor micritic limestone and chert*'.

Similarly, the NZMS 290 sheet O06/07 geology map identifies the site to be directly underlain by Alluvium (A1₂), comprising '*mud, sand and gravel with minor peat, forming river bed and floodplain deposits; unconsolidated to very soft, unweathered*'.

According to surrounding geology the NZMS indicates that at depth A1₂ is underlain by Micaceous sandstone (S5₂); '*blue-grey, quartz feldspar sandstone, with a mica content up to 5 %, in places calcareous, thinly to thickly bedded and widely fractured, with minor interbedded mudstone, hard conglomerate and carbonaceous material in places, and large calcareous concretions locally; moderately hard to hard. Weathered to soft, brown sandy clay to depths of 10 m*'.

Site specific geology is investigated further as part of the field investigations within Section 5 of this report.

4 Environmental Setting

Published environmental data relating to the site has been reviewed. A summary of relevant information is provided below.

4.1 Hydrology and Flooding

A summary of available information pertaining to hydrology and hydrogeology is presented in Table 4.1. It should be noted that specific detailed flood hazard reporting is outside the scope of this investigation; an examination of Far North District Council (FNDC) and Northland Regional Council (NRC) online GIS databases is included below.

Table 4.1 - Surface Water Features & Flooding

	Presence/Location	Comments
Groundwater sources including springs/wells (within 500 m)	None recorded.	
Surface Water Features (Ponds, Lakes etc)	Pond situated to the north of the ridgeline within proposed lot 11.	The identified pond is formed to the north west corner of the flat plateau of the ridgeline; accepting surface water runoff from the adjacent pasture land.
Watercourses (within 500 m)	Unnamed stream/creek within south western half of the site.	<p>The main surface water feature trends from south east to north west, roughly centrally within the property.</p> <p>The stream sources on land to the south east of the site and once flowing through the site includes discharge from adjacent sources including natural surface water flow, Koutu Loop Road drainage channels and run-off from a recent subdivision to the east of the site.</p> <p>The stream is culverted beneath Koutu Loop Road and enters the site roughly centrally along the south eastern site boundary. The stream continues in a relatively straight channel, discharging to tidal coastal waters adjacent to the western edge of the northern site boundary. The client noted that the watercourse is dry during summer and/or dry periods of the year.</p>
Flood Risk Status	None recorded within or within 50 m of the site.	<p>NRC and FNDC GIS databases indicate the site as an area outside of those currently modelled for anticipated maximum flood levels for both 10 and 100 year storm events, including provisions for climate change.</p> <p>However, it would be prudent to note that localised flooding adjacent to the on-site watercourse may be</p>

		encountered during and for a period following an intense rainfall event.
Flood Susceptibility	Low to moderate.	<p>Flood susceptible land is mapped according to the presence of alluvial, fluvial deposited soils indicating historic inundation by flood waters. From available geological mapping it is considered superficial soils are present within the site boundaries.</p> <p>It is interpreted from geological mapping that the flooding potential remains low to moderate with potential flooding affecting low-lying land adjacent to the on-site watercourse. However from client records this occurs roughly once every 20 years.</p>

4.2 Contaminated Land (HAIL) Assessment

According to recent and historical aerial photography the site is shown to have been utilised in the main for agricultural and pasture land. Locally, adjacent to the house small scale orchards can be seen on recent aerial photography (from 2004).

The client explained this area was only ever utilised for personal use and was never sprayed. The orchard area is small, (30 m by 30 m) and as the land was utilised for personal use only it is not considered to be classified under the Hazardous Activities and Industries List (HAIL).

The HAIL recognises orchards as a potential contaminant under code A10; defined as '*persistent pesticide bulk storage or use including sport turfs, market gardens, orchards, glass houses or spray sheds*'.

5 *Fieldworks*

5.1 **Visual Inspection**

Based upon a site walkover inspection conducted by Haigh Workman and information contained on geological plans, it is considered that the soils directly underlying the site typically comprise natural superficial soils formed through various depositional processes over recent (c. 10,000 to 20,000 years) periods. Based on a visual appraisal and geological knowledge of the area two distinct processes are considered to have formed the present day site features and topography. The central broad ridge line most likely represents a collapsed wind-blown sand dune in line with surrounding land features of the Opononi area; low-lying soils are considered to have been deposited in a low-flow environment such as flood events creating softer cohesive soils and localised peaty areas.

Soils are likely to include generally poor draining properties when influenced with large volumes of water according to geological mapping and surface waters will flow across the surface as sheet flow rather than being absorbed in large volumes.

No evidence of waterlogged and/or saturated soils was identified across the broad ridge feature and associated hill slopes; a higher groundwater table within close proximity to or at the surface may be encountered on low-lying areas of the site. Evidence of water retention and hydrophilic plant species were noted in these areas and it is considered during winter months/wetter periods of the year, natural groundwater levels are within close proximity to the surface in these areas.

Surface water is anticipated to flow as sheet flow across the site to the stream from areas of land to the south west of the site and the south western faces of the broad ridgeline. The north eastern face of the ridge is expected to flow to the north/north east across a small portion of the site before moving down the cliffs to tidal waters.

Although no signs were recorded during the Haigh Workman walkover survey it would be prudent to note that large boulder sized fragments of sandstone may be present within founding depth of a residential unit taking into account the local geology. Boulders would more likely be present within lower areas of the site.

At the time of the walkover survey the site was noted to be generally stable and the profile of the site and surrounding land indicates that the majority of the site is not susceptible to instability. The development of proposed lots will require careful consideration to ensure the hill slope is not destabilised, nor the global slope instability increased to an unacceptable level due to the scale of proposed earthworks or additional ground loading. It is recommended any residential development on these properties is set-back from the crest of the hill slope.

According to available aerial photography the presence of made ground on site is considered to be negligible, limited to areas of previous development such as surrounding the existing residential unit to the south of the property.

A Land Information Memorandum (LIM) report has not been included within the scope of works and is not subject to this review. It would be prudent to obtain for any further information about the area that may be recorded on the local authority GIS database which could otherwise cause restrictions or highlight land hazards that may be raised at the time of building development.

5.2 Subsurface Investigations

Fieldworks were undertaken by a Haigh Workman Geotechnical Engineer in a single stage on 20 February 2017 and comprised the drilling of five hand augured boreholes (BH101 to BH105, inclusive) to profile shallow underlying stratum to depths ranging from 0.50 m to 1.00 m below ground level (bgl).

All hand auger boreholes refused upon a dense hard pan layer at shallow depth; five standalone Dynamic Cone Penetrometer (DCP) probe holes were formed adjacent to each borehole in an attempt to penetrate the hard pan layer. DCP exploratory holes were advanced to a maximum final depth of 1.00 m bgl.

Site features and exploratory hole locations have been mapped following the intrusive investigation and are included as Drawing Nos. 18 173/P3, respectively; included within Appendix A. Relevant site photography is presented in Appendix C.

Detailed descriptions of strata and groundwater observations made during the intrusive investigation works are presented on the Engineers exploratory hole records included as Appendix B. Strata descriptions included on the exploratory hole records are compliant with New Zealand Geotechnical Society (NZGS) publication 'Field Description of Soil and Rock', 2005. The depths of strata and groundwater on the Engineer logs are recorded from ground levels at each exploratory hole.

5.2.1 Ground conditions

All exploratory holes were formed upon the broad ridgeline feature within the proposed house sites. A summary of ground conditions encountered during the intrusive investigation is included in Table 5.1.

Table 5.1 – Summary of Ground Conditions

Strata	Depth to Top of Strata (m bgl) (Thickness)	Details
Surface Coverings	Ground Level (0.10 m to 0.30 m)	During fieldworks the site was noted to include a surface covering of roughly grassed topsoil utilised for agricultural pasture land and grazing. Grassed topsoil was found to include variable soil characteristics including sandy clay, clayey sand and silty sand.
Natural Soils	0.10 to 0.30 (0.40 m to 0.70 m)	Roughly grassed topsoil was found to be directly underlain by natural granular soils generally comprising fine to medium sand. Granular soils were noted to be grey, locally orangish or yellowish brown and dry to moist; the latter within BH103 to BH105, inclusive. Natural granular soils are considered to be in line with available geological mapping; formed through wind-blown superficial processes in this area forming large sand dunes which become cemented in layers over time. Locally, within BH1 a thin layer (0.40 m thick) of cohesive soils were recorded directly underneath granular deposits. Cohesive soils may represent an inter-dune environment and included silty clay; brown and grey with wet and highly plastic properties.

Hard Pan	0.50 to 1.00 (NE)	<p>Natural soils were found to be directly underlain by a hard pan which most likely forms a horizon within the superficial soil sequence and will be underlain by further superficial deposits.</p> <p>The hard pan layer was distinguished by hand auger refusal and DCP blow counts > 5 per 50 mm penetration; the unit was noted to be relatively thick (>0.30 m) and was not fully penetrated by the adopted hand techniques.</p>
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NE - Not Encountered.

5.2.2 **Material Properties**

In-situ hand vane shear testing was undertaken locally, within BH101 where the thin cohesive soil layer was encountered (0.60 m to 1.00 m bgl). Two in-situ tests recorded vane shear tests of 114 kPa and 72 kPa at 0.70 m and 1.00 m bgl, respectively. However, due to the settlement characteristics a structure founded across granular and cohesive layers it is recommended this strata is not relied upon for bearing capacity. Further foundation recommendations are made in Section 6.3 of this report.

According to the NZGS 2005 publication a relative density (R_D) can be obtained from the sum of DCP blow counts per 100 mm penetration. From the results of the ground investigation ground properties of the initial sand layer and underlying hard pan can be defined as follows:

- The upper natural granular soils recorded mean and median DCP blow counts of 2.5, respectively, indicative of generally loose soils with a R_D in the order of 30. The New Zealand Building Code (NZBC) makes reference to a R_D of 40 as the lower bound limit of good granular ground and as such it is considered granular soils above the hard pan layer do not meet the requirement of good ground.
- The hard pan recorded shallow refusals, indicative of a dense layer. However it is recommended further geotechnical investigation is undertaken at the building consent stage as the layer was not fully penetrated in any exploratory hole.

5.2.3 **Groundwater**

Groundwater inflows/strikes were locally encountered as part of intrusive investigations. However it would be prudent to note that the hard pan layer will act as a physical barrier to the downwards migration of groundwater; as such the topsoil and upper granular layers may be observed as wet or saturated for prolonged times. Soil moisture details are included on the exploratory hole records included within Appendix B.

As a result of soil moisture, the hard pan horizon and localised groundwater strikes it can be expected that an extreme (perched) groundwater level of 0.30 m bgl can be adopted for the site. All excavations should anticipated encountering a perched groundwater strike above the hard pan layer, in particular during winter months. Standard pumping practices should be adopted to control the ingress of ground water.

It should be noted that the water levels are likely to fluctuate with the seasons/rainfall and therefore may be substantially higher/lower at wetter or dryer periods of the year compared to those recorded during this investigation.

Exploratory hole locations are shown on Drawing No. 18 173/P3 within Appendix A of this report. The locations of exploratory holes were recorded using a hand held GPS unit accurate to 1 to 3 m; all depths are recorded from existing ground levels at each location.

6 Geotechnical Recommendations

Recommendations and opinions contained in this report are based on the field results at exploratory positions as defined on Drawing No. 18 173/P3 included within Appendix A, information from available geological maps and geotechnical/local authority databases. The nature and continuity of subsurface soil and groundwater conditions away from the test locations is inferred, it must be appreciated that the actual ground conditions may vary from the assumed model between exploratory positions. A summary of geotechnical recommendations is included upon the exploratory hole location plan within Appendix A as Drawing No. 18 173/P3.

6.1 Vertical and Lateral Movement Potential

6.1.1 Settlement Analysis

At the anticipated foundation depths and for preliminary foundation design, based on a characteristic corrected relative density of 40 %, an angle of shearing resistance (Φ') of 30 ° and cohesion (C') of 0 kPa can be assumed. Initial calculations indicate that for the above foundation size and loading scenario settlement should be limited to below 25 mm. The settlement of foundations upon granular strata including sands takes place almost immediately as the foundation loading is imposed upon them.

The settlement of cohesive (clay) and granular (sand) soils are different. Upon excavation termination of foundation excavations, should mixed soil types be encountered then trenches or piles should be extended so as to bear upon a consistent stratum in order to prevent total/excessive differential settlement occurring between foundations.

Care should be taken to ensure all foundations are terminated within a consistent soil type and in particular not across granular/cohesive soils and the hard pan layer.

Advice Note: The above calculations for the proposed development are based on theoretical foundations. Settlement of foundations are dependent of foundation loadings and dimensions. Actual settlements are expected to vary from that calculated and the results of this analysis are considered conservative.

6.1.2 Shrink/Swell Potential

In reference to AS 2870:2011 and BRANZ SR120A, the results of the ground investigation and laboratory analysis within similar soil types, shallow foundations should be designed to reactivity soil class S or slightly-reactive. Class S meets the requirement of good ground in accordance with NZS 3604:2011.

6.1.3 Ground/Slope Stability

Topography at the proposed building sites comprise a generally flat and level plateau falls over approximately 10 m elevation difference on a moderate hill slope. All proposed house sites are considered to be stable, however any proposed cut and/or filling within 5 m of the crest of the slope should be specifically assessed at the time of building consent. This setback is recorded on the geotechnical site plan, included within Appendix A as Drawing No. 18 173/P3.

6.1.4 **Liquefaction Potential**

The effect of liquefaction at the site will be **low/negligible** during seismic events of up to 0.13 g Ground Acceleration Coefficient and within tolerable settlement limits set by the NZBC as calculated for the site with methodology set out in Section 6.2.3 of New Zealand Bridge Manual 2016 Amendment 2.

Following assessment under Section 3.1.3 of NZS1170 the site can be classed as site subsoil class C or a *shallow soil site*. A detailed liquefaction potential assessment was outside the scope of this ground investigation.

6.2 **Sulphate Attack**

Due to the granular nature of the site arising from wind-blown sources rather than alluvial/estuarine. The site is **not** considered to have the potential for buried concrete aggression where concrete is in contact the natural superficial deposits.

6.3 **Foundations**

Ground conditions varied locally across the proposed house sites, however soils generally included an upper loose granular, locally stiff cohesive layer overlying a shallow hard pan. Standard foundation design in accordance with NZS3604:2011 is not considered suitable for the site at this stage based on the current available data and aforementioned soil properties. However this solution may be possible with further geotechnical investigation at the building consent stage provided the hard pan thickness is fully profiled within the proposed building footprints.

As soil properties did not meet the minimum requirement for bearing capacity in accordance with NZS3604 at founding depth or within influencing distance of shallow foundations it is recommended all proposed lots are subject to further geotechnical investigation and specific foundation design at the time of building consent. It is recommended that foundations take the form of either:

- Piled foundations extended through shallow soils and the hard pan layer founding within underlying natural soils of adequate strength/bearing capacity, or;
- Concrete slab on grade specifically designed for soils of 50 kPa allowable bearing capacity and with an allowance to minimise differential settlement across granular/cohesive soils for proposed lot 11.

Provided that a lot specific geotechnical investigation is undertaken at the time of building consent which proves substantial thickness of the hard pan across the proposed building footprint, i.e. >0.50 m thick and underlying soils demonstrate adequate strength for bearing capacity (>100 kPa) a shallow pile foundation terminating within the hard pan layer would provide a suitable foundation solution for a low-rise residential development.

The aforementioned foundation recommendations are indicated on the exploratory hole and geotechnical site plan, included within Appendix A as Drawing No. 18 173/P3.

6.4 **Retaining Walls**

Due to the relatively flat and level nature of the proposed building sites, retaining walls are generally not considered necessary for residential development or to create a stable building site at this resource consent stage. However,

should a development be pursued outside of the outlined building sites, in particular upon hill slopes within all proposed lots it is recommended a geotechnical investigation confirms the requirement for retaining structures.

To complete the subdivision process it is proposed to cut the existing bank to the north eastern face of the subdivision entrance. For this option it is recommended that the cut is retained by a specifically designed retaining wall. It is recommended the wall is designed as condition of consent.

6.5 Building Setback

To ensure stability of the building sites a 5 m setback line has been applied to the crest of slopes from all proposed lots. The proposed building setback line is recorded on Drawing No. 18 173/P3 within Appendix A.

Development on the downslope side of the development setback line is possible, however any proposed earthworks and/or development should be subject to further geotechnical investigation and may require stabilisation measures such as retaining walls.

7 Site Access

Access to the proposed subdivision is as follows:

- Lot 12 – existing vehicle crossing on Koutu Loop Road
- Lots 2 to 11 – new intersection on Koutu Loop Road and road to vest

The locations of the accesses are shown on Haigh Workman drawing 18 173/P2.

7.1 Lot 12 Vehicle Crossing

Access to the existing house on proposed Lot 12 is from a vehicle crossing on Koutu Loop Road (Rapid No.594).

The road is straight to the north east; the 85 %ile operating speed of vehicles approaching from this direction is estimated to be 100 km/h. The 85 %ile operating speed of vehicles approaching from the south is limited by a 70 m radius horizontal curve; the operating speed of vehicles approaching from this direction is observed to be 65 km/h.

The following table compares operating speeds, minimum sight distances (in accordance with FNDC 2009 Engineering Standards drawing FNDC/S/6) and actual visibility from the vehicle crossing:

Traffic Direction	Operating Speed	FNDC Min Sight Distance	Visibility Achieved
From northeast	100 km/h	170 m	>200 m
From south	65 km/h	85 m	85 m

Visibility from the vehicle crossing complies with Council standards.

There will be no change in use as a result of the subdivision, however in accordance with resource consent conditions RC 2180188 issued in November 2017 Clause 4(a) *‘Prior to the issuing of a certificate pursuant to Section 224(c) of the Act, the consent holder shall: Upgrade the existing vehicle crossing to the balance Lot 1 (now revised to balance Lot 12) to provide a crossing which complies with the Councils Engineering Standards FNDC/S/6 and 6B, and section 3.3.17 of the Engineering Standard and NZS4404:2004. Seal the entrance plus splay for a minimum distance of 5 m from the existing seal edge’.*

As part of the subdivision works the client will upgrade the existing vehicle crossing to the required aforementioned standards.

7.2 Koutu Loop Road Intersection

The proposed road to vest / jointly owned access lot will serve ten residential lots: three previous subdivision lots and seven proposed lots.

The centre of the intersection would be located 325m northeast of Koutu Point Road and 126m southwest of the Koutu Terrace intersection.

Visibility

Koutu Loop Road at this location is straight in both directions, but visibility to the northeast is limited by a vertical curve in the road.

Koutu Loop Road becomes metalled 36m beyond Koutu Terrace (162m beyond the proposed intersection). The 85%ile speed of vehicles approaching from the northeast is currently less than 50 km/h because there is a step between the unsealed and sealed road that effectively creates a speed hump. The 11% uphill gradient from this point means vehicle speeds do not increase appreciably at the point where sight distance of the vehicle crossing is gained. If FNDC extended the seal in the future, vehicles could approach at a faster speed. Speeds would still be limited by the horizontal and vertical geometry of the road to a maximum of 75 km/h on this approach. We have therefore assessed the adequacy of sight distances in the north eastern direction on the basis of an 85%ile approach operating speed of 75 km/h.

The road to the southwest is straight and the 85%ile operating speed is assessed as 100km/h.

Thomson Survey has carried out a topographical survey of the road and prepared preliminary plans identifying the visibility that can be obtained from a point 5m back from the road edgeline. Visibility from the vehicle crossing has been assessed on the basis of Austroads Guide to Road Design Part 3 Geometric Design Table 5.1. Sight distances are measured from a passenger car driver eye height of 1.1m to the same height on an approaching vehicle.

Visibility from the proposed intersection is shown in Appendix C Figures 1 and 2.

The following table compares operating speeds, minimum sight distances (in accordance with FNDC 2009 Engineering Standards drawing FNDC/S/6) and actual visibility achievable from the vehicle crossing:

Traffic Direction	Operating Speed	FNDC Min Sight Distance	Visibility Achieved
From southwest	100 km/h	170 m	250 m
From northeast	75 km/h	105 m	105 m *

Note * sight benching and modification of the Lot 2 DP 144141 vehicle crossing is required to achieve the sight distance as shown on the drawings.

Once the sight benching is carried out, visibility from the intersection will comply with Council standards for the assessed 85%ile operating speeds.

Intersection Geometry

The appropriate geometry for the intersection is FNDC/S/6D with Stop control in accordance with NZTA MOTSAM Part 2 Figure 3.13. The width of widening opposite the intersection is not specified on drawing FNDC/S/6D. We suggest 1.5m widening which allows for a car to pass inside a turning car, but is not sufficiently wide to encourage parking in the shoulder widening area.

7.3 Road to Vest / Jointly Owned Access Lot

A stub road 80m long is proposed to serve ten lots (Lots 2 to 11). The road will be formed to Council standards; in particular District Plan Appendix 3B-2 Type A rural road with a 6.0m carriageway and 16.0m legal width.

We recommend that the road be sealed for at least the following distances:

- to a point where the longitudinal gradient reduces to less than 6%, and

- at least 15m from the edge of Koutu Loop Road.

As the road is not in an urban area, the remainder of the road need not be sealed.

District Plan Rule specifies where a road serves 9 or more lots, access shall be by public road. Council engineers have indicated Council may prefer the road to remain private. If so, the road to vest would become a jointly owned access lot.

If Council wishes the road to remain private, we request that a Jointly Owned Access Lot with a private road constructed to Council standards be accepted as compliance with District Plan permitted activity Rule 15.1.6C.1.1.

7.4 Rights of Way

Access to Lots 3 and 4, and 7 to 11 is via rights of way approximately 170 m long.

Minimum carriageway and legal widths are specified in the Far North District Plan Appendix 3B-1 as follows:

Right of Way	Lots served	Legal Width		Carriageway Width	
		FNDC standard	Proposed	FNDC standard	Proposed
A	7	7.5 m	10.0 m	5.0 m	5.0 m
B	4	7.5 m	10.0 m	3.0 m + PB	5.0 m

The legal width of rights of way has been increased to 10 m to accommodate a swale drain on the south eastern side and the curvature of the road (including the drain profiles).

7.5 Driveways

Driveways can be formed on gentle gradients to the building platforms shown on the drawings.

Driveways will be constructed at the building consent stage and do not form part of the subdivision. The earthworks associated with driveway formation is not included in the estimated earthworks volume for the subdivision.

7.6 Parking and manoeuvring

Parking and associated manoeuvring can be accommodated within the proposed lots.

8 Earthworks

8.1 Proposed Earthworks

It is anticipated that the subdivision can be completed with relatively minor earthworks. At this stage earthworks are anticipated to comprise:

- Stripping of topsoil;
- Excavation and fill to form rights of way;
- Right of way pavement aggregate;
- Excavation of proposed drainage channels.

It has been assumed that stripped topsoil and additional cut material will be disposed of on site. Our preliminary estimate of the areas and volumes of works required for the subdivision is as follows:

Table 8.1 –Subdivision Earthworks Volumes

Development	Area	Cut Volume	Fill Volume	Total Volume
Strip topsoil for road and ROWs	2250 m ²	450 m ³	450 m ³	900 m ³
Additional cut for road		400 m ³	400 m ³	800 m ³
Aggregate			450 m ³	450 m ³
Cut drainage channels up to 0.5 m deep	360 m ²	100 m ³	100 m ³	200 m ³
Total	2610 m ²	950m ³	1400 m ³	2350 m ³

In addition it is anticipated that standard residential development will include excavations and potentially filling upon the existing moderate hill slopes to create suitable level development platforms. These earthworks are anticipated at the time of building consent and do not form part of the subdivision works.

8.2 Regulatory Conditions

The land is zoned Coastal Living. This scale of earthworks will exceed the permitted activity in the Coastal Living zone of 300 m³ per year per Lot, and the 2,000 m³ per year per Lot maximum for a Restricted Discretionary activity.

Pursuant to rule 13.6.8 of the Operative District Plan, it is requested that consent for excavation/filling be incorporated into the subdivision consent.

The total volume over the site remains within the 5,000 m³ per year permitted under the Regional Water and Soil Plan for Northland rules and 5,000 m² per year permitted under the Proposed Regional Plan for Northland rules.

Excavated topsoil will be used to re-grass batters. Suitable excavated material may be used for fill for road formations. Imported fill and aggregate will be used to complete the road formation.

8.3 Earthworks Construction

Earthworks will be carried out in accordance with NZS 4404 and Council’s Engineering Standards and Guidelines.

Erosion and sediment control for earthworks will be carried out in accordance with Council’s Engineering Standards and Guidelines and Auckland Council GD05. Provided the earthworks are carried out in good weather, the most appropriate erosion and sediment control measures are silt fences.

Final earthworks details will be confirmed on more detailed design. It is recommended that, as a condition of consent, an Erosion and Sediment Control Plan be required to be submitted to and approved by Council prior to start of earthworks.

8.4 Assessment Criteria

The proposed earthworks has been assessed against the Assessment Criteria in Section 12.3.7 of the Far North District Plan as follows:

Table 8.2 -Far North District Plan Section 12.3.7 Assessment Criteria

Criterion	Assessment
(a) the degree to which the activity may cause or exacerbate erosion and/or other natural hazards on the site or in the vicinity of the site, particularly lakes, rivers, wetlands and the coastline;	The proposed earthworks will not cause or exacerbate erosion.
(b) any effects on the life supporting capacity of the soil;	Soil beyond the roads and rights of way will be suitable for lawn and landscape planting
(c) any adverse effects on stormwater flow within the site, and stormwater flow to or from other properties in the vicinity of the site including public roads;	The proposed fill will not obstruct local drainage paths.
(d) any reduction in water quality;	Sediment control will be implemented during the earthworks operation using the Auckland Council GD05 guidelines.
(e) any loss of visual amenity or loss of natural character of the coastal environment;	N/A
(f) effects on Outstanding Landscape Features and Outstanding Natural Features (refer to Appendices 1A and 1B in Part 4 , and Resource Maps);	N/A
(g) the extent to which the activity may adversely affect areas of significant indigenous vegetation or significant habitats of indigenous fauna;	N/A
(h) the extent to which the activity may adversely affect heritage resources, especially archaeological sites;	Refer Planner’s report
(i) the extent to which the activity may adversely affect the cultural and spiritual values of Maori, especially Sites of Cultural Significance to Maori and waahi tapu (as listed in Appendix 1F in Part 4 , and shown on the Resource Maps);	Refer Planner’s report
(j) any cumulative adverse effects on the environment arising from the activity;	Refer Planner’s report
(k) the effectiveness of any proposals to avoid, remedy or mitigate any adverse effects arising from the activity;	The sediment control plan is designed to avoid or mitigate erosion and sediment runoff.
(l) the ability to monitor the activity and to take remedial action if necessary;	The sediment control plan is required to be monitored and action taken to avoid, remedy or mitigate risks.
(m) the criteria in Section 11.20 Development Plans in Part 2 .	Not applicable

9 Stormwater Management

9.1 Introduction

The site is generally formed by multiple flat areas linked by moderate slopes. Site drainage is generally via natural soakage into the underlying soil or as slow moving sheet flow. An existing excavated watercourse drains the low lying area on the balance lot (proposed Lot 12). Drainage from the site ultimately flows across crown land to the Hokianga Harbour to the north.

On site stormwater management proposed in this report is designed to comply with Northland Regional Council (NRC) permitted activity rules and to satisfy FNCDC criteria for a restricted discretionary activity subdivision.

9.2 District Plan Provisions

The proposed lots are zoned as Coastal Living. The relevant stormwater management/ impermeable surface rules are as follows:

Permitted stormwater management activities;

10.7.5.1.6 Stormwater Management

The maximum proportion or amount of the gross site area which may be covered by buildings and other impermeable surfaces shall be 10 % or 600 m², whichever is the lesser.

It is intended that the proposed stormwater management system comply with the rule for a Controlled / Restricted Discretionary Activity subdivision, Rule 13.7.3.4 **STORMWATER DISPOSAL**.

9.3 Regional Plan Provisions

9.3.1 Regional Water and Soil Plan for Northland

Long term stormwater management should comply with NRC permitted activity rules for stormwater discharges Rule 21.1.2(a) of the Operative Regional Water and Soil Plan for Northland;

For new subdivision and development, the best practicable option for on-site stormwater disposal shall be identified and incorporated into the stormwater management design to avoid or minimise changes to stormwater flows after development for the 1 in 5-year return period storm event.

To help achieve the best practicable option for on-site stormwater disposal in clause (a), the following measures should be considered:

- Infiltration facilities in permeable soil types;
- The retention of natural stream channels;
- Minimise areas of impermeable surfaces;
- Stormwater detention before dispersal into waterways.

The Water and Soil Plan rule indicates stormwater attenuation should be provided for the 1 in 5-year return period storm event.

9.3.2 **Proposed Regional Plan for Northland**

The Northland Regional Council is reviewing its Regional Plans and a Proposed Regional Plan for Northland was notified in September 2017. It has statutory effect at this stage, alongside the Operative Water and Soil Plan.

Proposed Rule C6.4.2 provides for the diversion and discharge of stormwater from outside a public stormwater network provided (amongst other conditions) the discharge or diversion does not cause or increase nuisance or damage to other property. The rule has no overall requirement for stormwater attenuation.

Drainage from the site is via constructed drains to the coastal marine area. Stormwater discharge from the site will not cause or increase nuisance or damage to other property.

NOTE: It has been assumed that stormwater from the subdivision discharges to land before discharging to the coastal marine area. Direct stormwater discharge to the Coastal Marine Area is a discretionary activity under the Regional Coastal Plan and Proposed Regional Plan.

9.4 **Impermeable Surfaces**

The proposed subdivision involves the construction of the Road to Vest (Lot 100) and Rights of Way A and B. Impermeable surfaces at the time of subdivision are calculated as follows:

Table 9.1 – Estimated Impermeable Surfaces for Subdivision

Lot	Development	Impermeable Surface (m ²)	Lot Area	Coverage (%)
100	Road carriageway	480	1295	37 %
11	ROW A and B carriageway	820	8068	10.2 %

The proposed subdivision provides for, but does not include residential development. It is anticipated that houses when they are built will be of a similar scale to the existing larger scale residential development in other rural-residential land in the Hokianga area.

Typical impermeable surfaces on the lots when they are developed are estimated as follows:

Table 9.2 – Typical On-lot Impermeable Surfaces

Lot	ROW (m ²)	Driveway (m ²)	Roof (m ²)	Total Impermeable (m ²)	Lot Area	Coverage (%)
5 to 10		300	300	600	8000	7.5 %
11	820	300	300	1420	8068	17.6 %

Anticipated impermeable surface coverage on Lots 5 to 10 is unlikely to exceed the 10% threshold permitted by the District Plan rules, although a very large development may exceed the 600 m² threshold permitted by the District Plan rules.

Impermeable surfaces on Lot 11 will exceed the 10% and 600m² thresholds as a result of the rights of way being within Lot 11. As part of the subdivision, consent is sought for exceeding the impermeable surfaces thresholds on proposed Lot 11. A consent notice is suggested in Section 9.7 of this report.

9.5 Stormwater Objectives

Stormwater management is proposed in compliance with Northland Regional Council (NRC) permitted activity rules and to satisfy FNDC criteria for a restricted discretionary activity subdivision.

The Regional Water and Soil Plan Rule 2121.1.2(a) , Proposed Regional Plan Rule C6.4.2 and District Plan Rule 13.7.3.4 have conflicting objectives for stormwater management. The overarching objective is to avoid remedy or mitigate any adverse effects from increased stormwater runoff. Potential adverse effects of increased stormwater runoff are outlined in Auckland Council Technical Publication 10 Stormwater Management Devices – Design Guidelines Manual” Auckland Regional Council (2003). TP10 Section 4.2 outlines the following stormwater control practices:

4.2.1 Water quantity control

Water quantity control comprises those practices that detain stormwater runoff to regulate its rate of release to receiving waters or to infiltrate runoff into the ground so it does not become surface flow. Water quantity control can be further subdivided into three categories.

- > Flood control
- > Stream channel protection
- > Infiltration or low stream flow augmentation

4.2.2 Water quality control

Water quality control applies to those practices that remove contaminants having the potential to be in or that are already in stormwater runoff.

Water quantity control in this subdivision is not critical. There are no properties downstream that are at risk of flooding and the site drains into the coastal marine area. The existing watercourse on Lot 12 has adequate capacity for increased flows and is not prone to erosion. Attenuation of stormwater runoff is not necessary.

Water quality is an issue that should be considered. The rights of way will be unsealed and stormwater runoff will be concentrated into drains that ultimately discharge into the coastal marine area. To minimise sediment runoff from the rights of way, it is proposed to pass the stormwater through grassed swale drains and ponds to trap sediment.

Water quality is not an issue for residential development. Stormwater runoff from roof tank overflow will be clean rainwater. Runoff from unsealed driveways will drain over grassed slopes before entering the main watercourse, thus trapping any sediment runoff.

9.6 Subdivision Stormwater System

9.6.1 Stormwater Layout

The road to vest will drain to existing roadside drains on Koutu Loop Road that discharge into the existing watercourse through proposed Lot 12. Given the small area of road involved, no stormwater attenuation is proposed.

Rights of Way A and B follow a broad ridge with negligible overland stormwater being intercepted. The primary stormwater system for the rights of way consists of a watertable drain on the southwest side of the carriageway, leading to a grassed swale drains through Lot 11. The swale drain on Lot 11 drains to an existing pond on the lot before overflowing to the existing watercourse on Lot 12.

A rock-lined swale drain on proposed Lot 10 was approved as part of the previous subdivision stage (Resource consent 2180188-RMAVAR/B). This is no longer required for right of way drainage and will not be constructed.

9.6.2 Peak design flow rates

Peak stormwater flows from the rights of way have been calculated using the Rational method with Runoff Coefficients specified in NZ Building Code E1. The primary stormwater system is to be designed for the 10% AEP (10 year ARI) storm event in accordance with clause 4.3.2.5.1 of Council’s Engineering Standards and Guidelines March 2009 and NZS 4404:2010. Adopting the 10% AEP rather than the 20% AEP (5 year ARI) specified in the current Regional Water and Soil Plan rules and NZS 4404:2004, provides a conservative design approach and the risk of pipeline failure is therefore considered minor. Rainfall intensity should take into account the likelihood of more frequent and more intense storms as a result of climate change (10% AEP + CC); a 2.1 degree increase in temperature resulting in a 16.8 % increase in intensity over the next 100 years is currently accepted. The 10% AEP +CC rainfall intensity fro HIRDS is 78 mm/hr.

Secondary overland flow paths have been calculated for the 1% AEP + CC, 10 minute duration rainfall intensity of 125 mm/hr.

Total stormwater runoff during the 10% AEP + CC design rainfall event from the subdivision road and rights of way is estimated as follows:

Table 9.3 – Road and Right of Way Stormwater Runoff

Surfaces	Area (m ²)	C	I ₁₀ (mm/hr)	Q (L/s)
Road to Vest (sealed)	480	0.9	78	9.4
Right of Way A (unsealed)	500	0.5	78	5.4
Right of Way B (unsealed)	320	0.5	78	3.5
Total post-development runoff	1,300			18.2
Pre-development runoff	1,300	0.4	78	11.3
Increased run-off				7.0

The increase in runoff of 7.0 litres/sec will be attenuated by the swale drains and pond. Any residual increase in flow is readily accommodated by the natural watercourses through the site.

It is proposed to construct the swale drain with 4:1 side slopes and a depth of 0.3m. The maximum flows and velocities in the swale drains during the 10% and 1% AEP + CC design rainfall event are calculated as follows:

Table 9.4 – Open and Swale Drain Flows

Parameter	10% AEP Storm	1% AEP Storm
Catchment area (Right of Way A and B carriageway and watertables)	2010 m ²	2010 m ²
Average runoff coefficient	0.5	0.5
10 minute rainfall intensity	87 mm/hr	125 mm/hr
Drain flow	0.022 m ³ /s	0.035 m ³ /s
Longitudinal slope	0.0036	0.0036
RoW B Open Drain - Depth of flow	0.220 m	0.180 m
RoW B Open Drain - Velocity	0.40 m/s	0.37 m/s
Lot 11 Swale Drain - Depth of flow	0.180 m	0.150 m
Lot 11 Swale Drain - Velocity	0.26 m/s	0.24 m/s

The maximum velocities are well within the following maximum recommended velocities as specified in recognised publications:

- 1.3 – 1.5 m/s for stiff sandy clay [NZ Building Code E1 Table 5]
- 1.5 m/s during 10% AEP design flow for grassed swale drains [Auckland Council TP10 section 9.6.3 and NZS4404:2010 clause 4.3.7.6(f)]

The product of depth and velocity is well within 0.4 m²/s specified in Council’s Engineering Standards and Guidelines.

9.7 On-Lot Stormwater Management

Lots 5 to 9 and 11 drain to the existing water course on proposed Lot 12. Lot 10 drains directly to the coast.

Rainwater from roofs will be collected in tanks for use. Roof tank overflow, together with yard and driveway runoff, should be discharged on to grassed surfaces in a dispersed manner.

There are no properties downstream that are at risk of flooding and the existing watercourse is not prone to erosion. Stormwater attenuation from the residential development is not necessary and is not proposed.

Impermeable surfaces on Lot 11 will exceed the 10% and 600m² thresholds as a result of the rights of way being within Lot 11. As part of the subdivision, consent is sought for exceeding the impermeable surfaces thresholds on proposed Lot 11.

Stormwater attenuation from the rights of way is provided by the pond on Lot 11. Stormwater attenuation from future residential development is not necessary unless impermeable surfaces associated with the residential development become large. We recommend that the subdivision consent provide for 600m² impermeable surfaces on Lot 11 (as allowed under District Plan Rule 10.7.5.1.6) in addition to the impermeable surfaces associated with the rights of way.

We suggest a consent notice as follows:

Lots 11

Resource Consent has been issued, pursuant to RC, providing for up to 600m² impermeable surface coverage on Lot 11 in addition to the impermeable surfaces on Rights of Way A and B. If at the time of development of the Lot, impermeable surfaces exceed these areas, a stormwater management system shall be designed, for the approval of Council's duly authorised officer, and implemented for that Lot to ensure peak stormwater runoff from the developed lot does not exceed flows anticipated by the consented impermeable surface areas during a design 10% annual exceedance probability storm event with a recognised allowance for climate change.

9.8 Matters of Discretion

The proposed stormwater management has been assessed against the matters of discretion for a restricted discretionary subdivision. Far North District Plan Rule 13.8.5(g) refers to the matters listed in 13.7.3. The proposed stormwater system has been assessed for compliance with Section 13.7.3.4 as follows:

Table 9.5 – Far North District Plan Section 13.7.3.4 Matters

Matter	Comment
(a) All allotments shall be provided, within their net area, with a means for the disposal of collected stormwater from the roof of all potential or existing buildings and from all impervious surfaces, in such a way so as to avoid or mitigate any adverse effects of stormwater runoff on receiving environments, including downstream properties. This shall be done for a rainfall event with a 10% Annual Exceedance Probability (AEP).	Due to the low density of development, surface flows across the grassed surface to the existing watercourses is considered appropriate. Stormwater runoff from standard residential development will not have adverse effects on the downstream environment.
(b) The preferred means of disposal of collected stormwater in urban areas will be by way of piping to an approved outfall, each new allotment shall be provided with a piped connection to the outfall laid at least 600mm into the net area of the allotment. This includes land allocated on a cross lease or company lease. The connection should be at the lowest point of the site to enable water from driveways and other impervious surfaces to drain to it. Where it is not practical to provide stormwater connections for each lot then the application for subdivision shall include a report detailing how stormwater from each lot is to be disposed of without adversely affecting downstream properties or the receiving environment.	The subdivision is not in an urban area.

<p>(c) The provision of grass swales and other water retention devices such as ponds and depressions in the land surface may be required by the Council in order to achieve adequate mitigation of the effects of stormwater runoff.</p>	<p>An open drain, grassed swale and a pond will be utilised for stormwater runoff from the rights of way.</p>
<p>(d) All subdivision applications creating sites 2ha or less shall include a detailed report from a Chartered Professional Engineer or other suitably qualified person addressing stormwater disposal.</p>	<p>This report addresses this issue.</p>
<p>(e) Where flow rate control is required to protect downstream properties and/or the receiving environment then the stormwater disposal system shall be designed in accordance with the onsite control practices as contained in <i>“Technical Publication 10, Stormwater Management Devices – Design Guidelines Manual” Auckland Regional Council (2003)</i>.</p>	<p>The stormwater system has been designed to TP10.</p>

10 Water Supply

10.1 Potable Water Supply

There is no public water supply at Koutu. Each lot will be dependent on roof run off collected in standard water tanks.

10.2 Fire Fighting

Council Engineering Standards require a water supply that is adequate for firefighting purposes. Where there is currently no reticulated water supply, then each residential lot will be responsible for providing adequate on-site firefighting supply.

For a single family home without a sprinkler system in a non-reticulated supply area, the New Zealand Fire Service (NZFS) Fire Fighting Water Supplies Code of Practice SNZ PAS 4509:2008 recommends for a fire fighting supply a minimum water storage capacity of 45 m³ within 90 m of the dwelling, fitted with an adequate means for extracting the water from the tank.

10.3 Alternative to Fire Fighting Supply

The Code (SNZ PAS 4509:2008) specifically allows for alternative methods to be used in meeting the Code requirements, as long as there is approval from an appropriate person nominated by the NZFS National Commander. Clause 4.4 of the Code states that:

- Fire engineers or similar competent persons may use alternative methods, such as those detailed in Appendix H and Appendix J to determine firefighting water supplies. To comply with this code of practice, such alternatives must be submitted for approval to the person(s) nominated by the National Commander. The person(s) so nominated will approve these cases on confirmation that the method and calculations used are correctly applied.
- Alternative methods will need to show that the calculated firefighting water supply makes allowances for tactical flow rates (that is, the amount needed above a theoretical amount to absorb the released heat for operational effectiveness).

The procedure to be followed in the case of an alternative fire-fighting supply is as follows:

- The competent person should submit a firefighting facilities checklist (FFFC), with a scale site map showing contours and proposed alternatives to Table 2 with rationale for assessment to NZFS

If the proposed supply is approved by a nominated NZFS person, Council will accept the FFFC and compliance with the Code will be achieved.

NZFS considers that a 'one size fits all' volume is not appropriate in all circumstances. There are alternatives to firefighting couplings but firefighters are not expected to lift pumps or hoses onto the top of water tanks.

11 On-site Effluent Disposal

11.1 Summary of Regulatory Issues

11.1.1 Regional Water and Soil Plan

The discharge of sewage effluent on to land is controlled by the permitted activity rules 15.1 of the Regional Water and Soil Plan for Northland (RW&SP).

The effluent disposal systems will need to be sited to avoid surface runoff and natural seepage from higher ground, or protected by using interception drains. The disposal areas may need to be mounded above the surrounding land to ensure that the lowest point in the field complies with the Regional Water and Soil Plan (RW&SP) and Far North District Plan (FNDP) rules:

- Not less than 1.2 m above the winter groundwater table for primary treated effluent (RW&SP Rule 15.1.3), and;
- Not less than 0.6 m above the winter groundwater table for secondary treated effluent (RW&SP Rule 15.1.4).

The disposal field also needs to have minimum separation distances from watercourses and boundaries as follows:

- Not less than 20 m from any surface water for primary treated effluent (RW&SP Rule 15.1.3);
- Not less than 15 m from any surface water for secondary treated effluent (RW&SP Rule 15.1.4);
- Not less than 30 m from any river, lake, wetland or CMA (FNDP Rule 12.7.6.1.4);
- Not less than 20 m from any existing groundwater bore located on any other property (RW&SP Rules 15.1.3 and 15.1.4);
- Not less than 1.5 m from a boundary, and;
- Not less than 3.0 m from a dwelling.

The Regional Water & Soil Plan defines “Surface Water” as: all water, flowing or not, above ground. It includes water in continually or intermittently flowing rivers, artificial watercourses, lakes and wetlands, and water impounded by structures such as dams or weirs but does not include water while in pipes, tanks, cisterns, nor water in the Coastal Marine Area.

Surface water, as defined in NZS1547:2012, refers to: any fresh water or geothermal water in a river, lake, stream, or wetland that may be permanently or intermittently flowing. Surface water also includes water in the coastal marine area and water in man-made drains, channels, and dams unless these are to specifically divert surface water away from the land application area. Surface water excludes any water in a pipe or tank.

Northland Regional Council (NRC) has concluded that, to be a permitted activity, secondary treated wastewater is to achieve a 15 m setback from the 20 year ARI flood event. This is derived from TP58, where it is recommended that secondary treated effluent is disposed to ground outside of the 20 year ARI, with a further factor of safety applied being NRC’s surface water setback requirement.

11.1.2 **Proposed Regional Plan**

Northland Regional Council notified a Proposed Regional Plan in September 2017. The Proposed Regional Plan has statutory effect at this stage alongside the Operative Water and Soil Plan. The Proposed Plan may be operative by the time the lots are developed.

The discharge of sewage effluent on to land should comply with the proposed permitted activity rule C6.1.3. The proposed rule is similar to the existing permitted activity rule except that:

- The volume of wastewater discharge is reduced from 3m³ per day to 2m³ per day
- The slope of the disposal area is not to exceed 25 degrees
- Special provisions apply to disposal area slopes greater than 10 degrees
- Setback distances to watercourses are reduced in some cases.

The following analysis ensures that future on-site wastewater disposal on each lot can comply with both the operative and proposed wastewater discharge rules.

11.1.3 **District Plan**

The Far North District Plan contains an additional rule relating to wastewater discharges to land:

- District Plan Rule 12.7.6.1.4 specifies that effluent fields shall be located no closer than 30 m from any river, lake, wetland or the Coastal Marine Area.

11.2 **Design Population and System Flow Volumes**

11.2.1 **Design Occupancy Rating**

It has been assumed for the purpose of this site suitability report that each proposed subdivision will contain a three bedroom residential unit. In reference to TP58 Section 6.3.1, it is recommended that the design occupancy of five people is therefore adopted.

11.2.2 **Source of Water Supply**

Water supply is to be sourced from on-site roof water tank supply. Flow reduction fittings may be used, but this cannot be assumed in assessing potential wastewater flows.

11.2.3 **Design Flow Volumes**

It is assumed that the proposed residential units will be designed to meet category 'C' according to TP58 Section 6.3.1, 'households with 11/5.5 or 6/3 Flush Toilet(s) and Standard Fixtures, low water use dishwasher and NO garbage grinder'. A category C property accounts for up to 160 litres/person/day of wastewater generation for on-site roof water supply.

Total daily wastewater generation of the proposed development is calculated as follows;

$$\begin{aligned}
 \text{Total daily wastewater generation} &= \text{Daily occupancy number} \times \text{design flow allowances} \\
 &= 5 \times (160 \text{ litres/person/day})
 \end{aligned}$$

≡ 800 litres/day

Design flows of 800 litres per day for a five bedroom household shall be adopted for the purpose of this report.

11.3 Design for Land Application System

11.3.1 Trickle Irrigation

The use of trickle irrigation disposal is sustainable for the very long term. It provides as easy and convenient system for distributing effluent;

- Over a much wider area;
- At an application rate low enough to be sustained by evapo-transpiration without reliance on soakage, and;
- Without unduly disturbing the visual effect of the proposed land disposal area and landscaped gardens.

11.3.2 Land Disposal System Location

The maximum slope angle for drip irrigation land disposal systems according to TP58 guidelines is 25°, therefore it is considered suitable to locate the disposal systems across the entire site including the slopes of proposed lots 2 to 4, inclusive. However, effluent disposal systems will need to be sited to avoid surface runoff and natural seepage from higher ground, or protected by using interception drains as presented in Drawing No. 17 029/08 in Appendix A.

In addition siting restrictions listed in Section 7.1 of this report will need to be adhered to, to provide a suitable setback from watercourses, boundaries and buildings.

11.3.3 Land Disposal System Sizing and Design

Based upon the results of the intrusive investigation, soil category 7 as defined within TP58 can be expected to sustain a land loading rate of 2 mm/day, which has been adopted for the purpose of the following designs to account for the possible variations with future residential developments, and to factor in the shallow hard pan underlying the proposed lots.

The total length of the trickle irrigation system required (UniBioline or similar) is calculated as follows;

$$\begin{aligned}
 \text{Total length of dripper irrigation tubing} &= \frac{\text{Total daily wastewater generation}}{\text{Land loading rate}} \\
 &= \frac{800}{2} \\
 &= \mathbf{400\ m}
 \end{aligned}$$

The proposed lots are suitable for surface or sub-surface trickle irrigation systems. Both types of irrigation require the same surface area for land disposal and tubing should include 2.3 l/hr drippers at 0.6 m spacing (UniBioline or similar). Example locations are presented on Drawing No. 18 173/P2.

Surface trickle irrigation is for land intended to be densely planted up, and should be laid at 1 m centres (total of 200 m length tubing). The dripper lines may be covered with 200 mm of bark mulch and densely vegetated with suitable plants for evapo-transpiration systems. However, due to the presence of a dense hard pan at shallow depth beneath

the site and proposed disposal field, it is recommended that all disposal fields are mounded or built up to a minimum thickness of 600 mm. Additional materials should be sourced from site-won activities such as topsoil strips within the footprint of the residential units and driveways and comprise topsoil and/or bark mulch.

Subsurface irrigation is for land intended to be grassed or upon slopes $>10^\circ$; tubing must be laid 100 – 250 mm into topsoil. It is recommended that tubing is laid at 0.5 m centres (total of 400 m length tubing) to ensure even watering of turf.

Access to the disposal area should be minimised by effective bordering with either vegetation or fencing.

11.3.4 **Land Disposal System Reserve Area and Sizing**

In accordance with NRC guidelines a minimum reserve area of 100 % is required for subsurface and surface irrigation. The reserve field is required to cope with wastewater in the event of a system failure, or from underestimation of daily wastewater production. Example locations for these are indicated on Drawing No. 17 029/08.

11.3.5 **Loading Method**

It is proposed that the pump chamber for treated effluent will, as is usual practise, be controlled by float switches which would operate the trickle irrigation pumps on demand. No other means of control is necessary.

11.3.6 **Factors for Safety**

The major factor of safety is in treatment plant capacity. The standard treatment plants have at least 50 % spare capacity, in relation to the load from a normal 3-bedroom house. Safety factors exist for disposal by the presence of correctly sized reserve area.

11.4 **Design for Treatment System**

11.4.1 **Parameters affecting choice of Treatment**

- Certainty for long term sustainability;
- Minimal environmental effect.

11.4.2 **Treatment Plant Design Sizing**

The naming of a proprietary secondary treatment plant will be decided by the new owner at the building consent stage, when the position and scale of the building are known. Treatment plants must meet the requirements of AS/NZS 1546.3:2001.

The system is to meet the quality output of AS/NZS 1546.3:2003, producing effluent of less than 20 g/m³ of 5-day biochemical oxygen demand (BOD₅) and no greater than 30 g/m³ total suspended solids (TSS), capable of consistently treating 1,200 litres/day.

11.4.3 **Siting Requirements**

Restrictions on siting of secondary treatment plants are:

- Invert level at inlet not less than 0.5 m below floor level;
- Greater than 3.0 m from any house;

- Greater than 1.5 m from any boundary;
- Easily accessible for routine maintenance.

11.4.4 **Summary of Design Issues**

Due to the nature of subdivision exact build size and positioning are to be confirmed, therefore site suitability has been established and locations for wastewater disposal have been suggested to maximise the system performance and minimise disruptions caused by moisture content of the top and subsurface soils.

In addition it is recommended that if required, additional topsoil should be sourced from site-won sources, more specifically across the development platform during raising earthwork operations.

Hydrophilic plant species should be planted across the disposal field in order to maximise evapo-transpiration.

11.5 **Construction Installation**

11.5.1 **Installation Requirements**

Treatment plants must be installed by the plant provider to the manufacturers published specifications. The trickle irrigation tubing must be installed by the treatment plant installer.

11.5.2 **Commissioning Requirements**

The treatment and trickle irrigation must be tested and commissioned by the plant provider.

11.6 **Management Procedures**

11.6.1 **Operation Maintenance Requirements**

A maintenance agreement is to be entered into with the provider. Once commissioned the plant will operate automatically with alarms fitted to advise the house occupants in the event of emergency failure.

11.6.2 **Monitoring and Inspection**

As part of the maintenance agreement with the plant provider, there should be at least annual inspections with written reports provided to the owner.

The system is to meet the quality output of AS/NZS 1546.3:2003, producing effluent of less than 20 g/m³ of 5-day biochemical oxygen demand (BOD₅) and no greater than 30 g/m³ total suspended solids (TSS), capable of consistently treating 1000 litres/day.

11.7 **FNDC On-site Effluent Disposal Policy 2008**

11.7.1 **Likelihood of Failure/ Accidental Discharge**

The likelihood of a discharge from a household secondary (aeration) treatment plant is less than minor. The pipe work to and within the plant when correctly installed is robust with sealed connections and buried below ground reducing the risk of accidental damage. Only the puncture of a distribution pipe would allow treated effluent to escape in a concentrated manner.

11.7.2 **Consequence of Failure/ Accidental Discharge**

In the unlikely event of some form of failure/ accidental discharge, the material would have to travel in excess of 15 m over ground to reach any surface water (adopting the NRC minimum requirement of 15 m from surface water). Most, if not all, of the accidental discharge is likely to be lost to soakage over this distance and the failure should quickly become apparent.

11.7.3 **Multiple House Sites**

Proposed lots exhibit more than one location where a trickle irrigation field could be constructed, so the final appropriate location for installing the disposal system cannot be pre-determined.

11.7.4 **Vegetation Planting**

Trickle irrigation disposal systems rely on evapo-transpiration from sub-surface irrigated lawns or covered surface irrigated landscape planting. Where new planting is required, this must be in place prior for the evapo-transpiration process to begin functioning. A list of suitable plants is included within Appendix E.

11.8 **Site Assessment Form**

Enclosed within this report is a completed Wastewater Disposal Site Evaluation Checklist as guided by FNDC.

11.9 **Existing Wastewater System**

An existing wastewater system is currently operational, servicing the residential unit located within proposed lot 12. The existing wastewater system was observed on site during the Haigh Workman walkover survey and whilst no records were provided for the existing disposal system it is concluded that the dwelling discharges wastewater to a septic tank and ultimately trenches.

All existing wastewater disposal plant was observed to be situated within the proposed site boundaries of lot 12 with adequate set-back distances from site boundaries, existing structures and on-site watercourses/drains.

Appendix A – Drawings

Drawing No.	Title	Scale
18 173 / P1	Site Location Plan	1:5,000
18 173 / P2	Development Plan	1:1000
18 173 / P3	Exploratory Hole Location and Geotechnical Site Plan	1:1,000
18 173 / P4	Intersection Plan	1;500
18 173 / LS1	Longitudinal Section Koutu Loop Road	1:500
18 173 / LS2, LS3	Longitudinal Section Road 1	1:500
18 173 / LS4	Longitudinal Section Sight Line	1:500
18 173 / DE1	Typical Cross Sections	1:50
18 173 / CS1 – CS11	Cross Sections Road 1	1:100

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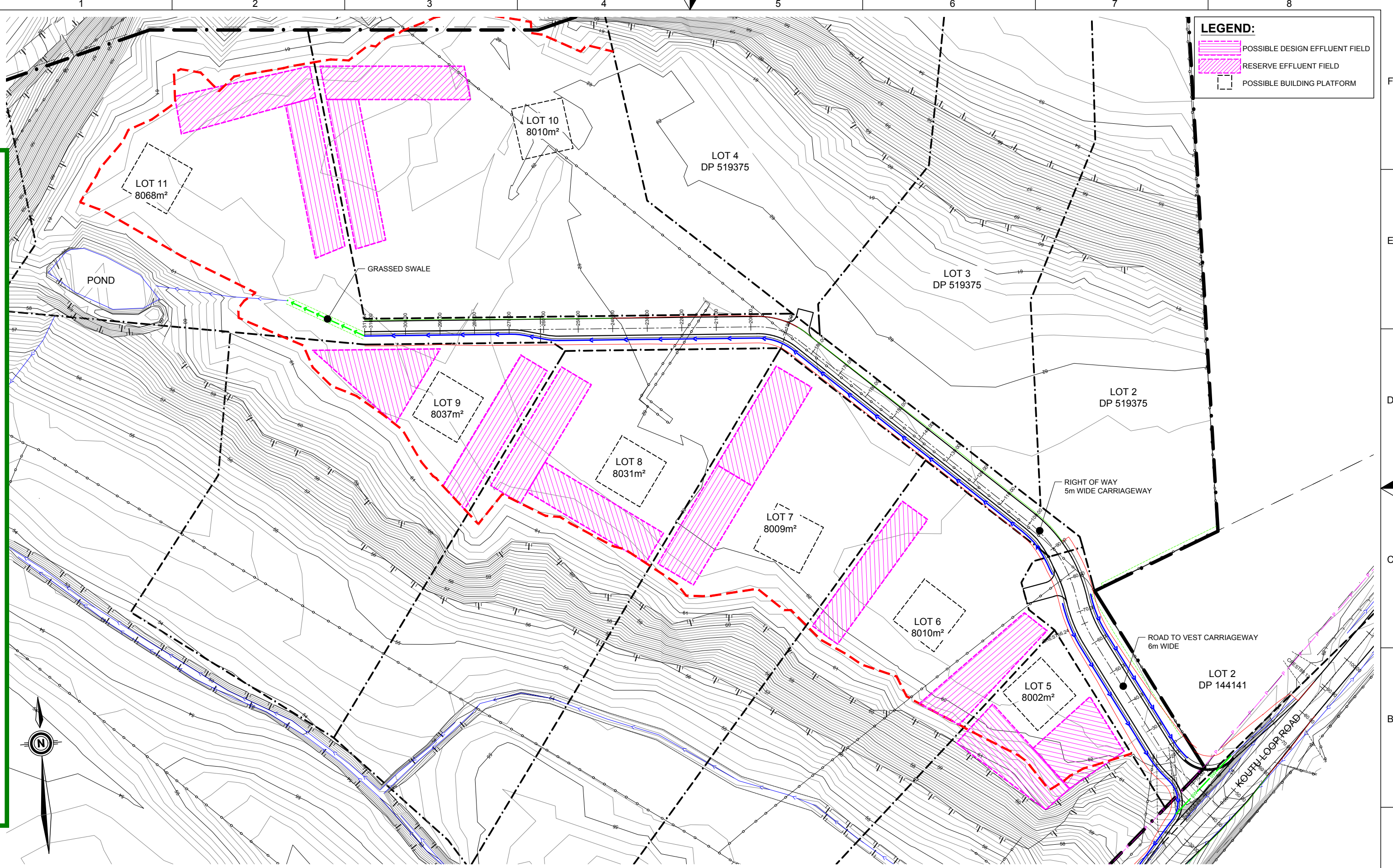
NOTES:
 1. LOT BOUNDARIES AND AERIAL PHOTO INFORMATION TAKEN FROM LAND INFORMATION NEW ZEALAND (LINZ).

THIS SITE



<table border="1"> <thead> <tr> <th>Issue</th> <th>Date</th> <th>Revision</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>04/09/2018</td> <td>FIRST ISSUE</td> </tr> </tbody> </table>			Issue	Date	Revision	A	04/09/2018	FIRST ISSUE	DWG Site Location Plan						Project Proposed Subdivision 594 Koutu Loop Road		DWG No. P1
Issue	Date	Revision															
A	04/09/2018	FIRST ISSUE															
			Scale 1:5000 @A3			Date 04/09/2018			Client B & T Family Trust	Sheet No. 1 of 4							
			Drawn AP Checked MW Approved JP			Project No. 18 173 RC no.											
			File Z:\18 JOBS\18 173 B & T FAMILY TRUST\DRAWINGS\180904 BT FAMILY TRUST SUBDIVISION.DWG			<small>DIMENSIONS MUST NOT BE SCALE MEASURED FROM THESE DRAWINGS. THE CONTRACTOR SHALL CHECK & VERIFY ALL DIMENSIONS INCLUDING, SITE LEVELS, HEIGHTS AND ANGLES ON SITE PRIOR TO COMMENCING ANY WORK. THE COPYRIGHT TO THESE DRAWINGS AND ALL PARTS THERE OF REMAIN THE PROPERTY OF HAIGH WORKMAN LTD. ©2018</small>											

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Issue	Date	Revision
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DWG Development Plan

Scale 1:1000 @A3

Date 04/09/2018

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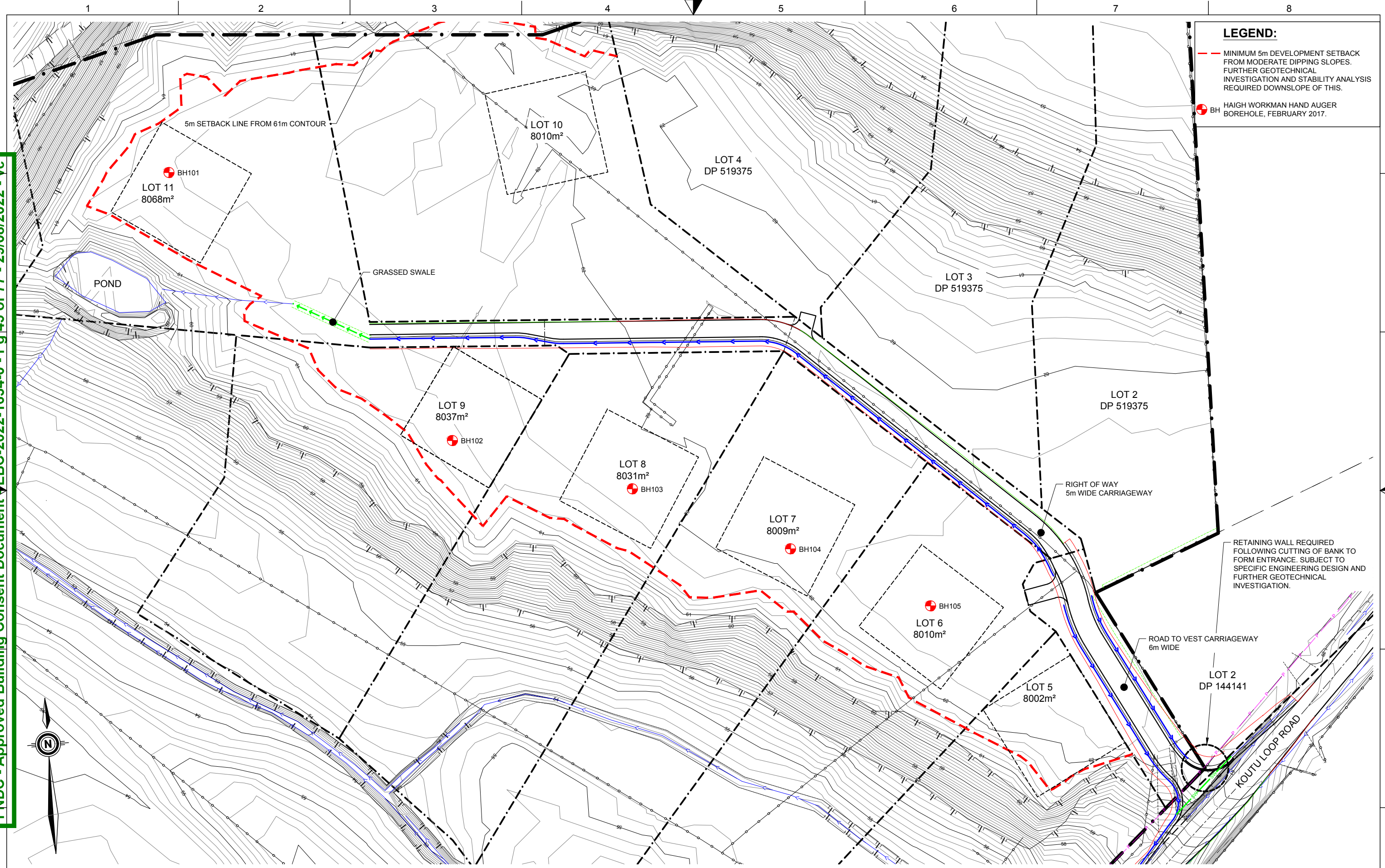
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DWG No. **P2**

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LEGEND:

- MINIMUM 5m DEVELOPMENT SETBACK FROM MODERATE DIPPING SLOPES. FURTHER GEOTECHNICAL INVESTIGATION AND STABILITY ANALYSIS REQUIRED DOWNSLOPE OF THIS.
- BH HAIGH WORKMAN HAND AUGER BOREHOLE, FEBRUARY 2017.

Issue	Date	Revision
A	04/09/2018	FIRST ISSUE

DWG **Exploratory Hole Location and Geotechnical Site Plan**

Scale 1:1000 @A3

Drawn AP Checked MW Approved JP

Date 04/09/2018

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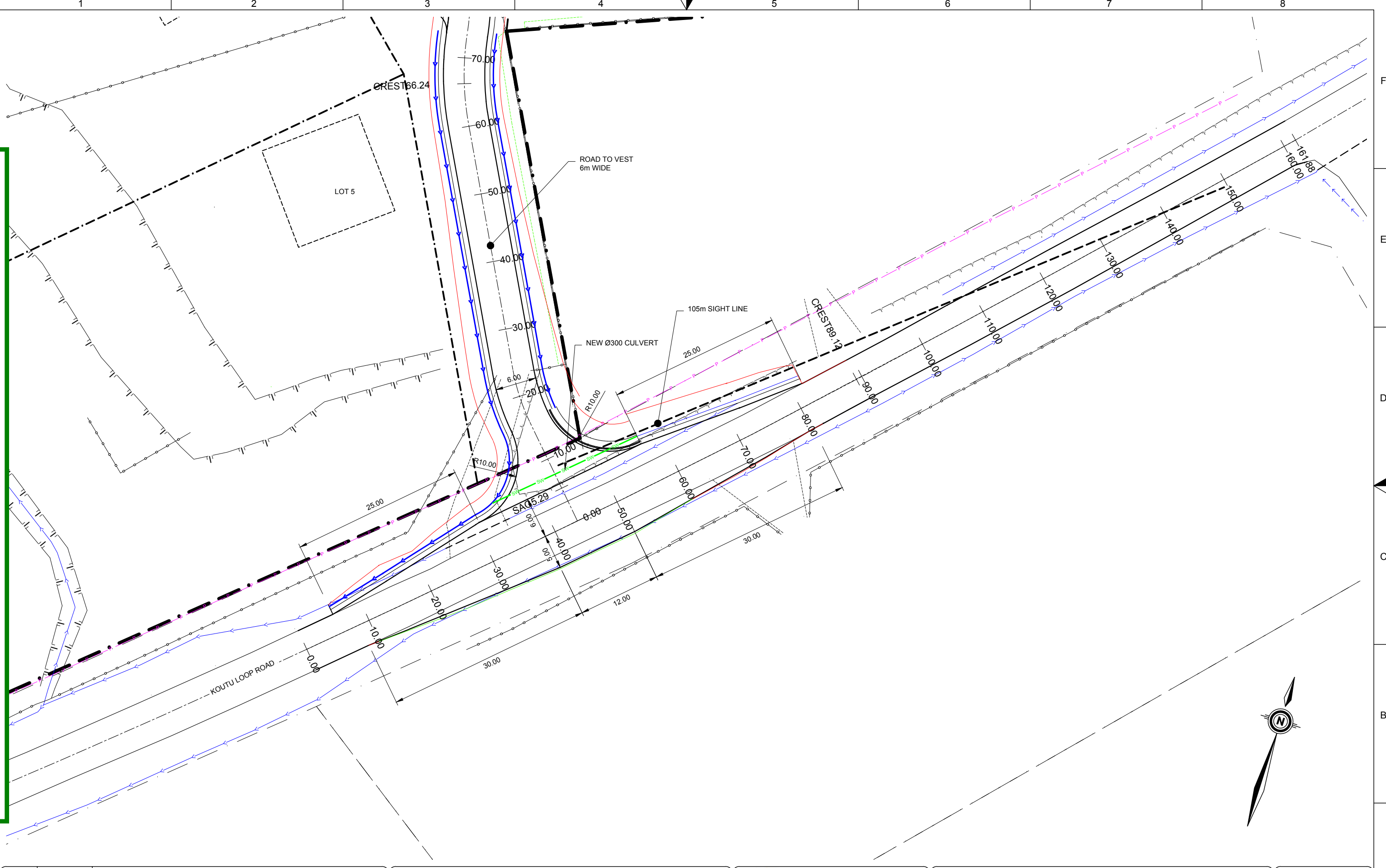
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A	04/09/2018	FIRST ISSUE

DWG **Intersection Plan**

Scale 1:500 @A3

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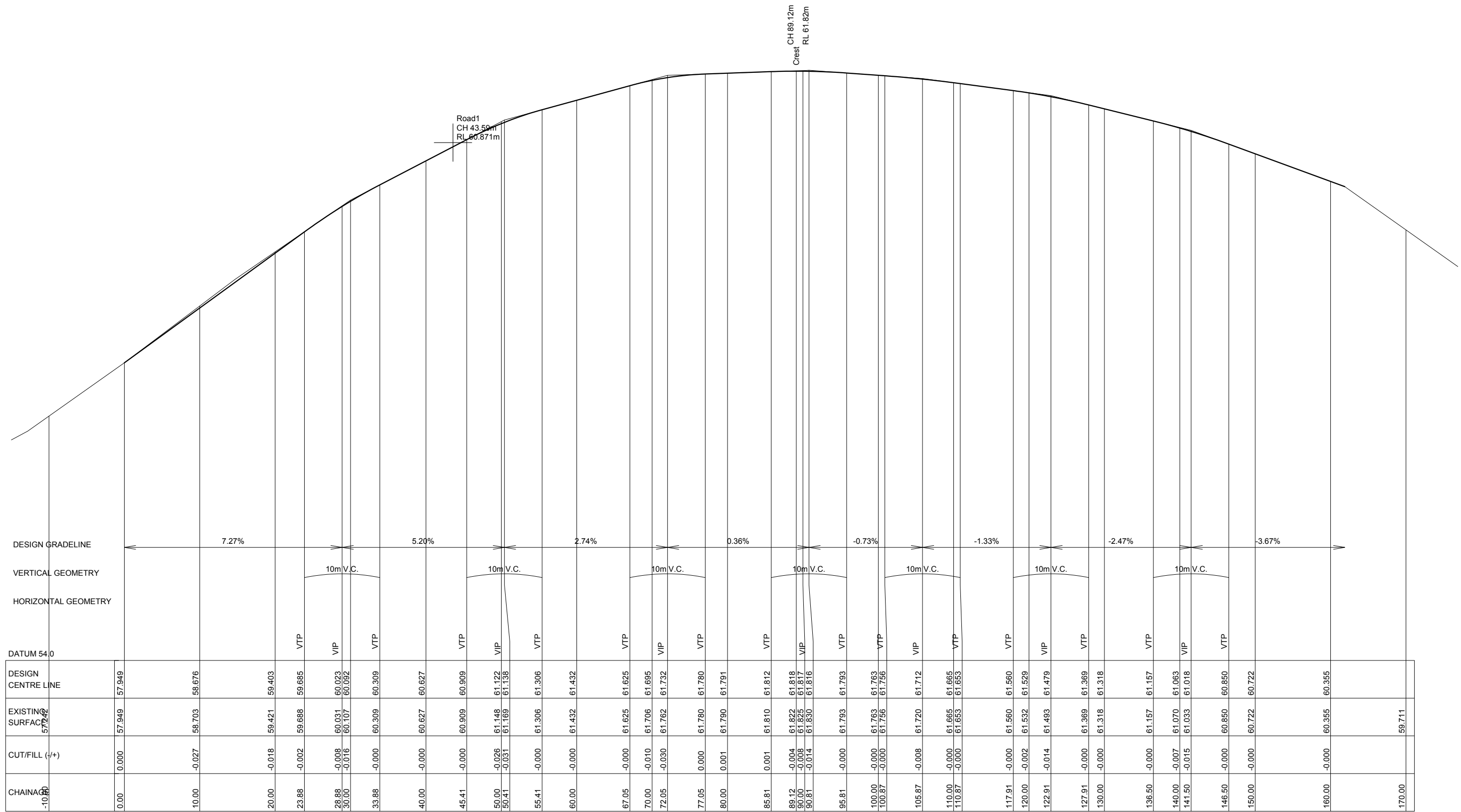
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Project No. **18 173** RC no.

DWG No. **P4**

Sheet No. **4 of 4**

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LONGITUDINAL SECTION Existing
 Horizontal Scale 1:500
 Vertical Scale 1:50

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A	04/09/2018	FIRST ISSUE

DWG **Longitudinal Section**
Koutu Loop Road

Scale 1:500 @A3

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Date 04/09/2018

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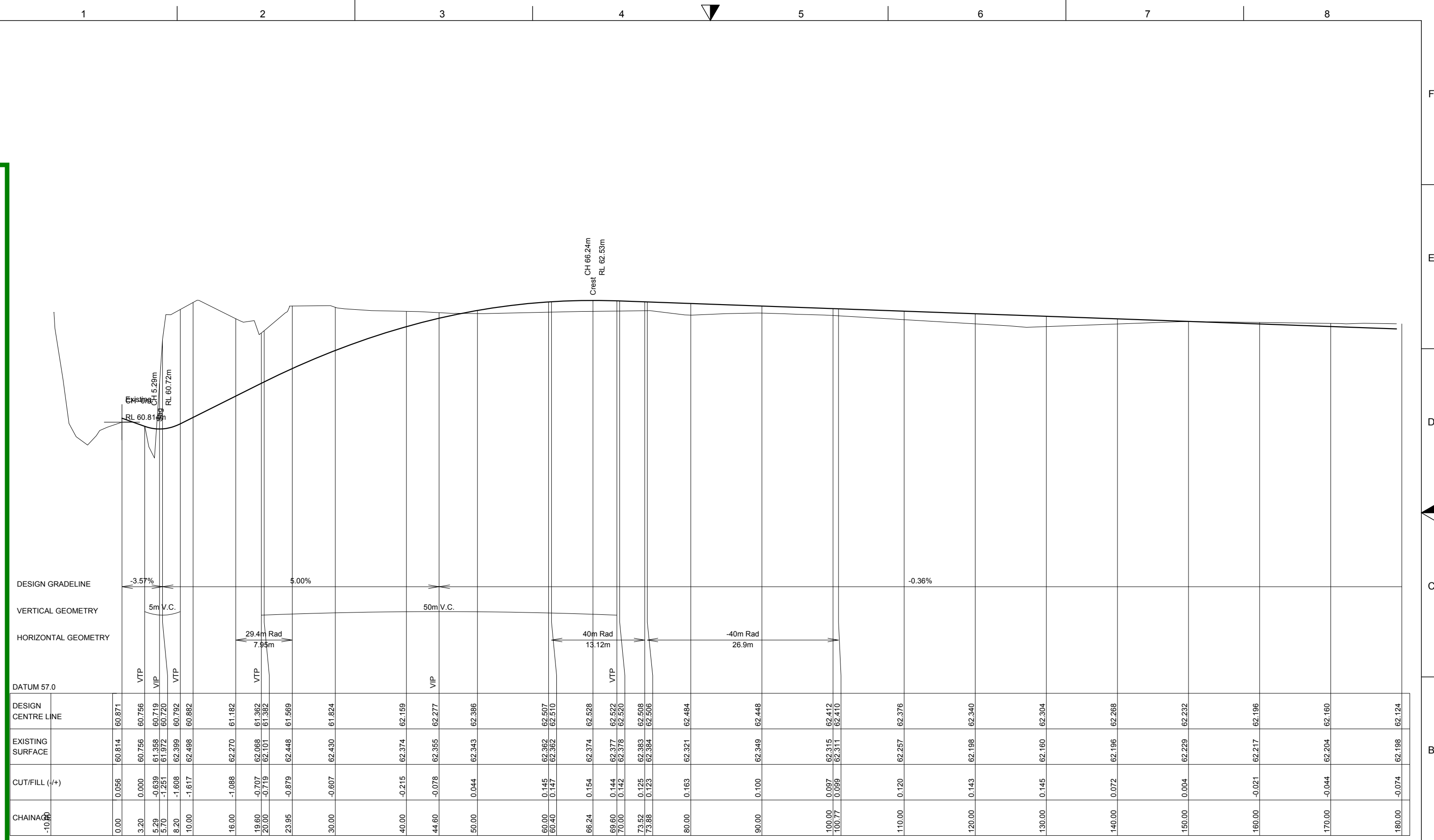
Project **Proposed Subdivision**
 594 Koutu Loop Road

Client **B & T Family Trust**

Project No. **18 173** RC no.

DWG No. **LS1**

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LONGITUDINAL SECTION Road1
 Horizontal Scale 1:500
 Vertical Scale 1:50

Issue	Date	Revision
A	04/09/2018	FIRST ISSUE

DWG Longitudinal Section Road 1

Scale 1:500 @A3

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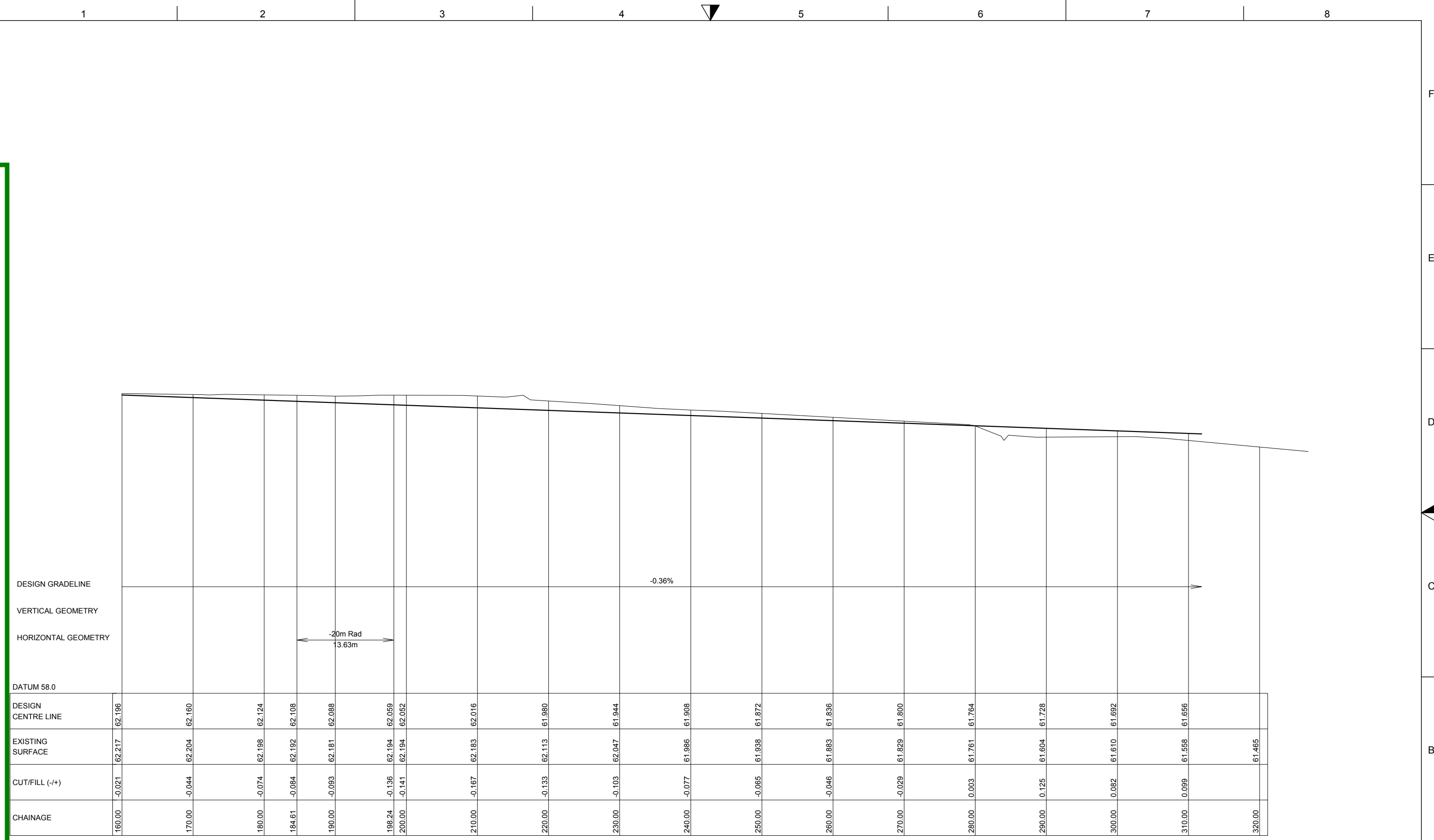
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Project No. 18 173 RC no.

DWG No. **LS2**

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LONGITUDINAL SECTION Road 1
 Horizontal Scale 1:500
 Vertical Scale 1:50

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A	04/09/2018	FIRST ISSUE

DWG Longitudinal Section Road 1

Scale 1:500 @A3

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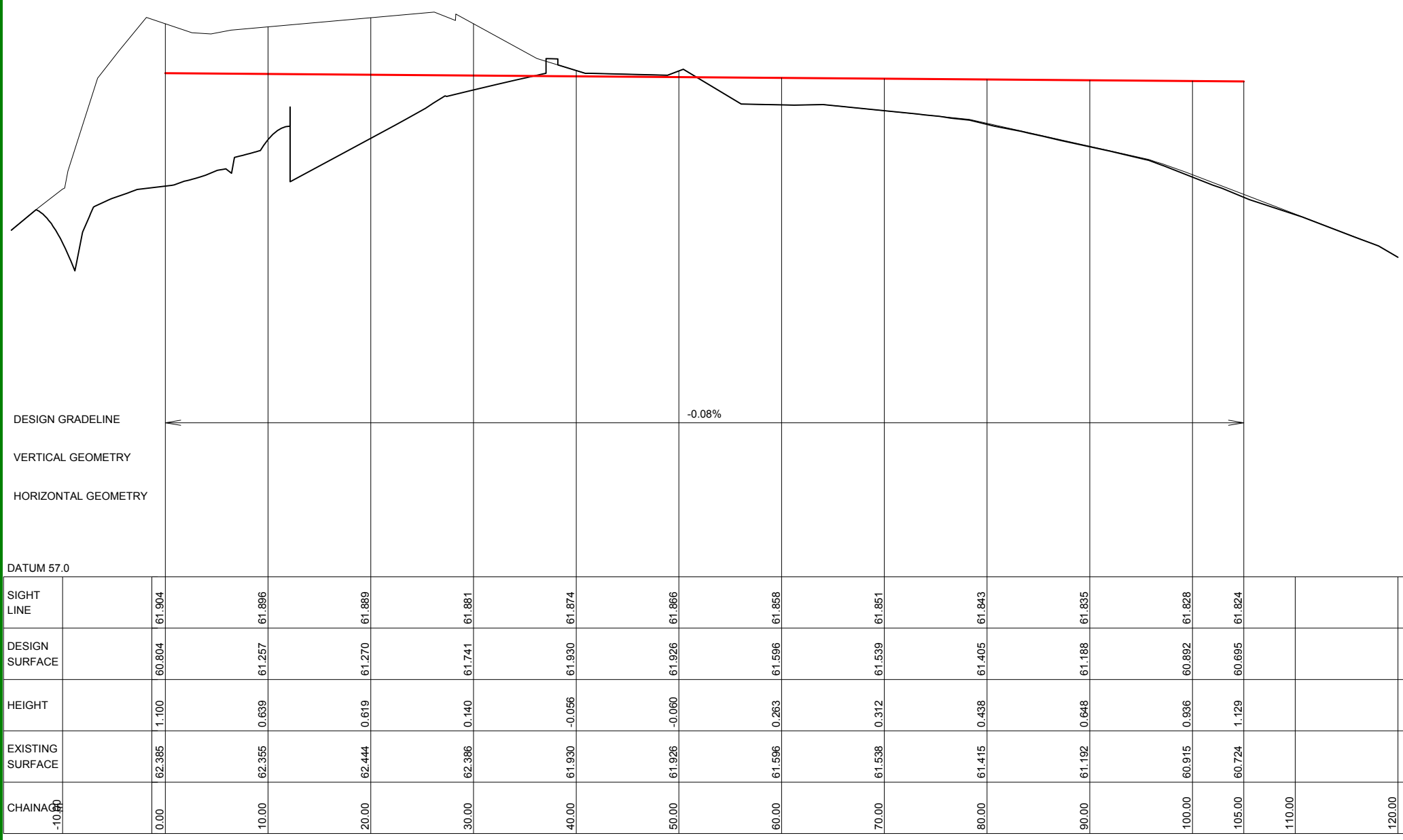
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DWG No. **LS3**

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LONGITUDINAL SECTION Sight Line
 Horizontal Scale 1:500
 Vertical Scale 1:50

Issue	Date	Revision
A	04/09/2018	FIRST ISSUE

DWG **Longitudinal Section Sight Line**

Scale 1:500 @A3

Drawn AP Checked MW Approved JP

Date 04/09/2018

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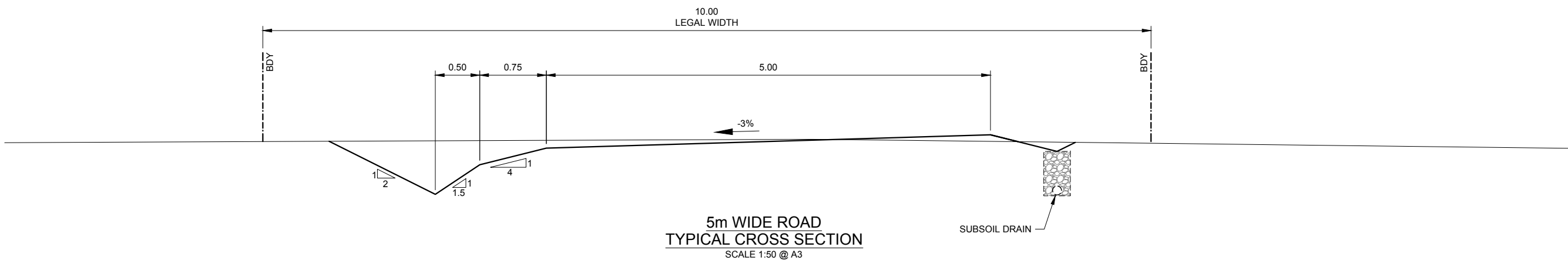
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Project No. **18 173** RC no.

DWG No. **LS4**

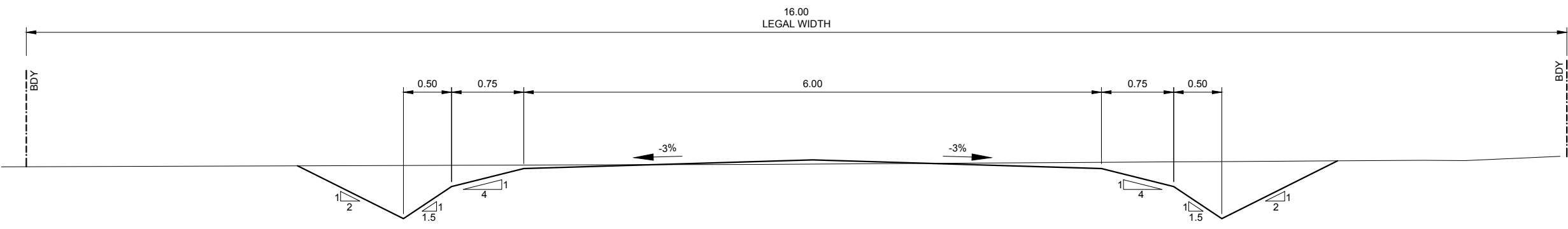
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**5m WIDE ROAD
TYPICAL CROSS SECTION**
SCALE 1:50 @ A3

SUBSOIL DRAIN



**6m WIDE ROAD
TYPICAL CROSS SECTION**
SCALE 1:50 @ A3

Issue	Date	Revision
A	04/09/2018	FIRST ISSUE

DWG	Typical Cross Sections	
Scale	1:50 @A3	Date 04/09/2018
Drawn	AP	Checked MW
Approved	JP	
File	Z:\18 JOBS\18 173 B & T FAMILY TRUST\DRAWINGS\180904 BT FAMILY TRUST SUBDIVISION.DWG	

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Project	Proposed Subdivision 594 Koutu Loop Road	
Client	B & T Family Trust	
Project No.	18 173	RC no.

DWG No.	DE1
Sheet No.	1 of 1

Appendix B – Exploratory Hole Records

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Borehole Log

JOB No. 18 173

Borehole no. **BH101**

Client B & T Family Trust

Date 20-Feb-17

Location 594 Koutu Loop Road, Koutu

Filling Method: Hand Auger

Diameter: 50mm

Logged: EC

Checked: JP

Soil Description	Depth	Legend	Shear Strength (kPa)	Moisture	Sample, Other Tests, Remarks.
Grassed TOPSOIL comprising sandy CLAY . Brown, wet, high plasticity.	0.0			Wet	
Fine to medium SAND . Grey, dry (hard pan).	0.3			Dry	
Silty CLAY . Brown and grey, very stiff, wet, high plasticity.	0.6			Wet	162 kPa
Borehole complete at 1.00 m	1.0				102 kPa
	1.5				
	2.0				
	2.5				
	3.0				
	3.5				
	4.0				
	4.5				
	5.0				

Soils Legend

Topsoil		Fill		Clay		Silt		xxxxxxx
Sand		Peat		Gravel		Rock		

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FNDC - Approved Building Consent Document - EBC-2022-1634-0 - Pg 54 of 77 - 29/08/2022 - vc

Borehole Log			JOB No. 18 173		Borehole no. BH102				
Client			Date		20-Feb-17				
Location			594 Koutu Loop Road, Koutu						
Drilling Method:		Diameter:	Logged:		Checked:				
Hand Auger		50mm	EC		JP				
Soil Description	Depth	Legend	Shear Strength (kPa)		Moisture	Sample, Other Tests, Remarks.			
			0	50	100	150	200		
Grassed TOPSOIL comprising fine to medium SAND. Dark brown, wet.	0.0	wwwwwww	■					Wet	
	0.2	wwwwwww ooooo				Dry			
Fine to medium SAND. Grey, dry, loose. Dense HARD PAN. Borehole terminated at 0.5 m	0.5	ooooo							
	1.0								
	1.5								
	2.0								
	2.5								
	3.0								
	3.5								
	4.0								
4.5									
5.0									

Soils Legend

Topsoil	wwwwwww	Fill	/ / / / / / / / /	Clay	-----	Silt	xxxxxxxxx
Sand	ooooo	Peat	v v v v v v v v	Gravel	ooooooooo	Rock	▲▲▲▲▲

Borehole Log

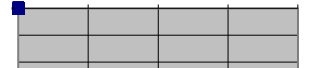

JOB No. 18 173

Borehole no. **BH103**

Client B & T Family Trust Date 20-Feb-17

Location 594 Koutu Loop Road, Koutu

Drilling Method: Hand Auger Diameter: 50mm Logged: EC Checked: JP

Soil Description	Depth	Legend	Shear Strength (kPa)					Moisture	Sample, Other Tests, Remarks.
			0	50	100	150	200		
Grassed TOPSOIL comprising clayey fine to medium SAND . Dark brown, wet.	0.0	wwwwwww						Wet	
Dense HARD PAN recovered as fine to medium SAND . Orangish brown, dry.	0.2	o.o.o.o.o.o.o.o.o.o.o.o						Dry	
Borehole terminated at 0.5 m	0.5								
	1.0								
	1.5								
	2.0								
	2.5								
	3.0								
	3.5								
	4.0								
	4.5								
	5.0								

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Soils Legend

Topsoil	wwwwwww	Fill	//////////	Clay	—————	Silt	xxxxxxxx
Sand	o.o.o.o.o.o.o.o.o.o	Peat	v.v.v.v.v.v.v.v	Gravel	oooooo	Rock	▲▲▲▲▲

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<h2 style="margin: 0;">Borehole Log</h2>	JOB No. 18 173	Borehole no. BH104
--	----------------	---------------------------

Client B & T Family Trust	Date 20-Feb-17
---------------------------	----------------

Location 594 Koutu Loop Road, Koutu	Diameter: 50mm	Logged: EC	Checked: JP
-------------------------------------	----------------	------------	-------------

Soil Description	Depth	Legend	Shear Strength (kPa)	Moisture	Sample, Other Tests, Remarks.
			0 50 100 150 200		
Classed TOPSOIL comprising silty fine to medium SAND . Dark grey, wet.	0.0 0.1	wwwwww o.o.o.o.o.o.o.o.o.o.o.o		Wet Moist	
Fine to medium SAND . Grey and light grey, moist.	0.1 0.4	o.o.o.o.o.o.o.o.o.o.o.o o.o.o.o.o.o.o.o.o.o.o.o			
Dense HARD PAN recovered as fine to medium SAND . Yellowish and organish brown, moist.	0.4 0.5	o.o.o.o.o.o.o.o.o.o.o.o o.o.o.o.o.o.o.o.o.o.o.o			
Borehole terminated at 0.5 m	0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0				

Soils Legend

Topsoil		Fill		Clay		Silt	
Sand		Peat		Gravel		Rock	

Borehole Log

JOB No. 18 173

Borehole no. **BH105**

Client	B & T Family Trust	Date	20-Feb-17
Location	594 Koutu Loop Road, Koutu		

Filling Method:	Hand Auger	Diameter:	50mm	Logged:	EC	Checked:	JP
-----------------	------------	-----------	------	---------	----	----------	----

Soil Description	Depth	Legend	Shear Strength (kPa)				Moisture	Sample, Other Tests, Remarks.	
			0	50	100	150			200
Grassed TOPSOIL comprising silty fine to medium SAND . Dark grey, wet.	0.0	wwwwwww						Wet	
	0.1	wwwwwww						Moist	
Fine to medium SAND . Grey and light grey, moist.		wwwwwww							
Dense HARD PAN recovered as fine to medium SAND . Yellowish and organish brown, moist.	0.4	wwwwwww							
	0.5	wwwwwww							
Borehole terminated at 0.5 m									
	1.0								
	1.5								
	2.0								
	2.5								
	3.0								
	3.5								
	4.0								
	4.5								
	5.0								

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Soils Legend

Topsoil	wwwwwww	Fill	///////	Clay	-----	Silt	xxxxxxxxx
Sand	ooooooooo	Peat	v:v:v:v:v	Gravel	oooooo	Rock	▲▲▲▲▲

Project No: 18 173

Date: 20/02/2017

Test No. **BH101 - BH103**

Project: 594 Koutu Loop Road, Koutu

Operated by: **EC**

Location: Additional subdivision

Logged by: **EC**

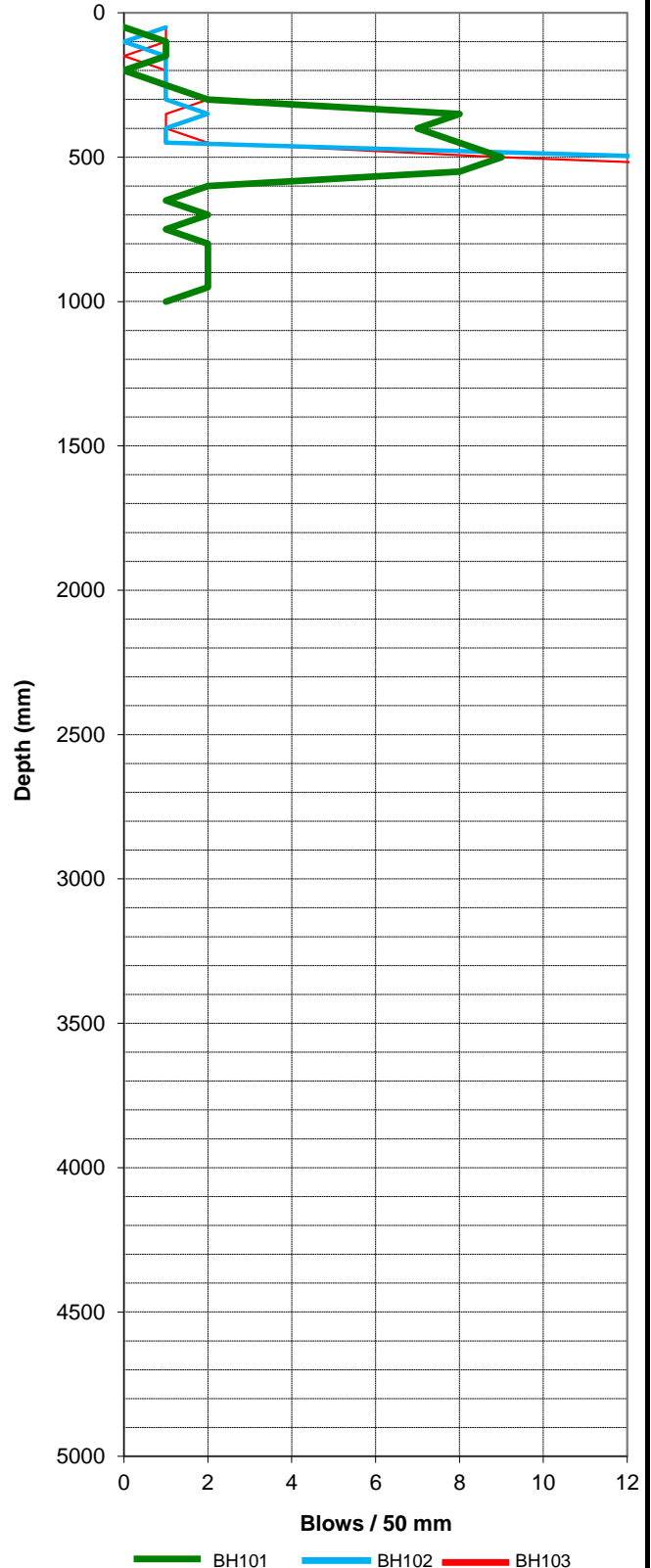
RL:

Checked by: **JP**

Sheet of **1** / **2**

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mm Driven	BH101 No. of Blows	BH102 No. of Blows	BH103 No. of Blows	mm Driven	BH101 No. of Blows	BH102 No. of Blows	BH103 No. of Blows
50	0	1	1	3050			
100	1	0	1	3100			
150	1	1	0	3150			
200	0	1	1	3200			
250	1	1	1	3250			
300	2	1	2	3300			
350	8	2	1	3350			
400	7	1	1	3400			
450	8	1	2	3450			
500	9	13	9	3500			
550	8	15	18	3550			
600	2			3600			
650	1			3650			
700	2			3700			
750	1			3750			
800	2			3800			
850	2			3850			
900	2			3900			
950	2			3950			
1000	1			4000			
1050				4050			
1100				4100			
1150				4150			
1200				4200			
1250				4250			
1300				4300			
1350				4350			
1400				4400			
1450				4450			
1500				4500			
1550				4550			
1600				4600			
1650				4650			
1700				4700			
1750				4750			
1800				4800			
1850				4850			
1900				4900			
1950				4950			
2000				5000			
2050				5050			
2100				5100			
2150				5150			
2200				5200			
2250				5250			
2300				5300			
2350				5350			
2400				5400			
2450				5450			
2500				5500			
2550				5550			
2600				5600			
2650				5650			
2700				5700			
2750				5750			
2800				5800			
2850				5850			
2900				5900			
2950				5950			
3000				6000			



Project No: 18 173

Date: 20/02/2017

Test No. **BH104 - BH105**

Project: 594 Koutu Loop Road, Koutu

Operated by: **EC**

Location: Additional subdivision

Logged by: **EC**

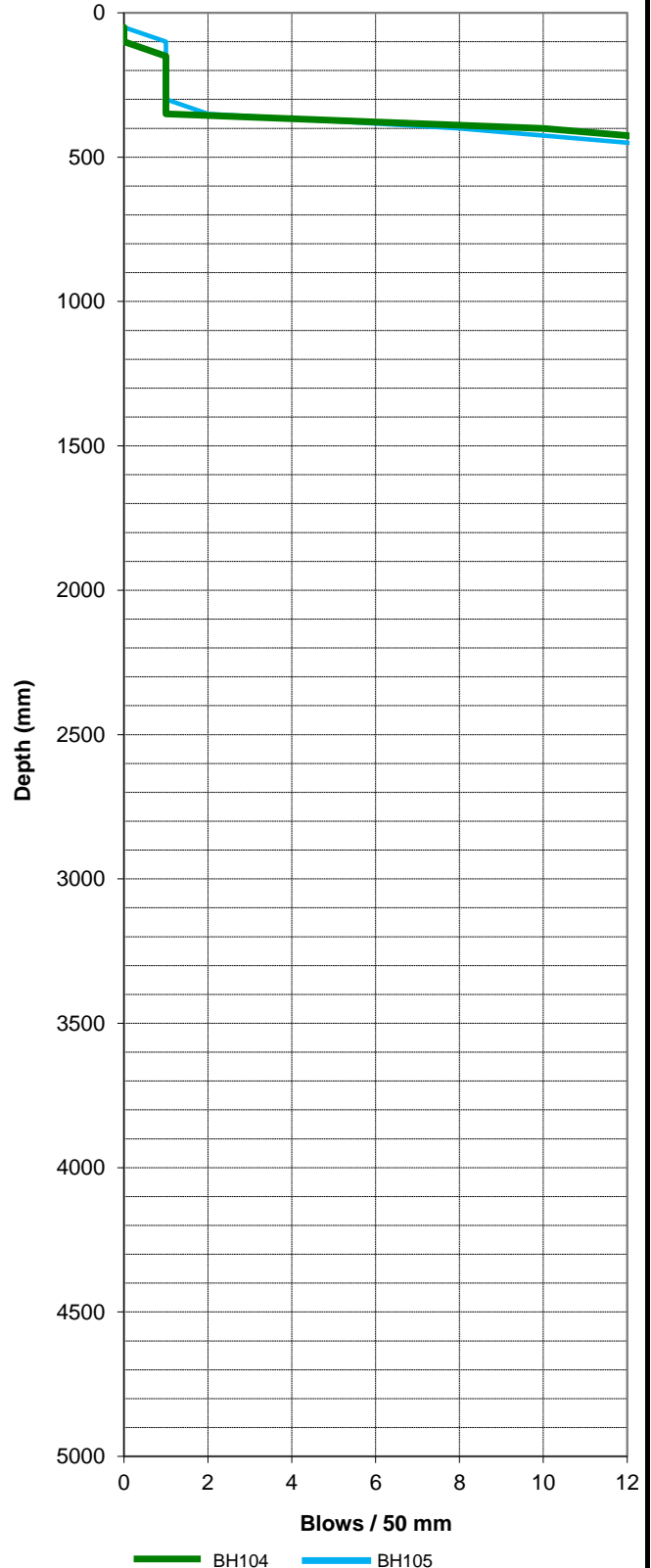
RL:

Checked by: **JP**

Sheet **2**
of **2**

FNDC - Approved Building Consent Document - EBC-2022-1634-0 - Pg 59 of 77 - 29/08/2022 - VC

BH104				BH105			
mm Driven	No. of Blows	No. of Blows	No. of Blows	mm Driven	No. of Blows	No. of Blows	No. of Blows
50	0	0		3050			
100	0	1		3100			
150	1	1		3150			
200	1	1		3200			
250	1	1		3250			
300	1	1		3300			
350	1	2		3350			
400	10	8		3400			
450	14	12		3450			
500	20	16		3500			
550				3550			
600				3600			
650				3650			
700				3700			
750				3750			
800				3800			
850				3850			
900				3900			
950				3950			
1000				4000			
1050				4050			
1100				4100			
1150				4150			
1200				4200			
1250				4250			
1300				4300			
1350				4350			
1400				4400			
1450				4450			
1500				4500			
1550				4550			
1600				4600			
1650				4650			
1700				4700			
1750				4750			
1800				4800			
1850				4850			
1900				4900			
1950				4950			
2000				5000			
2050				5050			
2100				5100			
2150				5150			
2200				5200			
2250				5250			
2300				5300			
2350				5350			
2400				5400			
2450				5450			
2500				5500			
2550				5550			
2600				5600			
2650				5650			
2700				5700			
2750				5750			
2800				5800			
2850				5850			
2900				5900			
2950				5950			
3000				6000			



Appendix C – Site Photography

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Figure 1 – Site access from Koutu Loop Road, looking south west



Figure 2 – Site access from Koutu Loop Road, looking north east



Figure 3 – Photograph of Lot 5 and Koutu Loop Road



Figure 4 – Plateau area proposed Lots 6 to 8



Figure 5 – Moderate slope on proposed Lots 6 to 8



Figure 6 – View from Lot 11 looking south east across balance lot to existing residential unit



Appendix D – On-Site Wastewater (TP58) Checklist

Item	Enclosure	Checklist
01	Site Evaluation Checklist	✓
02	Assessment of Environmental Effects	✓
03	Producer Statement	
04	System Maintenance Schedule	✓
05	Suitable Plants for Evapo-Transpiration Systems	✓
06	Typical Irrigation Field Layout (Drawing No. 17 029/09)	✓
07	Typical Interception Drain (Drawing No. 17 029/09)	✓
08	Treatment Plant Plans and Specifications	

FAR NORTH DISTRICT COUNCIL
Appendix E TP58
On-site Wastewater Disposal Site Evaluation
Investigation Checklist

Part A –Owners Details

1. Applicant Details:

Applicant Name	<i>B & T Family Trust</i>
Company Name	
Property Owner Name(s)	<i>Barbara Kathleen Adams Derek George Railey Trevor Howard Jones</i>

Nature of Applicant*	<i>Owners</i>
----------------------	---------------

(*i.e. Owner, Leasee, Prospective Purchaser, Developer)

2. Consultant / Site Evaluator Details:

Consultant/Agent Name	<i>Haigh Workman</i>		
Site Evaluator Name	<i>Edward Collings</i>		
Postal Address	<i>PO Box 89 Kerikeri 0245</i>		
Phone Number	Business	<i>407 8327</i>	Private
	Mobile		Fax <i>407 8378</i>
Name of Contact Person	<i>Edward Collings</i>		
E-mail Address	<i>edward@haighworkman.co.nz</i>		

3. Are there any previous existing discharge consents relating to this proposal or other waste discharge on this site?

Yes		No	<input checked="" type="checkbox"/>	
(Please tick)				
If yes, give Reference Numbers and Description				

4. List any other consent in relation to this proposal site and indicate whether or not they have been applied for or granted

If so, specify Application Details and Consent No.
 (eg. LandUse, Water Take, Subdivision, Earthworks Stormwater Consent)

<i>Currently undergoing resource consent for subdivision.</i>

Part B- Property Details
1. Property for which this application relates:

Physical Address of Property	<i>594 Koutu Loop Road</i>		
Territorial Local Authority	FAR NORTH DISTRICT COUNCIL		
Regional Council	NORTHLAND REGIONAL COUNCIL		
Legal Status of Activity	Permitted: <input checked="" type="checkbox"/>	Controlled:	Discretionary:
Relevant Regional Rule(s) (Note 1)	<i>15.1.4</i>		
Total Property Area (m ²)	<i>137,649 m²</i>		
Map Grid Reference of Property If Known			

2. Legal description of land (as shown on Certificate of Title)

Lot No.	<i>1</i>	DP No.	<i>194427</i>	CT No.	<i>NA121C/628</i>
Other (specify)					

 Please ensure copy of Certificate of Title is attached
PART C: Site Assessment - Surface Evaluation

(Refer TP58 - Sn 5.1 General Purpose of Site Evaluation and Sn 5.2.2(a) Site Surface Evaluation)

Note: Underlined terms defined in Table 1, attached
Has a relevant property history study been conducted?

Yes	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>	(Please tick one)
-----	--------------------------	----	-------------------------------------	-------------------

If yes, please specify the findings of the history study, and if not please specify why this was not considered necessary.

<i>Outside scope of works.</i>

1. Has a Slope Stability Assessment been carried out on the property?

Yes		No	✓	Please tick
-----	--	----	---	-------------

If No, why not?

Site is considered stable.

If Yes, please give details of report (and if possible, please attach report):

Author	
Company/Agency	
Date of Report	
Brief Description of Report Findings:-	

2. Site Characteristics (See Table 1 attached):

Provide descriptive details below:

Performance of Adjacent Systems:
No problems known
Estimated Rainfall and Seasonal Variation:
1800 mm per year; 1100 mm winter, 700 mm summer.
Vegetation / Tree Cover:
Grassed pasture with some vegetation cover.
Slope Shape: (Please provide diagrams)
Broad flat ridgeline roughly centrally within site
Slope Angle:
Moderate slopes from ridgeline at approx. 15 degrees
Surface Water Drainage Characteristics:
Soakage and sheet flow to on-site watercourses and final discharge to coastal waters
Flooding Potential: YES/NO
No

If yes, specify relevant flood levels on appended site plan, i.e. one in 5 years and/or 20 year and/or 100 year return period flood level, relative to disposal area.

Surface Water Separation:
> 15 m
Site Characteristics: or any other limitation influencing factors
None

3. Site Geology		Check Rock Maps	
<i>Underlying rock is Whangai Formation (Kkw) of the Mangakahia Complex, a subsidiary group of the Northland Allochthon Formation.</i>			
<i>Soil is of the Undulating Terraces and Lowlands formation comprising Kara clay (KRe) and Kara silt loam.</i>			
Geological Map Reference Number		<i>NZMS 290 rock and soils maps P04/05</i>	
4. What Aspect(s) does the proposed disposal system face? (please tick)			
North	<input type="checkbox"/>	West	<input type="checkbox"/>
North-West	<input type="checkbox"/>	South-West	<input type="checkbox"/>
North-East	<input checked="" type="checkbox"/>	South-East	<input type="checkbox"/>
East	<input type="checkbox"/>	South	<input type="checkbox"/>
5. Site clearances,(Indicate on site plan where relevant)			
Separation Distance from	Treatment Separation Distance (m)	Disposal Field Separation Distance (m)	FNDC minimum
Boundaries	<i>>1.5</i>	<i>>1.5</i>	1.5
Surface water, creeks, drains	<i>>15</i>	<i>>15</i>	15
Groundwater	<i>NA</i>	<i>Not encountered</i>	0.6
Stands of Trees/Shrubs	<i>NA</i>	<i>NA</i>	NA
Wells, water bores	<i>>20</i>	<i>>20</i>	20 m
Embankments/retaining walls	<i>>3</i>	<i>>3</i>	3 m
Buildings	<i>>3</i>	<i>>3</i>	3 m
Rivers, Coastal Marine area	<i>>30</i>	<i>>30</i>	30 m
PART D: Site Assessment - Subsoil Investigation			
(Refer TP58 - Sn 5.1 General Purpose of Site Evaluation, and Sn 5.2.2(a) Site Surface Evaluation and Sn 5.3 Subsurface Investigations)			
Note: Underlined terms defined in Table 2, attached			
1. Please identify the soil profile determination method:			
Test Pit	<input type="checkbox"/>	(Depth _____ m	No of Test Pits
Bore Hole	<input checked="" type="checkbox"/>	(Depth <u>1.00</u> m	No of Bore Holes
Other (specify):		<input type="checkbox"/>	
Soil Report attached?			
Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/> Please tick
2. Was fill material intercepted during the subsoil investigation?			
Yes	<input type="checkbox"/>	No	<input checked="" type="checkbox"/> Please tick
If yes, please specify the effect of the fill on wastewater disposal			
<input type="text"/>			
3. percolation testing (mandatory and site specific for trenches in soil type 4 to 7)			
Please specify the method			
Test Report Attached?	Yes	<input type="checkbox"/>	No
	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> Please tick

4. Are surface water interception/diversion drains required?

Yes	✓	No	
-----	---	----	--

Please tick

If yes, please show on site plan

To be determined at building design stage.
4a Are subsurface drains required

Yes		No	✓
-----	--	----	---

Please tick

If yes, please provide details

5. Please state the depth of the seasonal water table:

Winter	>1.0	m	Measured		Estimated	✓
Summer	>1.0	m	Measured		Estimated	✓

6. Are there any potential storm water short circuit paths?

Yes		No	✓
-----	--	----	---

Please tick

If the answer is yes, please explain how these have been addressed

--

7. Based on results of subsoil investigation above, please indicate the disposal field soil category
 (Refer TP58 Table 5.1)

Is Topsoil Present? ✓	If so, Topsoil Depth? 0.1 (m)
-----------------------	-------------------------------

Soil Category	Description	Drainage	Tick One
1	Gravel, coarse sand	Rapid draining	
2	Coarse to medium sand	Free draining	
3	Medium-fine & loamy sand	Good drainage	
4	Sandy loam, loam & silt loam	Moderate drainage	
5	Sandy clay-loam, clay loam & silty clay-loam	Moderate to slow drainage	
6	Sandy clay, non-swelling clay & silty clay	Slow draining	
7	Swelling clay, grey clay, hardpan	Poorly or non-draining	✓

Reasons for placing in stated category

<i>Soil map classification, soil colour and texture investigation</i>

PART E: Discharge Details
1. Water supply source for the property (please tick):

Rainwater (roof collection)	✓
Bore/well	
Public supply	

2. Calculate the maximum daily volume of wastewater to be discharged, unless accurate water meter readings are available

(Refer TP58 Table 6.1 and 6.2)

Number of Bedrooms	3			
Design Occupancy	5			(Number of People)
Per capita Wastewater Production	145	160 <input checked="" type="checkbox"/>	180	(tick) (Litres per person per day)
Other - specify	200	220		
Total Daily Wastewater Production	800			(litres per day)

3. Do any special conditions apply regarding water saving devices

a) Full Water Conservation Devices?	Yes		No	<input checked="" type="checkbox"/>	(Please tick)
b) Water Recycling - what %?		%		<input checked="" type="checkbox"/>	(Please tick)

If you have answered yes, please state what conditions apply and include the estimated reduction in water usage

4. Is Daily Wastewater Discharge Volume more than 3000 litres:

Yes	<input type="checkbox"/>	(Please tick)
No	<input checked="" type="checkbox"/>	(Please tick)

Note if answer to the above is yes, an N.R.C wastewater discharge permit may be required

5. Gross Lot Area to Discharge Ratio:

<i>Proposed Lot 1</i>		
Gross Lot Area	8000	m ²
Total Daily Wastewater Production	800	(Litres per day)(from above)
Lot Area to Discharge Ratio	10	
<i>Proposed Lot 2</i>		
Gross Lot Area		m ²
Total Daily Wastewater Production		(Litres per day)(from above)
Lot Area to Discharge Ratio		

7. Does this proposal comply with the Northland Regional Council Gross Lot Area to Discharge Ratio of greater than 3?

Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>	Please tick
-----	-------------------------------------	----	--------------------------	-------------

8. Is a Northland Regional Council Discharge Consent Required?

Yes	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>	(Please tick)
-----	--------------------------	----	-------------------------------------	---------------

PART F: Primary Treatment (Refer TP58 Section 7.2)

1. Please indicate below the no. and capacity (litres) of all septic tanks including type (single/dual chamber grease traps) to be installed or currently existing: If not 4500 litre, dual chamber explain why not

Number of Tanks	Type of Tank	Capacity of Tank (Litres)
	Total Capacity	

2. Type of Septic Tank Outlet Filter to be installed?

PART G: Secondary and Tertiary Treatment

(Refer TP58 Section 7.3, 7.4, 7.5 and 7.6)

1. Please indicate the type of additional treatment, if any, proposed to be installed in the system: (please tick)

Secondary Treatment	<input checked="" type="checkbox"/>	
Home aeration plant	<input type="checkbox"/>	
Commercial aeration plant	<input type="checkbox"/>	
Intermediate sand filter	<input type="checkbox"/>	
Recirculating sand filter	<input type="checkbox"/>	
Recirculating textile filter	<input type="checkbox"/>	
Clarification tank	<input type="checkbox"/>	
Tertiary Treatment	<input type="checkbox"/>	
Ultraviolet disinfection	<input type="checkbox"/>	
Chlorination	<input type="checkbox"/>	
Other	<input type="checkbox"/>	Specify <input type="text"/>

PART H: Land Disposal Method

(Refer TP58 Section 8)

1. Please indicate the proposed loading method: (please tick)

Gravity	<input type="checkbox"/>
Dosing Siphon	<input type="checkbox"/>
Pump	<input checked="" type="checkbox"/>

2. High water level alarm to be installed in pump chambers

Yes No

If not to be installed, explain why

3. If a pump is being used, please provide the following information:

Total Design Head		(m)
Pump Chamber Volume		(Litres)
Emergency Storage Volume		(Litres)

4. Please identify the type(s) of land disposal method proposed for this site: (please tick)

(Refer TP58 Sections 9 and 10)

Surface Dripper Irrigation	<input checked="" type="checkbox"/>		
Sub-surface Dripper irrigation	<input checked="" type="checkbox"/>		
Standard Trench	<input type="checkbox"/>		
Deep Trench	<input type="checkbox"/>		
Mound	<input type="checkbox"/>		
Evapo-transpiration Beds	<input type="checkbox"/>		
Other	<input type="checkbox"/>	Specify	

5. Please identify the loading rate you propose for the option selected in Part H, Section 4 above, stating the reasons for selecting this loading rate:

Loading Rate	2	(Litres/m ² /day)
Disposal Area	Design	400 (m ²)
	Reserve	400 (m ²)

Explanation (Refer TP58 Sections 9 and 10)

Design loading rates for soil category 7 (2 mm/day). Wastewater disposal fields should be mounded up to 600 mm by site-won topsoil.

6. What is the available reserve wastewater disposal area (Refer TP58 Table 5.3)

Reserve Disposal Area (m ²)	400
Percentage of Primary Disposal Area (%)	100 %

7. Please provide a detailed description of the design and dimensions of the disposal field and attach a detailed plan of the field relative to the property site:
Description and Dimensions of Disposal Field:

Use a minimum of 400 m of Unibioline trickle tubing or equivalent with 2.3 litre per hour emitters at 0.6 m centres. Lines to be laid at 1 m centres for surface irrigation, and covered with c. 200 mm bark mulch. Subsurface lines to be laid at 0.5 m centres within 600 mm topsoil and turfed.

Plan Attached?	Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>	(Please tick)
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If not, explain why not

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PART I: Maintenance & Management

(Refer TP58 Section 12.2)

1. Has a maintenance agreement been made with the treatment and disposal system suppliers?

Yes		No	<input checked="" type="checkbox"/>	(Please tick)
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Name of Suppliers

PART J: Assessment of Environmental Effects

1. Is an assessment of environmental effects (AEE) included with application?

(Refer TP58 section 5. Ensure all issues concerning potential effects addressed)

Yes	<input checked="" type="checkbox"/>	No		(Please tick)
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If Yes, list and explain possible effects


PART K: Is Your Application Complete?

1. In order to provide a complete application you have remembered to:

Fully Complete this Assessment Form	<input checked="" type="checkbox"/>
Include a <i>Location Plan</i> and <i>Site Plan</i> (with Scale Bars)	<input checked="" type="checkbox"/>
Attach an Assessment of Environmental Effects (AEE)	<input checked="" type="checkbox"/>

1. Declaration

I hereby certify that, to the best of knowledge and belief, the information given in this application is true and complete.

Name	John Papesch	Signature	
Position	Director	Date	13/09/2018

Note

Any alteration to the site plan or design after approval will result in non-compliance.

ENVIRONMENTAL EFFECTS, MITIGATION MEASURES

A. Assessment of Environmental Effects

Impact on Surface Water (incl. flood times) Very Minor

Impact on Ground Water Very Minor

Impact on Soils Minor

Impact on Amenity Values Minor

B. Public Health Issues:

Should access to the disposal area be discouraged? No

Will odour effects be greater than usual? No

Will noise effects be greater than usual? No

C. Mitigation Measures

Has conservative approach been taken in choosing system design capacity? Yes

Is system design robust (cope with fluctuations of load, climate)? Yes

Is level of treatment high? Medium – final treatment within soil

Protection against failure storage, alarms? Alarms

Is hydraulic loading rate conservative? Yes

Is distribution area protected from hydraulic overload (interception drains)? If required

Will soil type enhance treatment? Yes

Are desired separation distances attainable? (to surface water, groundwater, bores) Yes

Is the reserve area adequate? Yes

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ON-SITE DOMESTIC WASTEWATER MANAGEMENT Advice to Home Owner/Occupier

Home owner and occupiers are legally responsible to keep their on-site wastewater system in good working order. The following schedule gives advice on the use and maintenance of the system.

1. Use of the System

For the on-site wastewater system to work well there are some good habits to encourage and some bad habits to avoid:

1.1 In order to reduce sludge building up in the tank:

- (i) Scrape all dishes to remove fats, grease etc, before washing.
- (ii) Keep all possible solids out of system.
- (iii) Don't use a garbage grinder unless the system has been specifically designed to carry the extra load.
- (iv) Don't put sanitary napkins, other hygiene products or disposable nappies into the system.

1.2 In order to keep bacteria working in the tank and in the land-application area:

- (i) Use biodegradable soaps.
- (ii) Use a low-phosphorus detergent.
- (iii) Use a low-sodium detergent in dispersive soil areas.
- (iv) Use detergents in the recommended quantities.
- (v) Don't use powerful bleaches, whiteners, nappy soakers, spot removers and disinfectants.
- (vi) Don't put chemicals or paint down drain.

1.3 Conservation of water will reduce the volume of effluent disposed to the land-application area, make it last longer and improving its performance. Conservation measures could include:

- (i) Installation of water-conservation fittings.
- (ii) Taking showers instead of baths.
- (iii) Only washing clothes when there is a full load.
- (iv) Only using the dishwasher when there is a full load.

1.4 Avoid overloading the system by spacing out water use evenly. For example not doing all the washing on one day and by not running the washing machine and dishwasher at the same time.

2. Maintenance

- 2.1 The primary wastewater-treatment unit (septic tank) will need to:
- (i) Be desludged regularly i.e. every 3 to 5 years, or when scum and sludge occupy 2/3 of the volume of the tank (or first stage of a two-stage system).
 - (ii) Be protected from vehicles.
 - (iii) Have any grease trap cleaned out regularly.
 - (iv) Have the vent and/or access cover of the septic tank kept exposed.
 - (v) Have the outlet filter inspected and cleaned.
- 2.2 The land-application area needs protection as follows:-
- (i) Where surface water diversion drains are required by the design, these need to be kept clear to reduce the risk of stormwater runoff entering the effluent soakage area.
 - (ii) No vehicles or stock should be allowed on trenches or beds.
 - (iii) Deep rooting trees or shrubs should not be grown over absorption trenches or pipes.
 - (iv) Irrigation areas are not play areas for children and access should be restricted.
 - (v) Any evapo-transpiration areas should be designed to deter pedestrian traffic.
 - (vi) The baffles or valves in the distribution system should be periodically (monthly or seasonally) changed to direct effluent into alternative trenches or beds, if required by the design.
- 2.3 Evapo-transpiration and irrigation areas should have their grass mowed and plants maintained to ensure that these areas take up nutrients with maximum efficiency.
- 2.4 For aeration treatment systems. Check equipment and:
- (i) Follow the manufacturer's instructions for maintaining and cleaning pumps, siphons, and septic tank filters.
 - (ii) Clean disc filters or filters screens on irrigation-dosing equipment periodically by rinsing back into the primary wastewater-treatment unit.
 - (iii) Flush drip irrigation lines periodically to scour out any accumulated sediment.

SUITABLE PLANTS FOR EVAPO-TRANSPARATION SYSTEMS

Native Shrubs and Trees

Coprosma	<i>Coprosma propinqua</i>
Hebe	<i>Hebe</i>
Manuka	<i>Leptospermum Scoparium</i>
Weeping Mapou	<i>Myrsine Divaricata</i>
Flax (fast)	<i>Phormium Tenax</i>
Pokaka (slow)	<i>Elaeocarpus Hookerianus</i>
Cabbage Tree (fast)	<i>Cordyline Australias</i>
Rangiora (fast)	<i>Brachyglottis Repanda</i>
Lacebark (fast)	<i>Hoheria Populnea</i>
Ribbonwood (fast)	<i>Plagianthus Regius</i>
Poataniwha	<i>Melicope Simplex</i>
Heketara	<i>Olearia Rani</i>
Poataniweta	<i>Carpodetus Serratus</i>
Kohuhu (fast)	<i>Pittosporum Tenufolium</i>

Grasses

Jointed Twig Sedge	<i>Baumea Articulata</i>
Longwood Tussock	<i>Carex Comans</i>
Pukio	<i>Carex Secta</i>
Toetoe (use native species- not invasive Pampas Grass)	<i>Cortaderia Fulvida</i>
Umbrella Sedge	<i>Cyperus Ustulatus</i>
Oioi	<i>Leptocarpus Similis</i>
Hooksedge	<i>Uncinia Unciniata</i>

Introduced Species

Canna Lilies, Taro, Aralia,
Fuschia, Philodendrons,
and Begonias



CARING FOR NORTHLAND AND ITS ENVIRONMENT

WHANGAREI: 36 Water Street, Private Bag 9021, Whangarei; Phone 09 438 4639, Fax 09 438 0012.

OPUA: Unit 10, Industrial Marine Park, Opuia; Phone 09 402 7516, Fax 09 402 7510.

DARGAVILLE: 61B Victoria Street, Dargaville; Phone 09 439 3300, Fax 09 439 3301.

KAITAIA: 192 Commerce Street, Kaitaia; Phone 09 408 6600, Fax 09 408 6601.

Freephone: 0800 002 004 Environmental Hotline: 0800 504 639 Website: www.nrc.govt.nz