McKENZIE&CO CONSULTANTS LTD

INFRASTRUCTURE REPORT

ROTOKAURI NORTH PRIVATE PLAN CHANGE

Prepared for Green Seed Consultants Ltd

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A	12/12/2018	Draft for client review	Brad Rudsits	Andrew Hunter	Andrew Hunter
B	20/12/2018	Draft for HCC Review	Brad Rudsits	Andrew Hunter	Andrew Hunter
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D	10/02/2020	Updates to reflect PDA	Andrew Hunter		Andrew Hunter

Executive Summary

The following report supports the proposed Private Plan Change (PPC) for the re-zoning of Rotokauri North from Future Urban Zone to Medium Density Residential Zone and Business 6 Zone. The report provides an outline of the necessary engineering infrastructure works required to enable development of the site as anticipated by the PPC. The key infrastructure works include the development of roads, stormwater, wastewater, water supply, and utility servicing works.

The report affirms that the appropriate infrastructure is available, or can be readily provided, to support the proposed re-zoning of Rotokauri North.

Contents

Appendices

1 Introduction

McKenzie & Co Consultants Ltd. has been engaged by Green Seed Consultants Ltd. (GSCL) to prepare this Infrastructure Report (IR) in support of the proposed Private Plan Change (PPC) of approximately 140 hectares within the "Future Urban Zone" (FUZ) to "Medium Density Residential" and "Business 6" zones located at Burbush Road, Exelby Road, and Te Kowhai Road, Rotokauri North.

This report summarises the suitability of the existing infrastructure and proposed upgrades/extensions required to service the anticipated development sought for the Rotokauri North area as shown on the structure plan attached, **1693-0-011** in **Appendix 1**.

The purpose for this report is to demonstrate to Hamilton City Council (HCC) the deliverability of infrastructure to Rotokauri North in accordance with the requirements of the Council and other service providers.

2 Site Description

The site subject to the PPC is located at the north west extent of Hamilton City and consists of a total area of approximately 140 hectares as per Figure 1. Its bounded by Te Kowhai Road (SH39) to the north, greenfield lands to the east and south and Exelby Road to the west and south. Burbush Road runs north to south through the eastern portion of the PPC area.

The PPC area consists of 31 parcels of land described on Figure 1 and plans **1693-0-062** (see **Appendix 2**). These being:

- 21 parcels having a total area of 133.1 ha under GSCL's umbrella; and
- 10 parcels having a total area of 6.9 ha not under GSCL's umbrella.

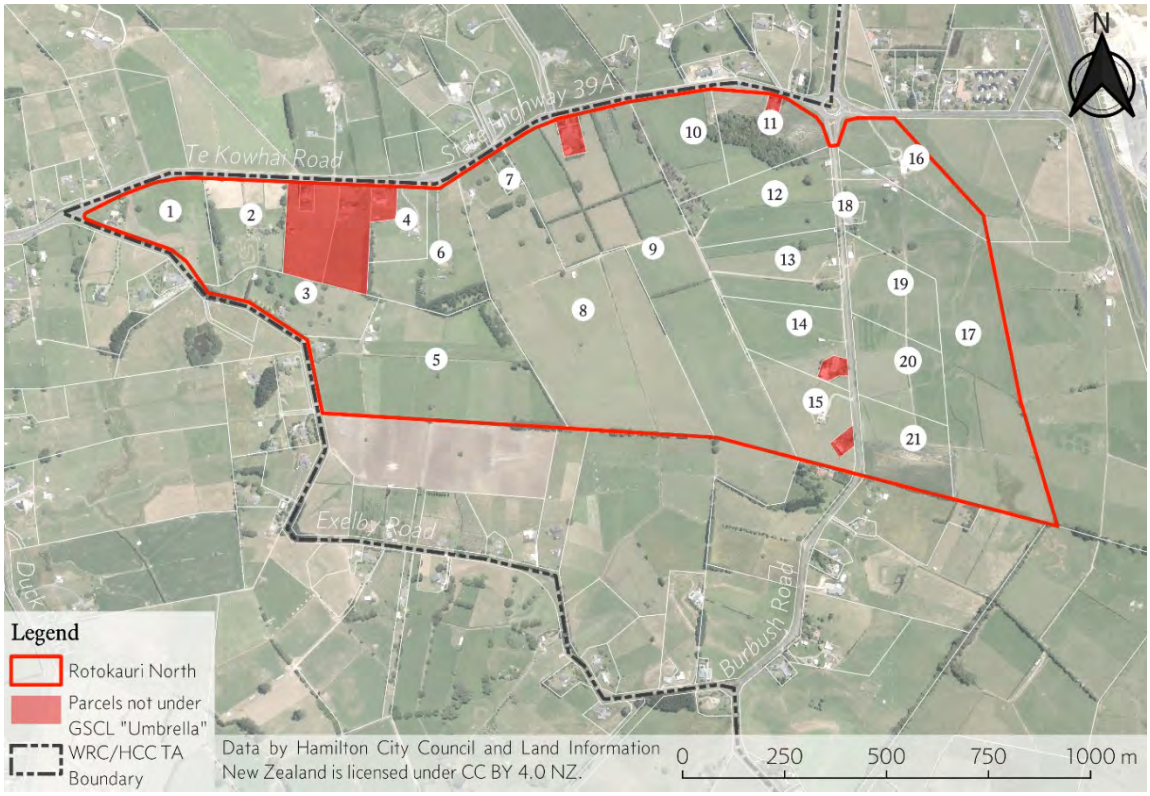

Figure 1: Rotokauri North Private Plan Change Area

The site is generally flat either side of a ridgeline that follows Burbush Road and the southern alignment of Exelby Road. The ridgeline rises to approximately 51 m RL at its highest. The area east of Burbush Road has an approximate elevation of 31 m RL, while the larger western side has an elevation generally ranging between 29 and 30 m RL – see Figure 2 below and also drawing **1693-0-015** in **Appendix 3**.

The eastern side of the PPC area has an easterly aspect, while the western side is generally north-westerly facing. The predominant land use is pastoral with some residential lifestyle blocks.

Due to the flat topography, a manmade drainage network has been constructed over a number of years. The drainage channels have varying permanent water levels, which are directly related to local groundwater levels, hydrogeology of the area, and seasonal affects. Maintenance of the drainage network varies across the area depending on land usage, i.e., cropping compared with stock grazing. The drainage channels form part of four different stream catchments:

- Ohote (draining west);
- Te Otamanui (draining north);
- Mangaheka (draining north); and
- Rotokauri South (draining south).

Figure 2: Topographic Features Rotokauri North

The natural stream sections of these catchments are typically highly modified, receiving stormwater from the farm drainage networks. The stream sections were classified by Tonkin and Taylor (D. Miller, personal communication, 2018) in accordance with definitions within the Waikato Regional Plan (WRP) (Waikato Regional Council, 2012).

The extent of existing flooding has been considered within the reports:

- Rotokauri North Private Plan Change: Catchment Modelling (Rudsits, 2019);
- Rotokauri North Catchment Stormwater Modelling, Ohote Stream Capacity Assessment Model Build Report; (Vajilikova, 2018)
- Mangaheka Integrated Catchment Management Plan (Adams, 2018); and
- The Te Otamanui Stream Flood Assessment (Howe, 2018).

Due to the flat topography there are areas predicted to have wide spread flooding, specifically the western part of the PPC area. The stormwater conveyance network for the PPC and Rotokauri North Sub-Catchment Integrated Catchment Management Plan (ICMP) (Fraser-Smith, Hunter, & Rudsits, 2018) areas has been developed with regard to grade limitations across the site see **Figure 3** and drawing **1693-0-065** in **Appendix 3**.

Soil types consist predominantly of layers of silt, clay and sand throughout the lower areas, with the ridgeline having hard clay/silts consistent with Hamilton Ash formation (Alder, 2018b). Due to the high groundwater table liquefaction is considered to be a moderate to severe risk for the site (Alder, 2018b).

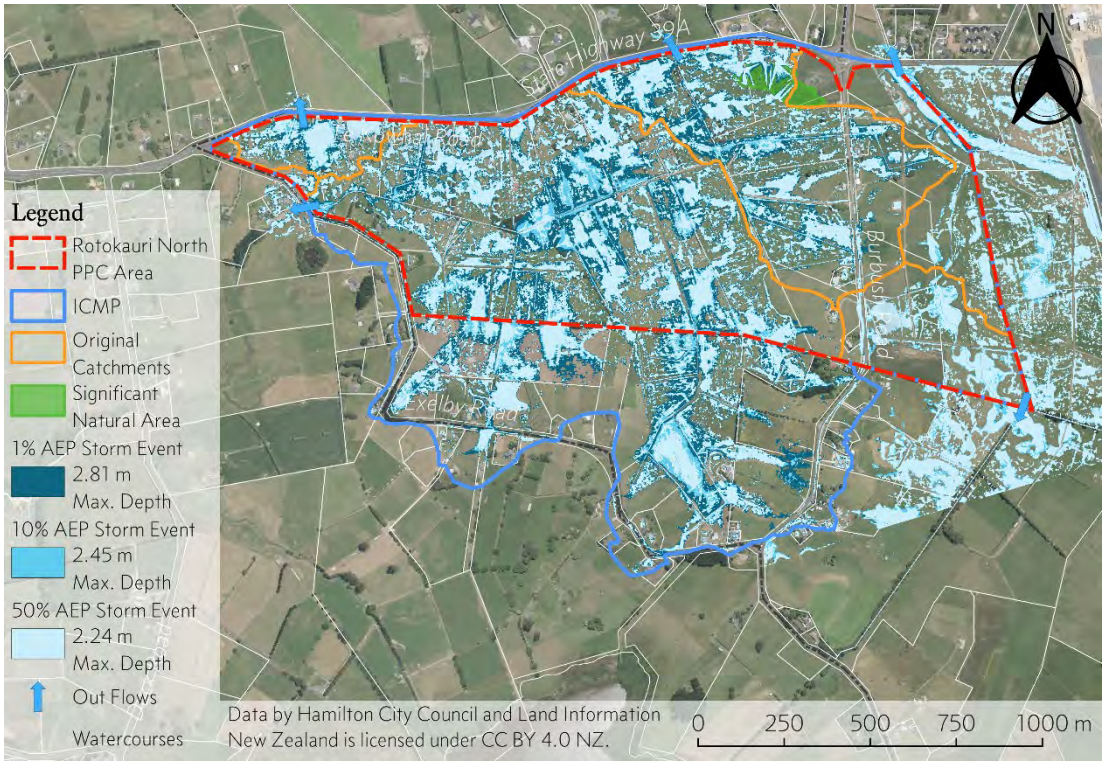

Figure 3: Flood Assessment

3 Geotechnical Investigation

A preliminary geotechnical investigation (Alder, 2018b) and geotechnical assessment reporting (Alder, 2018a)has been undertaken by HD Geo (Alder, 2018b, 2018a) for the PPC area. The reports are summarised as follows:

3.1 Geology

The geology of the area is underlain by the Walton Subgroup, Hinuera Formation, and Piako Subgroup. The Walton Subgroup (early to middle Pleistocene epoch) deposits comprise alluvium (clays, silts, sands) and re-worked non-welded ignimbrite, and are generally found on the hills/ridges through the site. The Hinuera Formation and Piako Subgroup (late Pleistocene) were generally found across the flat areas. The Hinuera Formation deposits are cross-bedded pumice sand, silt and gravel interbedded with peat. The Piako Subgroup consists of locally derived mud, silt, gravel and peat.

The preliminary assessment was based on a desktop review and field investigations comprising hand augers, cone penetrometer tests and dissipation tests.

HD Geo recommended that:

- The liquefaction hazard at the site should be refined through further investigation and assessment and outline mitigation measures where necessary. These investigations should include shear wave velocity testing and laboratory testing of onsite soils;
- Assessment of the liquefaction induced lateral spreading risk adjacent to proposed stormwater swales;

- Investigation of the risk of settlement in areas where significant fill is likely;
- Establish the ground water regime for detailed liquefaction analysis through dissipation testing or piezometers;
- Investigation of cut areas to determine fill properties.

HD Geo concludes that the liquefaction risk can be mitigated for residential development with strengthened foundations and/or shallow ground improvements. Further investigation and assessment is recommended prior to earthworks and infrastructure design. Given the recommendations above, HD Geo consider the site to be suitable for the proposed development (Alder, 2018a).

4 Staging

Development within the PPC area would be progressively staged, with key infrastructure sized for the ultimate development. Ultimately sized infrastructure would include road/movement networks, stormwater management devices, water and wastewater reticulation. The extent and location of staging will be determined through subdivision resource consent applications.

5 Anticipated Yields and Timeframe

The intention is to deliver approximately 2,000 houses. It is expected that the project will take 10 to 15 years to build out depending on market demand.

6 Servicing

6.1 Introduction

This section covers the following servicing aspects for development;

1. Stormwater;
2. Wastewater;
3. Potable Water;
4. Roads; and
5. Utilities

6.2 Stormwater

The reader is referred to the ICMP for the Rotokauri North PPC area (Fraser-Smith et al., 2018) . The ICMP provides a comprehensive overview of the existing stormwater system, and proposes infrastructure required to enable development to occur at within the PPC area.

The ICMP was developed to be complimentary to the approved Rotokauri South and Mangaheka ICMPs.

The key stormwater management opportunities and constraints have been developed with a focus on reducing flood risk and protecting the receiving environment. Future development must incorporate various stormwater elements to ensure that urban outcome include opportunities for:

- Ecological enhancement of existing stream habitat and the riparian margin;
- Mitigation of flood risk such that development is located outside the 100-year flood plain;
- Minimisation of overland flow paths through private property; and
- Provide various options for slow release of frequent rainfall events to downstream catchments.

The ICMP includes Water Sensitive Urban Design (WSUD) principles for all stormwater design within the development, for treatment, discharge, and conveyance of stormwater so as to mitigate downstream erosion.

The ICMP (Fraser-Smith et al., 2018) proposes a range of treatment options for stormwater, both at source, and communally. The primary conveyance system will comprise swales and channels capable of conveying the 10-year ARI peak runoff from all impervious services, such as roads, carparks and buildings. The secondary flow network will accommodate flood flows up to the 100-year ARI plus climate change by utilising the swales, channels and road carriageways. Refer to **Figure 4** and drawing **1693-0-032, Appendix 3,** showing an indicative primary swale network for conveyance and treatment, and wetlands for stormwater treatment.

The ICMP (Fraser-Smith et al., 2018) provides design solutions to meet the outcomes prescribed in the Regional Infrastructure Technical Specifications (RITS) (Waikato Local Authority, 2018) and the Waikato Regional Council Stormwater Management Guideline (SMG) (Shaver, 2018a). Final options will be determined at the subdivision stage for public and communal infrastructure, and at building consent stage for individual lots.

In general, development within catchments that discharge to streams must provide detention (temporary storage) such that the post development flows for the 50%, 10% and 1% Average Exceedance Probability (AEP) 24-hour rainfall events do not exceed 80% of the pre-development peak flows.

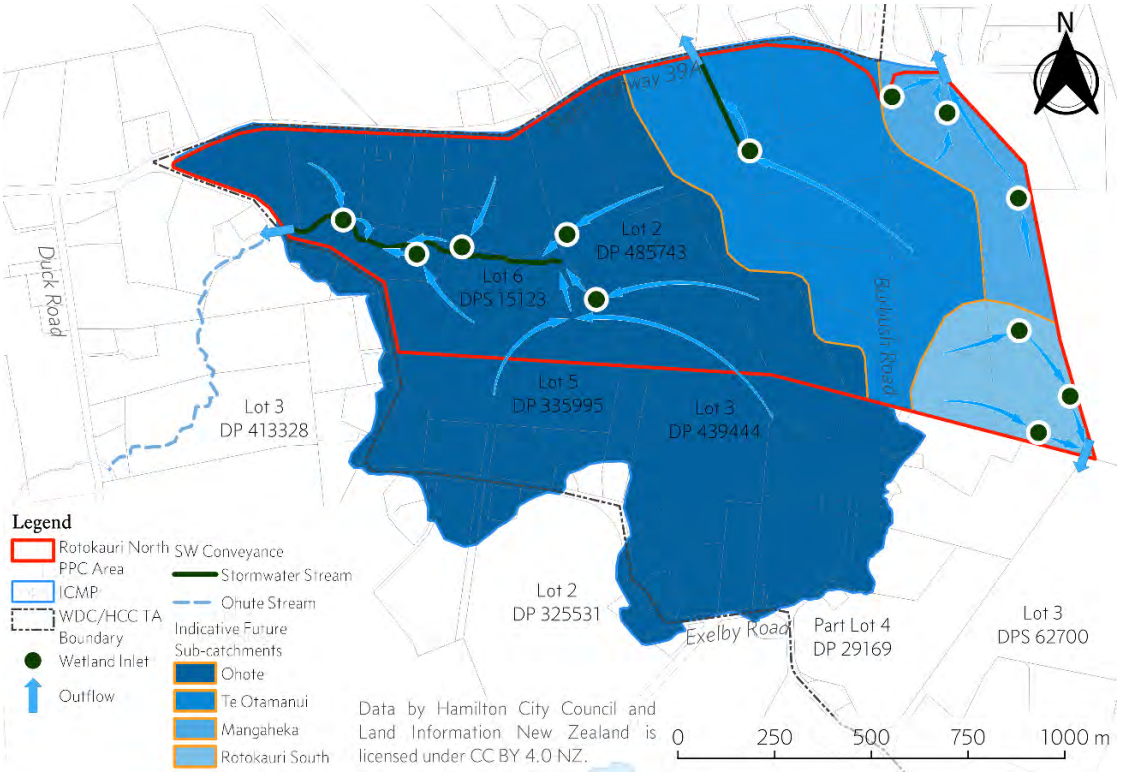

Figure 4: Indicative Subcatchments and SW Conveyance Network

Preliminary hydrogeological comments by Beca (Nutsford, 2018) indicate that the existing groundwater levels show a direct and immediate response to rainfall, soils are expected to have low permeability and overall groundwater level is very shallow. Subsequently the use of infiltration devices for stormwater management is likely to be limited across the PPC area.

McKenzie & Co. (Rudsits, 2019) identify some flood potential in the existing PPC area (see **Figure 3**, and drawing **1693-0-065**, **Appendix 3**). It is anticipated that much of the flood potential indicated will be mitigated during detailed subdivision design through earthwork design to lift development areas out of the flood plain, and shaping of green corridors to improve stormwater conveyance and management.

McKenzie & Co. (Rudsits, 2019) note that differences in modelling software and input datasets used by AECOM and McKenzie & Co. have produced differing results that effect stormwater detention requirements within the majority of the Rotokauri North PPC area(the Ohute catchment). It was recommended that the peak value of 0.7m^3/s be adopted as per the Rotokauri ICMP (Hart, 2017) for the 1% AEP design rainfall event, and that, subject to additional information being gathered (topography) and runoff analyses design parameters being agreed between all relevant parties (GSCL, HCC, WRC), the final value to be used for ED flows be further assessed during Resource Consenting.

The development of the ICMP (Fraser-Smith et al., 2018) was based on the following documents, which should also be referred to in future design:

- Waikato Local Authority Shared Services – Regional Infrastructure Technical Specifications (Waikato Local Authority, 2018);
- Hamilton City Council Three Waters Practice Note HCC02 – Rainwater Reuse System (Rain Tanks) (Hamilton City Council, 2016c);
- Hamilton City Council Three Waters Practice Note HCC05 – Rainwater Reuse and Detention System (Hamilton City Council, 2016b);
- Hamilton City Council Three Waters Practice Note HCC06 – Detention Tank (Hamilton City Council, 2016a);
- Hamilton City Council Three Waters Practice Note HCC09 – Water Impact Assessments (Hamilton City Council, 2016d);
- Waikato Regional Council Technical Report 2018/01 – Waikato Stormwater Management Guideline (Shaver, 2018a);
- Waikato Regional Council Technical Report 2018/02 – Waikato Stormwater Runoff Modelling Guideline (Shaver, 2018b);
- Auckland Council TP-108 - Guidelines for Stormwater Modelling in the Auckland Region (1999);
- Auckland Council's TP 10 (2003) Stormwater Management Devices: Design Guidelines Manual.

All stormwater infrastructure within the PPC area will be constructed and funded by the developers.

Network discharge consent(s) from the Regional Council will be required for the new stormwater network. This would likely be obtained by the developer(s) and transferred at a later date to HCC with the vesting of the assets.

6.3 Wastewater

Currently the PPC area is not serviced by a wastewater network, however provision has been made within the existing Far Western Interceptor (FWI) to cater for future urban development. A new trunk wastewater network with associated connecting branches would service the PPC area and future upstream catchments.

Two servicing options have been developed for the PPC area based on McKenzie & Co. conceptual designs (Rudsits, 2018):

6.3.1 Conventional gravity sewer

A wastewater network based on servicing all lots using gravity connections has been conceptually investigated for the ultimate development. The network is based on the catchment west of Burbush Road draining to one or more new wastewater pumping stations (WWPS). The WWPS would discharge to the gravity wastewater catchment east of Burbush Road. The catchment east of Burbush Road would connect to the existing DN1050 wastewater network manhole (WWK09003) on FWI, immediately west of State Highway 1.

The gravity reticulation would comprise pipe diameters ranging from 150mm to 300mm, with depths expected to range from 2 to 7 m.

A single WWPS would be sized for a pumping rate of 100 l/s, equivalent to population of approximately 6,000 people. If two pump WWPS are employed, lower individual pumping rates can be expected. Pump station sites would be located on separate land parcels, with sufficient space for related infrastructure such as emergency storage tanks. At a minimum, a single appropriately sized rising main will be required to discharge the pumped flows, however the opportunity for dual rising mains to manage septicity and lower initial flows is expected to be investigated during detailed design.

The design of the pump stations, sewer pipework, manholes, and associated sewer infrastructure is subject to detailed design.

Preliminary investigation suggests that if two pump stations are used to service the wastewater requirements for the ultimate development, one pump station will be within the Ohute catchment, and one within the Te Otamanui catchment – see **Figure 5**. The benefit of multiple pump stations is that wastewater construction depths can be minimised.

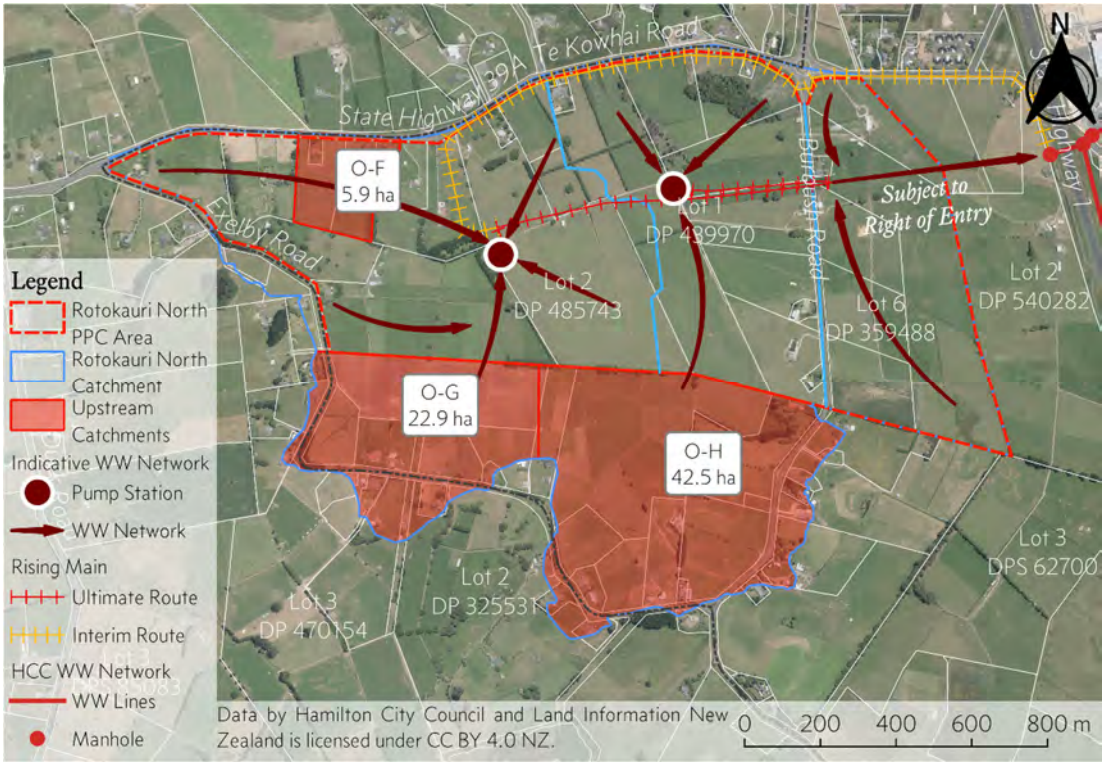

Figure 5: Indicative Wastewater Network

All wastewater reticulation network design and pump station design must comply with RITS.

In general, the PPC area can be serviced for wastewater disposal.

6.4 Water

As with wastewater, the PPC area is currently not serviced by water, and requires the extension of water service from existing trunk network. Mott McDonald have prepared a hydraulic modelling report (Tomasi, 2017) that incorporated water demands from the PPC area and the trunk upgrades as per HCC Infrastructure Strategy (Hamilton City Council, 2018). The modelling was based on expanding that done for the Rotokauri ICMP (Plessis, 2015).

The modelling confirmed that when the long-term upgrades were implemented, there was sufficient capacity and pressure to service the PPC area. The long-term upgrades required to service the PPC area include:

- New 520 mm trunk main from Pukete Reservoir to Te Wetini Drive, to service both Rotokauri South and the PPC area (completed);
- New 450 mm trunk watermain extension along Te Wetini Drive, reducing to 250 mm at connection to Rotokauri Road;
- Connect existing 250 mm water main on Arthur Porter Drive to the new Te Wetini Drive 520 mm trunk main (completed);
- New 450 mm trunk watermain crossing State Highway 1, from approximate intersection of Te Kowhai Road East and Arthur Porter Drive, to the Rotokauri development area.

Specific upgrades required for the PPC area would be:

- New 250 mm watermain from intersection of Ruffell Road and Arthur Porter Drive, following Te Kowhai Road to the first stage of the PPC area to provide initial supply;
- Replacement of existing 100 mm watermain with 150 mm watermain along Ruffell Road;
- Installation of new 150 mm watermain from Te Koura Drive roundabout along Te Kowhai Road to the Stage 1 development.
- Ultimately, a new 250 mm watermain extending from the Stage 1 development around PPC area.

The proposed 450 mm trunk watermain crossing State Highway 1 will need to be brought forward to allow for security of supply for subsequent stages of the PPC area. The timing for these works will be determined through additional demand modelling and detailed design in the relevant stages. We expect that the existing 250 mm line from Arthur Porter Drive along Te Kowhai East Road to the roundabout at Earthmover Crescent will be upgraded to a 450 mm line at this time.

Refer to **Figure 6** and drawing **1693-0-670**, **Appendix 3**.

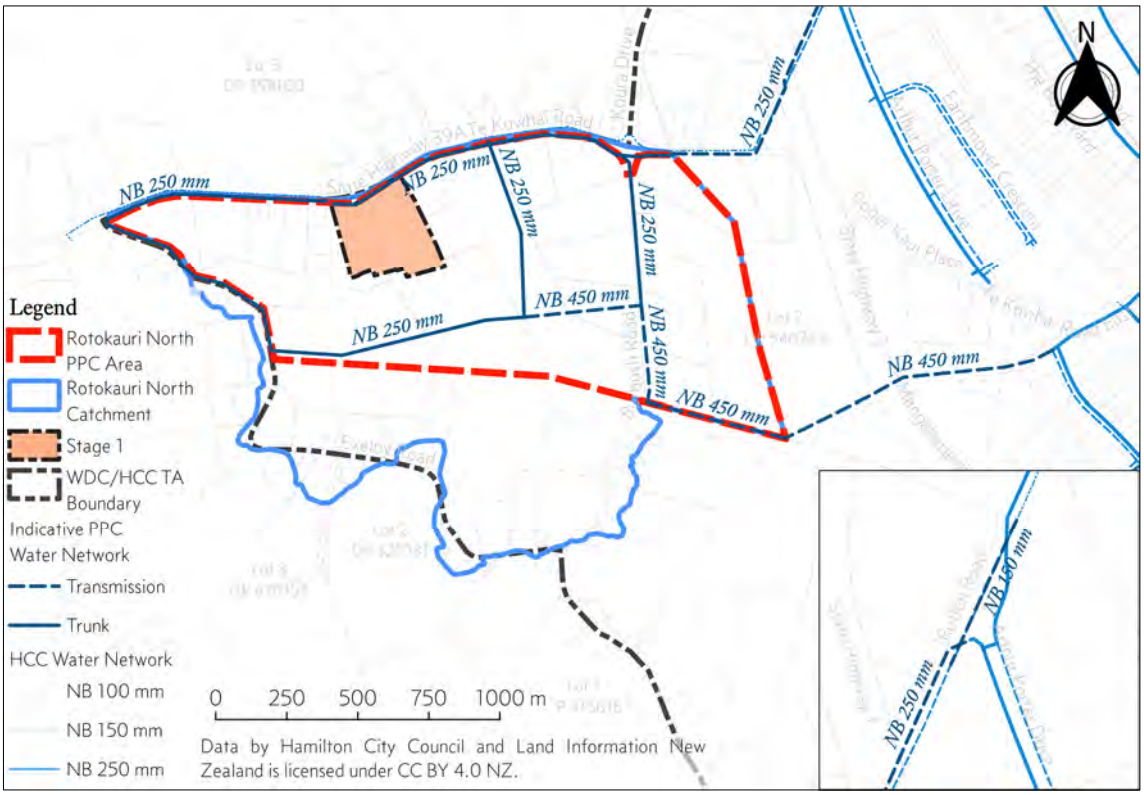

Figure 6: Indicative Water Network

The reticulation within the PPC area would be based on sizing to meet the capacity and pressure requirements within Waikato LASS RITS (2018). The conceptual network design was based on looped networks branching off a central trunk main. The central trunk main would form part of the wider regional ring main connecting Rotokauri North and South with the Te Wetini Drive and State Highway 1 mains.

Water Staging Plan

The initial stage of the PPC area could be serviced by a new 250 mm diameter pipeline from Ruffell Road and Arthur Porter Drive intersection. The water main would cross State Highway 1, parallel to the existing 100 mm water main to Errol Close. Thereafter it would follow Te Kowhai Road to the first stage of the PPC area.

A new 150 mm watermain from Te Koura Drive roundabout along the south side of Te Kowhai Road to the Stage 1 development would be used to provide security of supply for the first stage. To support adequate supply for Stage 1, replacement of the existing 100 mm watermain with a 150 mm watermain along Ruffell Road, at the intersection of Arthur Porter Drive, is also indicated.

Detailed demand analysis and modelling will be completed to verify that capacity and pressure requirements are meet for this arrangement.

As demand increases with additional staged development across the PPC area, the existing 100 mm water main would not be expected to provide sufficient security of supply. It would be expected that the 450mm trunk main crossing State Highway 1

from Te Kowhai Road East would need to be constructed. Demand analysis and modelling would be completed during detailed design so as to confirm timing requirements for the construction of the new 450 mm, relative to the staging plan when developed.

6.5 Roads

Commute Transportation Consultants have undertaken an Integrated Transportation Assessment (ITA) (Seneviratne & Hills, 2019) for PPC area that identifies specific transportation improvements required to support the PPC. In summary these improvements include:

- Two new collector road intersections on Te Kowhai Road (State Highway 39), consisting of one single lane roundabout, and one priority control intersection (initially) with potential to be upgraded to a roundabout control in the future;
- Upgrade of existing roundabout at Te Kowhai and Burbush to a two-lane roundabout;
- Upgrade of Burbush Road to collector road status;
- Upgrade of Exelby Road to collector road status.

A minor arterial road is anticipated along the eastern edge of the PPC area.

Within the PPC area there would be new local and collector roads developed to service the community, including appropriate allowances for pedestrian, cycling, private and public transportation. Intersections would range from give way controlled for local to local and local to collector intersections, to signalised or roundabout controlled for arterial to collector and collector to collector. Demand analysis during future design stages would be used to determine intersection control types and requirements for construction of new required intersections (or upgrades to existing intersections).

Refer to drawings **1693-0-360** to **1693-0-362**, **Appendix 3**, for indicative local, collector, and minor arterial typical section.

Commute recommend that public transportation to service the area is implemented by the time 1,000 dwellings have been constructed and occupied.

6.6 Utility Services

6.6.1 Gas Reticulation

First Gas have confirmed that their supply network has capacity to provide reticulated gas supply for the PPC area.

6.6.2 Telecommunications

Chorus advise that the PPC area can be serviced. This will be confirmed at each subdivision stage once detailed design has been commissioned.

6.6.3 Power

WEL advise they can service the PPC area with electrical supply. At each subdivision stage the location of above ground infrastructure of transformers and switch gear locations will be determined, with space set aside within legal road corridors

WEL also have an existing above ground 11kV asset towards the western side of the PPC Area that they wish to retain – see **Figure 2** and drawing **1693-0-015**, **Appendix 3**. Discussions will be held between the developer and WEL should the asset be relocated underground within a future road corridor.

6.6.4 Summary

All utility operators will enter into commercial agreements to service each subdivision at the time of detailed design.

7 Conclusion

Investigations, meetings and correspondence with the respective Council departments and utility providers to date indicate that existing infrastructure can be extended and be made available to service the PPC area.

Future subdivision and development associated with land subject to the PPC can provide essential infrastructure necessary for use and enjoyment of the developed lots in compliance HCDP and Council standards.

8 References

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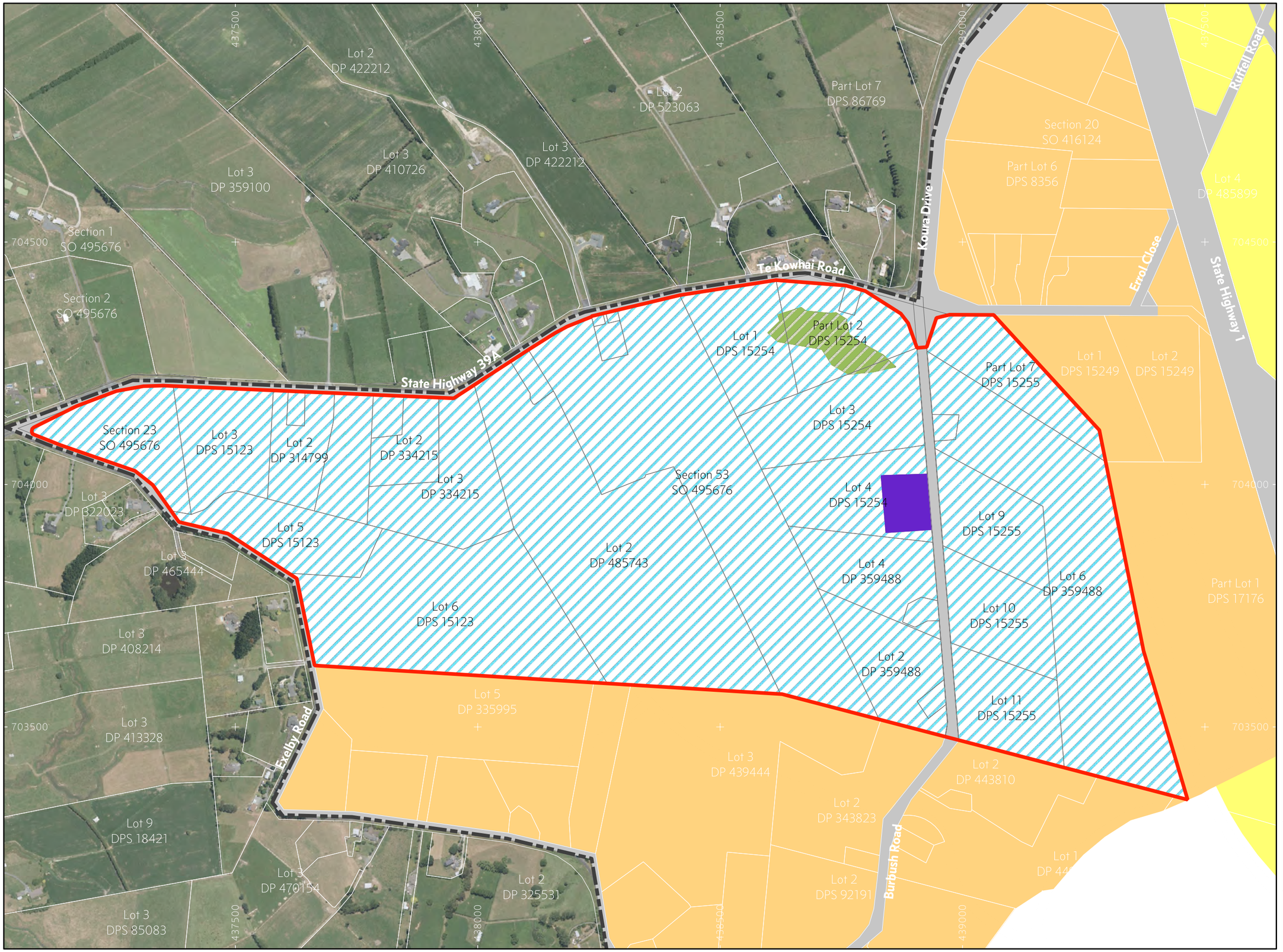
9 Appendices

Appendix 1: Zone & Structure Plans

1693-0-010 – Rotokauri North Zone Map
1693-0-011 – Rotokauri North Structure Plan



N

Legend

- Rotokauri North PPC Area

Proposed Land Use Zones

- Medium Density Residential Zone
- Business 6 Zone

HCC Zones

- Future Urban
- Industrial
- Residential
- Transport Corridor Zone
- Natural Open Space Zone
- WDC/HCC TA Boundary

Map Projection:
NZGD2000 / Mount Eden 2000 (EPSG: 2105)

Drawn By:	FW	Date:	26/04/2019
Checked By:		Date:	
Approved By:		Date:	
Plot Date:	26/04/2019		

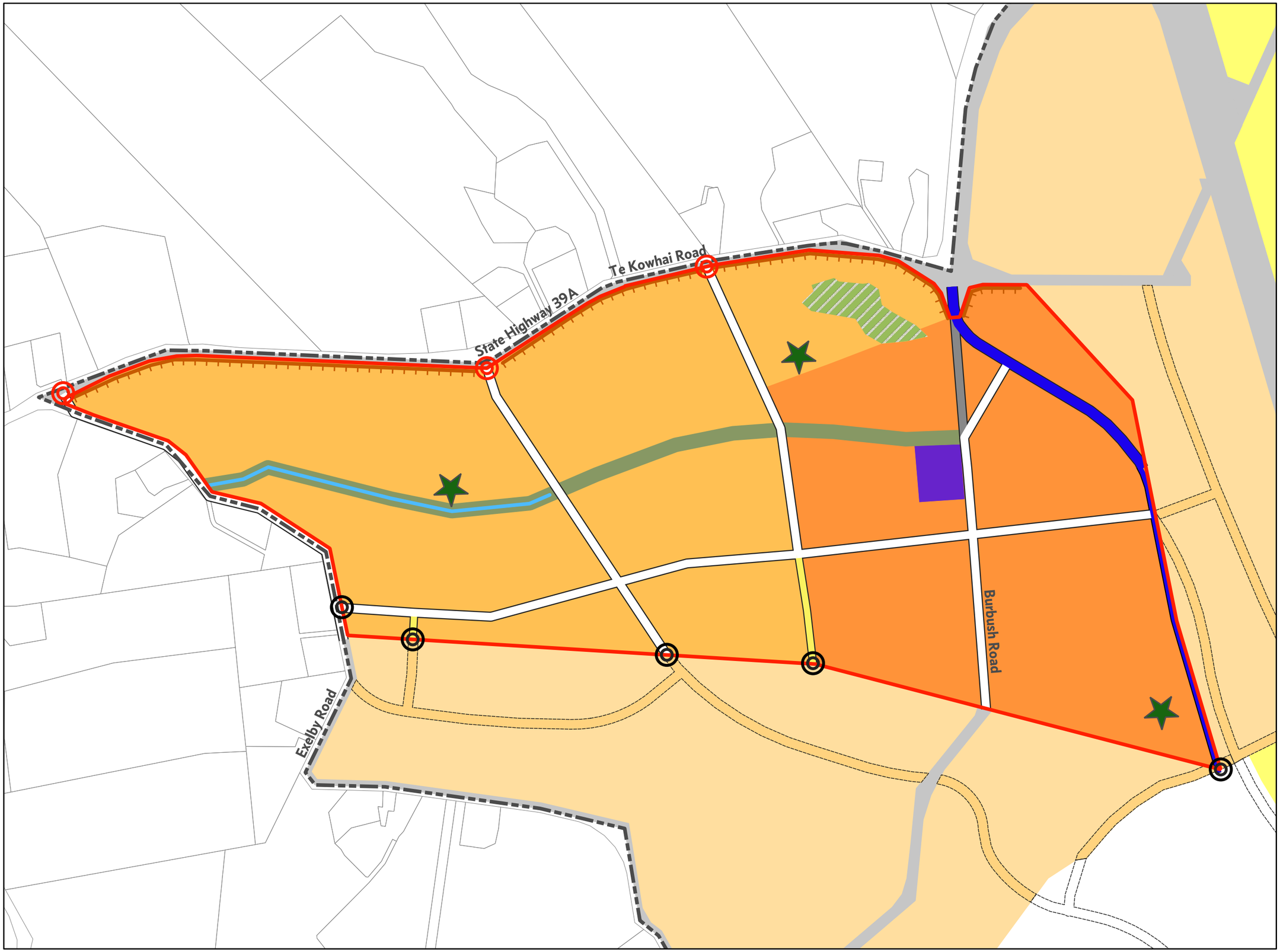
Signed:

Project:
Rotokauri North
Private Plan Change (PPC)
Green Seed Consultants Limited

Title:
Zone Map

McKENZIE&Co CONSULTANTS LTD

Issue Status:	For Information
Project Number:	1693-0
Drawing Number:	010
Revision:	G
A3 Scale:	1:7500



N

Legend

- Rotokauri North PPC Area

Zone Type

- Medium Density Residential Zone
- Business 6 Zone
- Medium Density Overlay Area A

HCC Zones

- Future Urban Zone
- Industrial Zone
- Residential Zone
- Transport Corridor Zone
- Natural Open Space Zone
- Future Transportation Corridor Zone

Road Connections

- State Highway Intersection
- Road Connection

Indicative Roads

- Minor Arterial Road
- Collector Road
- Local Road
- Future Road Closing/Stopping
- No Direct Access from State Highway /Landscape Buffer
- Green Spine (could include a road)
- Ohute Stream
- Indicative Neighbourhood Reserve
- WDC/HCC TA Boundary

Map Projection:
NZGD2000 / Mount Eden 2000 (EPSG: 2105)

Drawn By:	FW	Date: 26/04/2019	Signed:
Checked By:		Date:	Signed:
Approved By:		Date:	Signed:
Plot Date:	26/04/2019		

Project:
Rotokauri North
Private Plan Change
Green Seed Consultants Ltd.

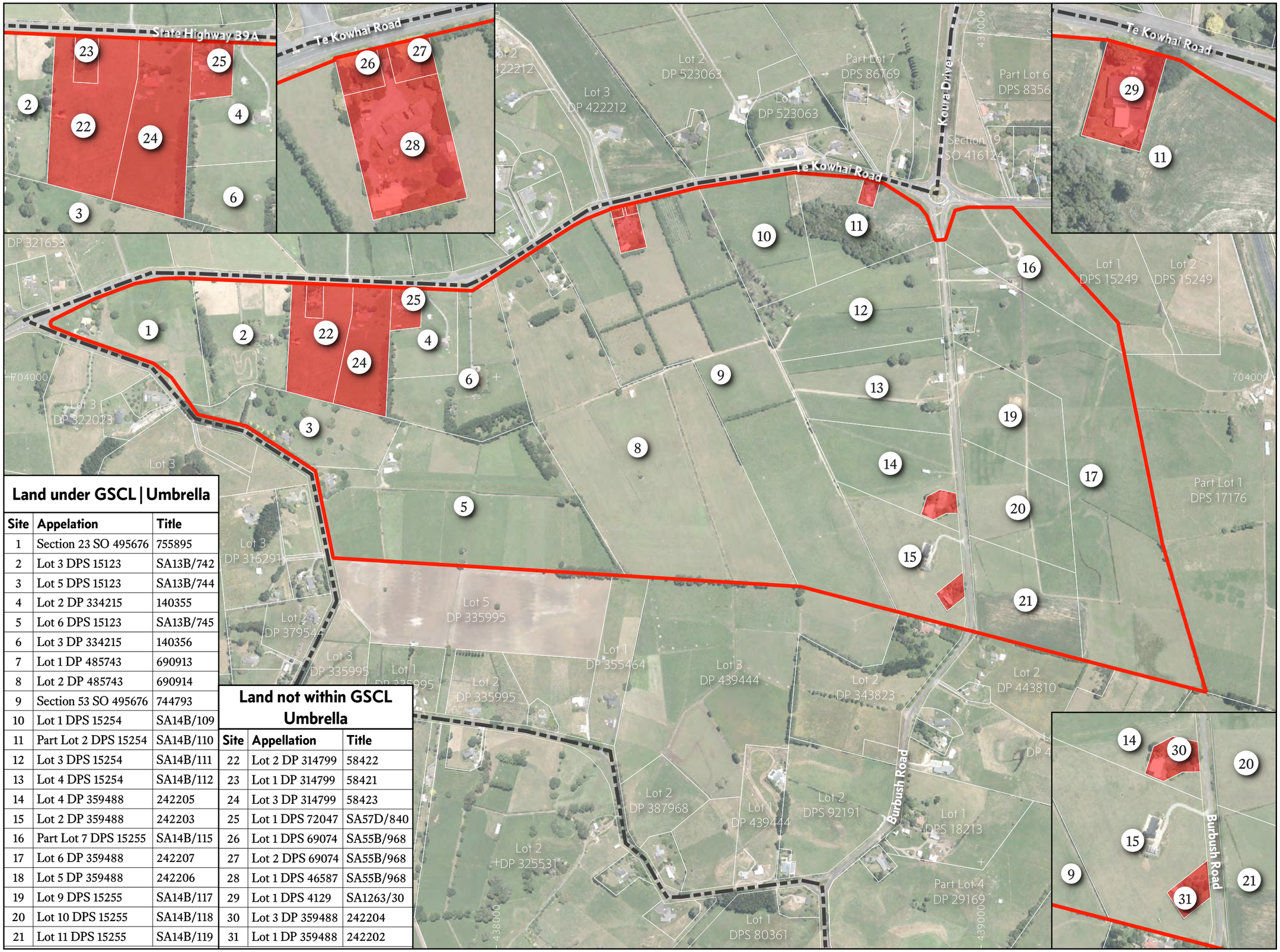
Title:
Structure Plan

McKENZIE&Co CONSULTANTS LTD

Issue Status:	For Information
Project Number:	1693-0
Drawing Number:	011
Revision:	I
A3 Scale:	1:7500

Appendix 2: Rotokauri North Land Parcels

1693-0-062 – Green Seed Consultants Properties



Land under GSCL | Umbrella

Site	Appelation	Title
1	Section 23 SO 495676	755895
2	Lot 3 DPS 15123	SA13B/742
3	Lot 5 DPS 15123	SA13B/744
4	Lot 2 DP 334215	140355
5	Lot 6 DPS 15123	SA13B/745
6	Lot 3 DP 334215	140356
7	Lot 1 DP 485743	690913
8	Lot 2 DP 485743	690914
9	Section 53 SO 495676	744793
10	Lot 1 DPS 15254	SA14B/109
11	Part Lot 2 DPS 15254	SA14B/110
12	Lot 3 DPS 15254	SA14B/111
13	Lot 4 DPS 15254	SA14B/112
14	Lot 4 DP 359488	242205
15	Lot 2 DP 359488	242203
16	Part Lot 7 DPS 15255	SA14B/115
17	Lot 6 DP 359488	242207
18	Lot 5 DP 359488	242206
19	Lot 9 DPS 15255	SA14B/117
20	Lot 10 DPS 15255	SA14B/118
21	Lot 11 DPS 15255	SA14B/119

Land not within GSCL Umbrella

Site	Appellation	Title
22	Lot 2 DP 314799	58422
23	Lot 1 DP 314799	58421
24	Lot 3 DP 314799	58423
25	Lot 1 DPS 72047	SA57D/840
26	Lot 1 DPS 69074	SA55B/968
27	Lot 2 DPS 69074	SA55B/968
28	Lot 1 DPS 46587	SA55B/968
29	Lot 1 DPS 4129	SA1263/30
30	Lot 3 DP 359488	242204
31	Lot 1 DP 359488	242202

N

Legend

- Rotokauri North PPC Area
- Land not under GSCL Umbrella
- WDC/HCC TA Boundary

Map Projection:
NZGD2000 / Mount Eden 2000 (EPSG: 2105)

Drawn By:	FW	Date:	26/04/2019
Checked By:		Date:	
Approved By:		Date:	
Plot Date:	26/04/2019		

Signed:

Project:
Rotokauri North
Private Plan Change (PPC)
Green Seed Consultants Limited

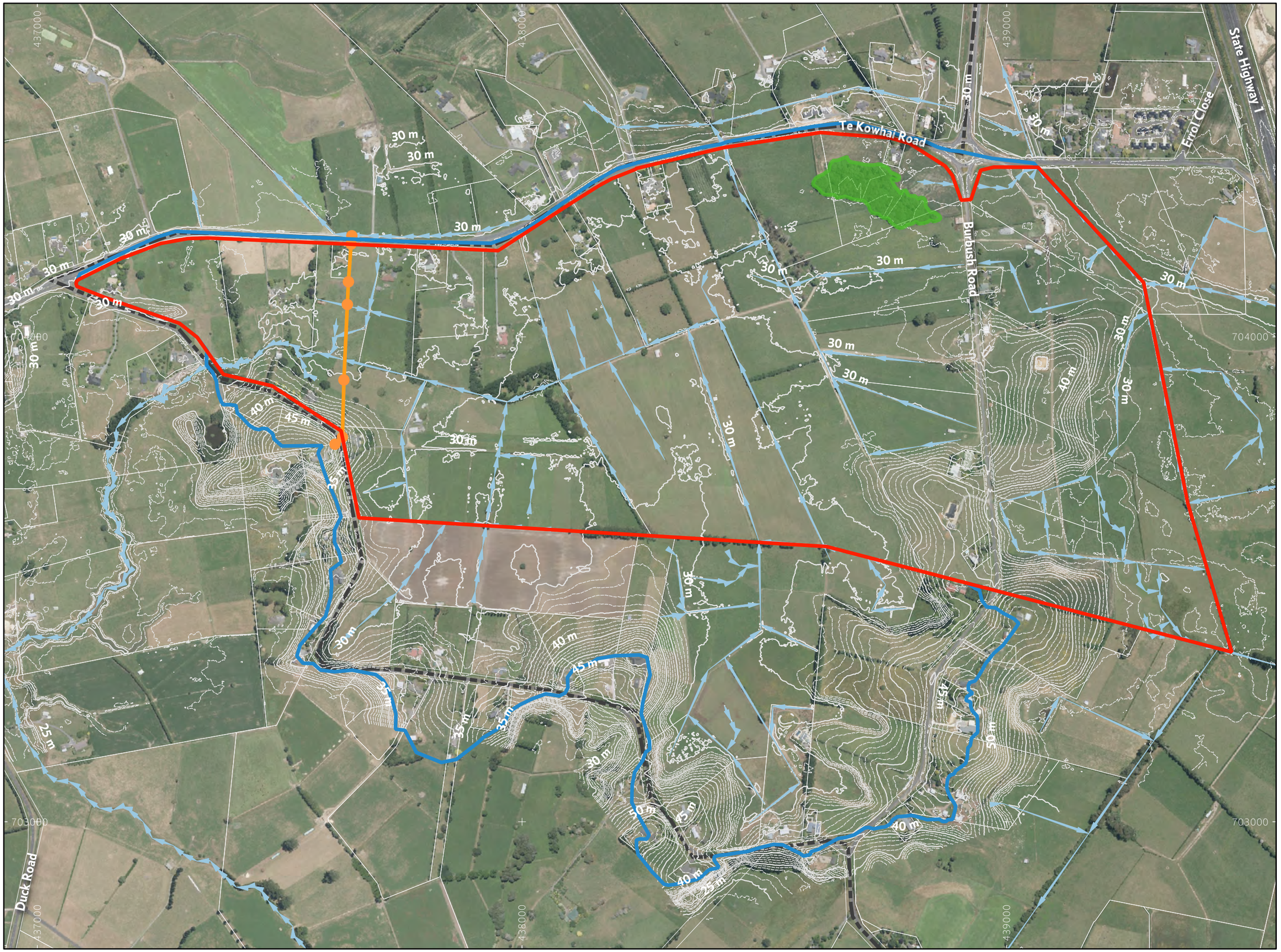
Title:
Properties Under GSCL "Umbrella"

McKENZIE&Co CONSULTANTS LTD

Issue Status:	For Information
Project Number:	1693-0
Drawing Number:	062
Revision:	E
A3 Scale:	1:7500

Appendix 3: Topographic Plan, Typical Road Sections and Concept Plans for Stormwater, Wastewater and Water

1693-0-015 – Topographic Plan
1693-0-032 – Sub-catchments with Indicative Swales and Wetland Locations
1693-0-065 – Flood extents under existing conditions
1693-0-360 – Local Road Typical Section
1693-0-361 – Collector Road Typical Section
1693-0-362 – Minor Arterial Road Typical Section
1693-0-571 – Wastewater Catchment Plan, Gravity Sewer (Two Pump Stations)
1693-0-671 – Water Concept Plan PPC Area



N

Legend

- Rotokauri North PPC Area
- Tree Stand (Kahikatea)
- Watercourses
- Rotokauri North Catchment

Catchment In/Out Flows

- WDC/HCC TA Boundary
- 11kV WEL Asset

Map Projection:
NZGD2000 / Mount Eden 2000 (EPSG: 2105)

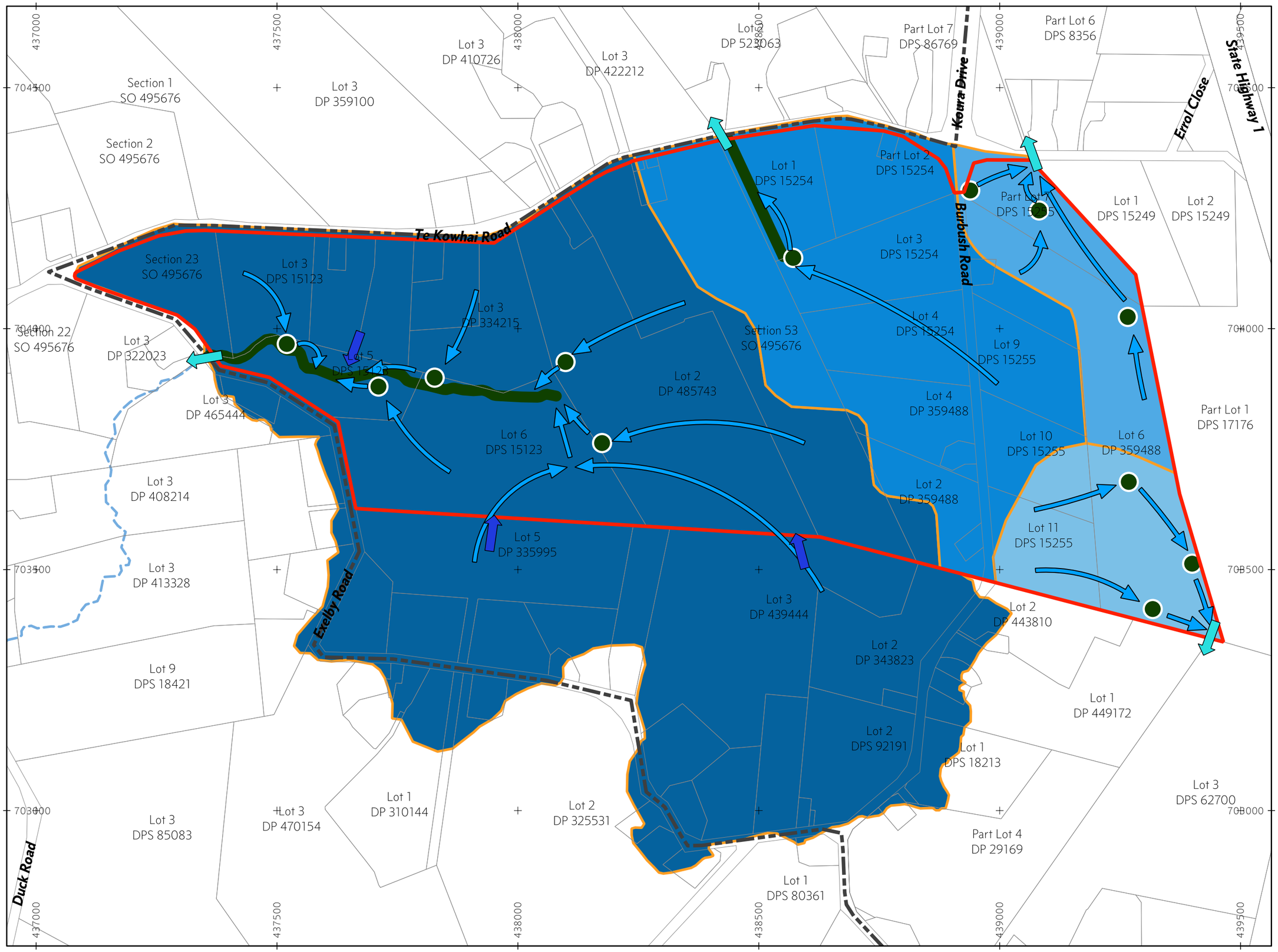
Drawn By:	FW	Date: 26/04/2019	Signed:
Checked By:		Date:	Signed:
Approved By:		Date:	Signed:
Plot Date:	26/04/2019		

Project:
Rotokauri North
Private Plan Change (PPC)
Greenseed Consultants Ltd

Title:
Topographic Plan

McKENZIE&Co CONSULTANTS LTD

Issue Status:	For Information
Project Number:	1693-0
Drawing Number:	015
Revision:	F
A3 Scale:	1:7500



N

Legend

- Rotokauri North PPC Area
- WDC/HCC TA Boundary
- Indicative Wetland Inlet

Catchment in/Out Flows

- Inflow
- Outflow
- Stormwater Network

Swales

- Stormwater Stream
- Ohote Stream

Indicative Future Catchments

- Ohote
- Te Otamanui
- Mangaheka
- Rotokauri South

Map Projection:
NZGD2000 / Mount Eden 2000 (EPSG: 2105)

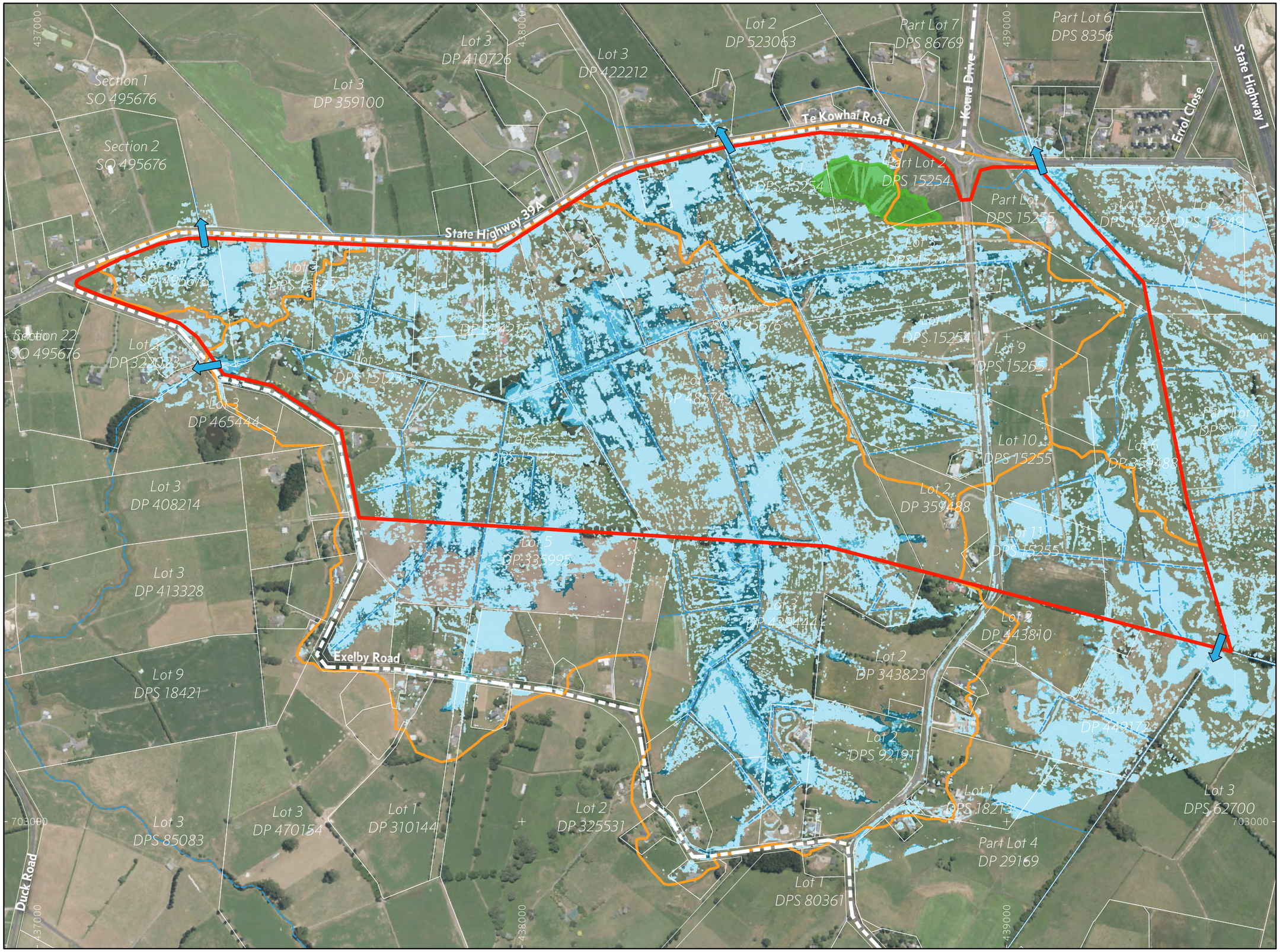
Drawn By:	FW	Date: 26/04/2019	Signed:
Checked By:		Date:	Signed:
Approved By:		Date:	Signed:
Plot Date:	26/04/2019		

Project:
Rotokauri North
Private Plan Change (PPC)
Green Seed Consultants Limited

Title:
Subcatchments with Indicative Swales and Wetland Locations

McKENZIE&Co CONSULTANTS LTD

Issue Status:	For Information
Project Number:	1693-0
Drawing Number:	032
Revision:	G
A3 Scale:	1:7500



N

Legend

- Rotokauri North PPC Area
- Rotokauri North Catchment
- Existing Catchments
- Significant Natural Area
- Watercourses

Flood Depths

1% AEP Storm Event

2.81 m Max. Depth

10% AEP Storm Event

2.45 m Max. Depth

50% AEP Storm Event

2.25 m Max. Depth

Catchment In/Out Flows

Outlet

Map Projection:
NZGD2000 / Mount Eden 2000 (EPSG: 2105)

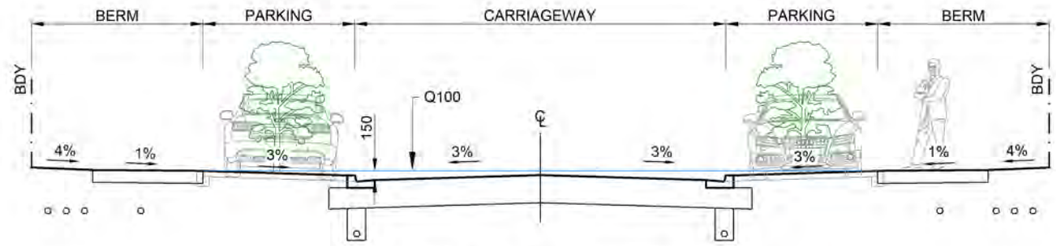
Drawn By:	FW	Date: 26/04/2019	Signed:
Checked By:		Date:	Signed:
Approved By:		Date:	Signed:
Plot Date:	26/04/2019		

Project:
Rotokauri North
Private Plan Change (PPC)
Green Seed Consultants Ltd

Title:
Flood Map

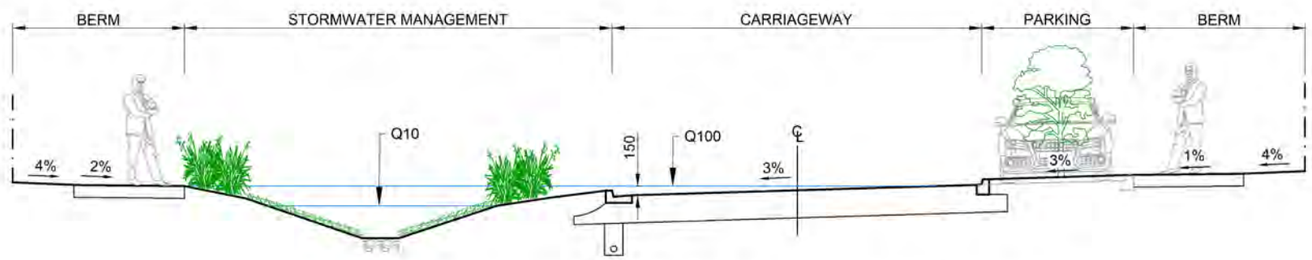
McKENZIE&Co CONSULTANTS LTD

Issue Status:	For Information
Project Number:	1693-0
Drawing Number:	065
Revision:	C
A3 Scale:	1:7500

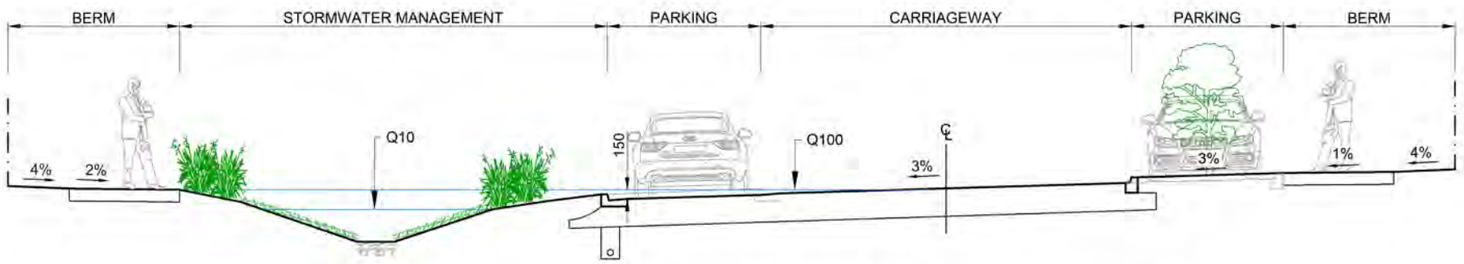


INDICATIVE LOCAL ROAD CROSS SECTION

NOTE: THIS SECTION ONLY APPLIES FOR CATCHMENTS UP TO 1.5 ha



INDICATIVE LOCAL ROAD CROSS SECTION OPTION
WITH PARKING ONE SIDE



INDICATIVE LOCAL ROAD CROSS SECTION OPTION
WITH PARKING BOTH SIDES

REV	DESCRIPTION	BY	DATE
C	ISSUED FOR DRAFT PLAN CHANGE	BH	03/04/19
B	ISSUED FOR DRAFT PLAN CHANGE	BH	19/12/18
A	FIRST ISSUE	BH	01/07/18

ORIGINATOR: BH | DATE: 01/07/18 | SIGNED: | PLOT BY:
DRAWN: BH | DATE: 01/07/18 | SIGNED: | PLOT DATE:
CHECKED: | DATE: | SIGNED: | SURVEY BY:
APPROVED: | DATE: | SIGNED: | SURVEY DATE:

PROJECT:
GREEN SEED CONSULTANTS LIMITED
ROTOKAURI NORTH

TITLE:
ROADING
TYPICAL CROSS SECTIONS
LOCAL ROADS

McKENZIE&CO CONSULTANTS LTD

ISSUE STATUS: FOR APPROVAL
PROJECT NO: 1693
SCALES: 1:50 @ A1, 1:100 @ A3
A1
DRAWING NO: 1693-0-360
REV: C

2019-04-17 11:06:48

REFER TO APPROVED MASTER DRAWING FOR ORIGINAL SIGNATURES

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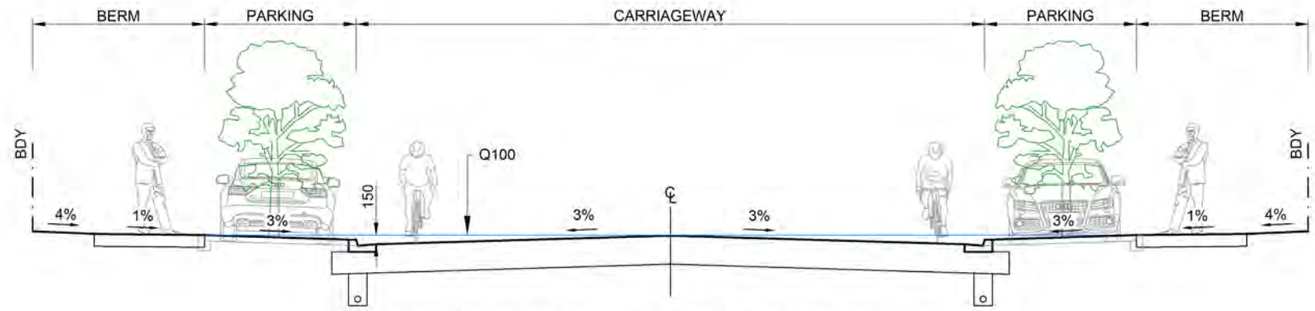
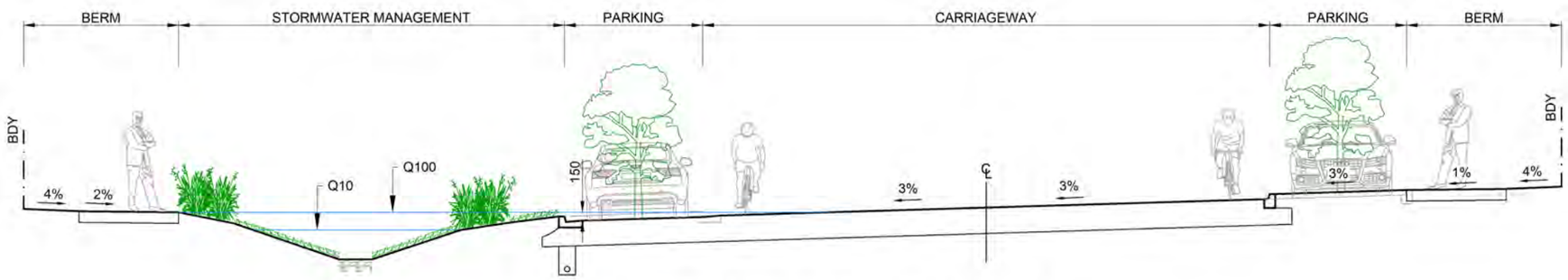
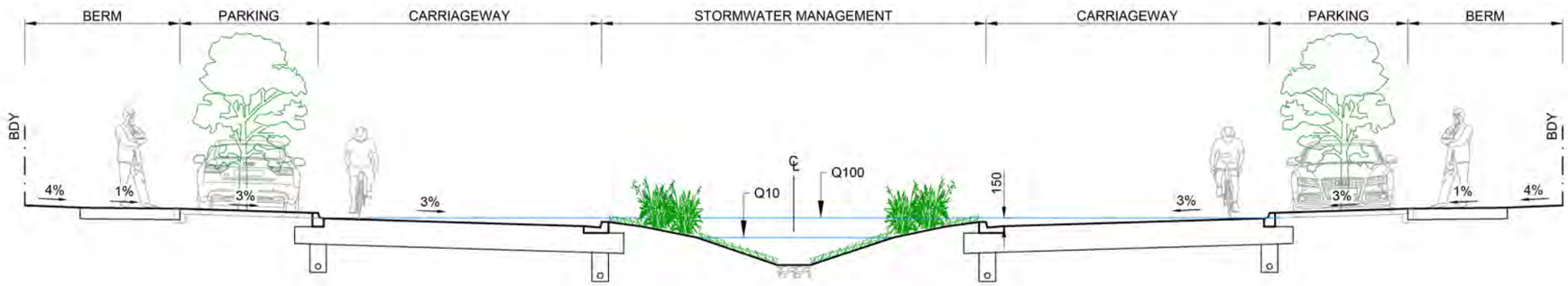


INDICATIVE COLLECTOR ROAD CROSS SECTION
WHERE NO SWALE IS REQUIRED



INDICATIVE COLLECTOR ROAD CROSS SECTION
WITH SIDE SWALE



INDICATIVE COLLECTOR ROAD CROSS SECTION
WITH CENTRAL SWALE

REV	DESCRIPTION	BY	DATE
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B	ISSUED FOR DRAFT PLAN CHANGE	BH	19/12/18
A	FIRST ISSUE	BH	01/07/18

ORIGINATOR: BH | DATE: 01/07/18 | SIGNED: | PLOT BY:
DRAWN: BH | DATE: 01/07/18 | SIGNED: | PLOT DATE:
CHECKED: | DATE: | SIGNED: | SURVEY BY:
APPROVED: | DATE: | SIGNED: | SURVEY DATE:

PROJECT:
GREEN SEED CONSULTANTS LIMITED
ROTOKAURI NORTH

TITLE:
ROADING
TYPICAL CROSS SECTIONS
COLLECTOR ROADS

McKENZIE&CO CONSULTANTS LTD

ISSUE STATUS: FOR APPROVAL
PROJECT NO: 1693
SCALES: 1:50 @ A1, 1:100 @ A3
A1
DRAWING NO: 1693-0-361
REV: C

2019-04-17 11:22:23
REFER TO APPROVED MASTER DRAWING FOR ORIGINAL SIGNATURES
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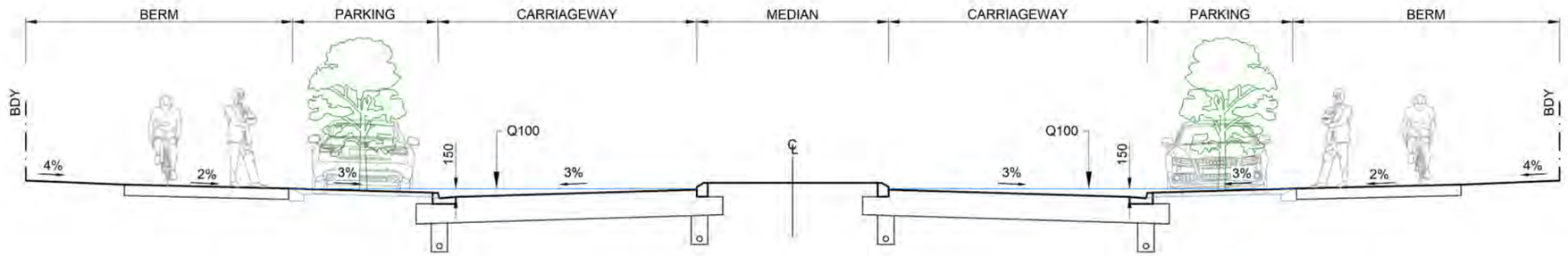
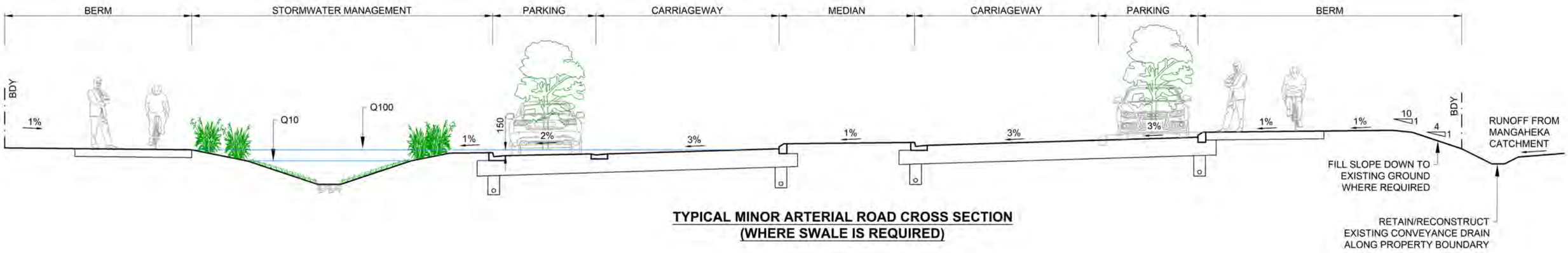
NOTES
1. DIMENSIONS SHOWN BASED ON ROTOKAURI SOUTH CONSTRUCTION DRAWING S1057320 Rev 3 ISSUED BY CKL LTD ON 28/06/17.



TYPICAL MINOR ARTERIAL ROAD CROSS SECTION
(WHERE SWALE IS NOT REQUIRED)

WEST SIDE

EAST SIDE



TYPICAL MINOR ARTERIAL ROAD CROSS SECTION
(WHERE SWALE IS REQUIRED)

REV	DESCRIPTION	BY	DATE
C	ISSUED FOR DRAFT PLAN CHANGE	BH	03/04/19
B	ISSUED FOR DRAFT PLAN CHANGE	BH	19/12/18
A	FIRST ISSUE	BH	01/07/18

ORIGINATOR: BH | DATE: 01/07/18 | SIGNED: | PLOT BY:
DRAWN: BH | DATE: 01/07/18 | SIGNED: | PLOT DATE:
CHECKED: | DATE: | SIGNED: | SURVEY BY:
APPROVED: | DATE: | SIGNED: | SURVEY DATE:

PROJECT:
GREEN SEED CONSULTANTS LIMITED
ROTOKAURI

TITLE:
ROADING
TYPICAL CROSS SECTIONS
MINOR ARTERIAL

McKENZIE&CO CONSULTANTS LTD

ISSUE STATUS: FOR APPROVAL
PROJECT NO: 1693
SCALES: 1:50 @ A1, 1:100 @ A3
A1
DRAWING NO: 1693-0-362
REV: C

2019-04-17 11:31:46
REFER TO APPROVED MASTER DRAWING FOR ORIGINAL SIGNATURES
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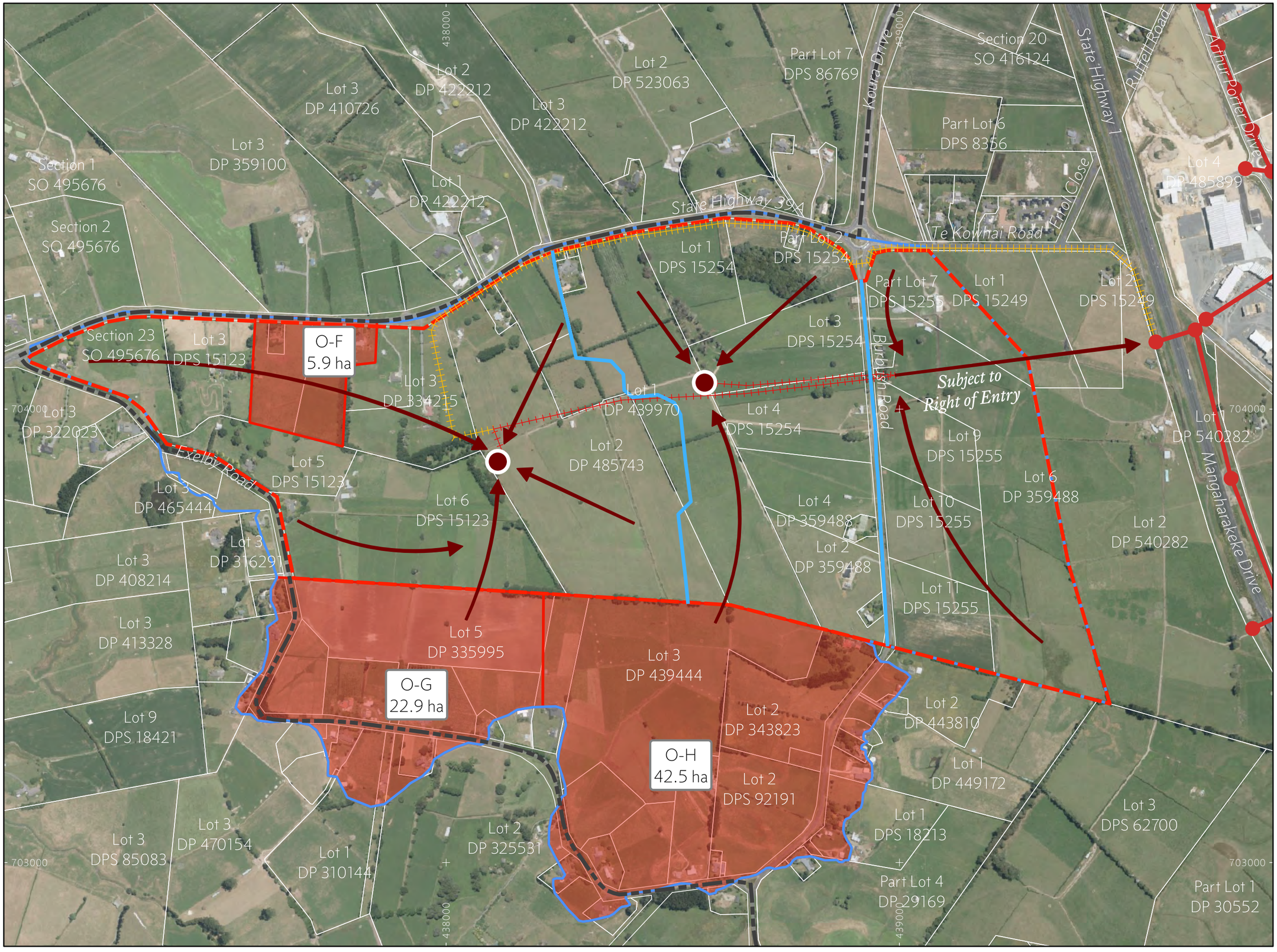


N

Legend

- Rotokauri North PPC Area
- Rotokauri North Catchment
- Upstream Catchments
- WDC/HCC TA Boundary

Indicative WW Network

- Pump Station
- WW Network

Rising Main

- Ultimate Route
- Interim Route
- WW Catchments

HCC WW Network

- WW Lines
- Manhole

Map Projection:
NZGD2000 / Mount Eden 2000 (EPSG: 2105)

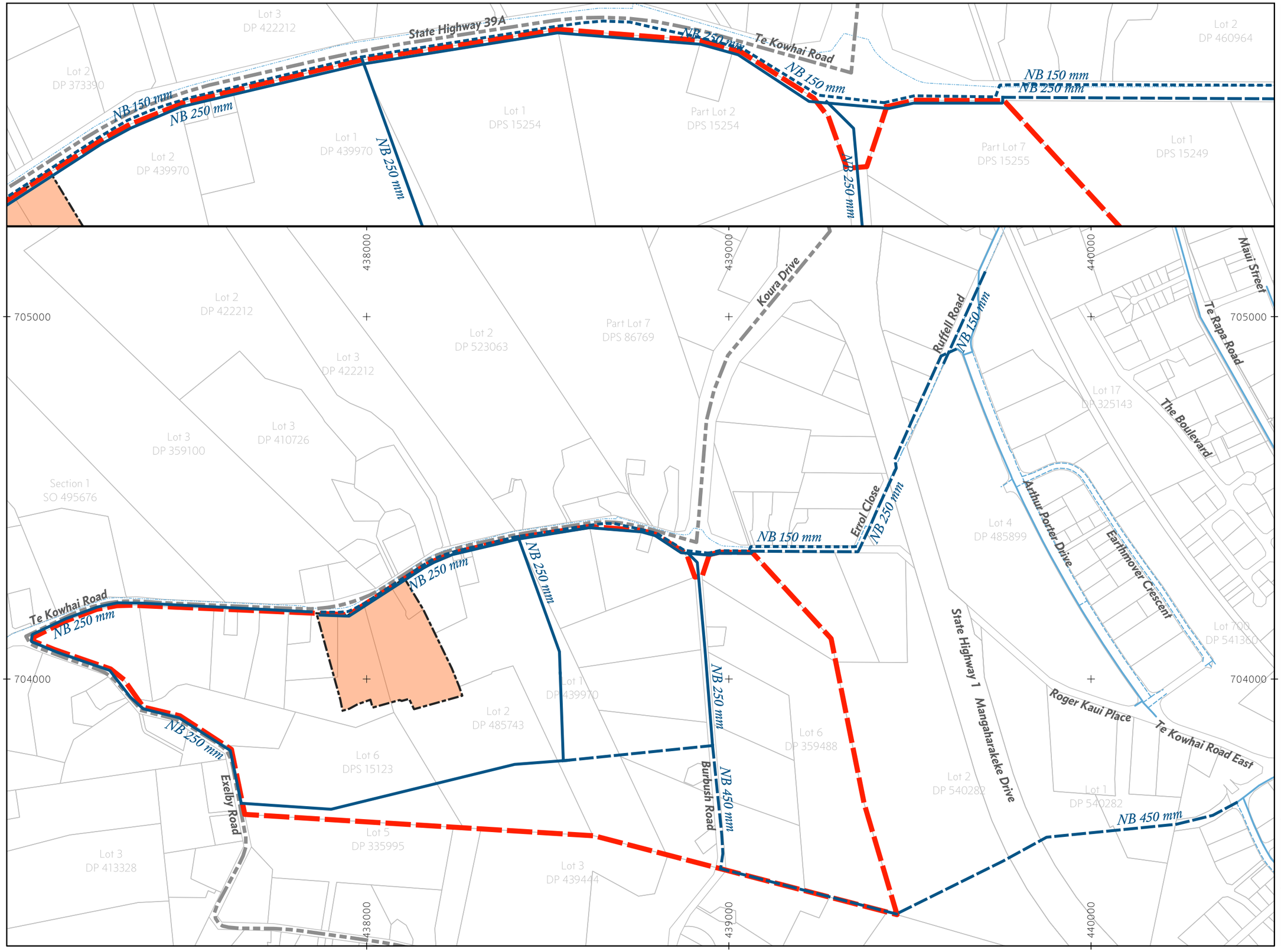
Drawn By:	AJSH	Date: 5/03/2019	Signed:
Checked By:		Date:	Signed:
Approved By:		Date:	Signed:
Plot Date:	10/02/2020		

Project:
Rotokauri North
Private Plan Change (PPC)
Green Seed Consultants Limited

Title:
Gravity Wastewater Network
Concept Design of Ultimate Network
With Two Pump Stations

McKENZIE&Co CONSULTANTS LTD

Issue Status:	For Information
Project Number:	1693-0
Drawing Number:	571
Revision:	D
A3 Scale:	1:8000



N

Legend

- Rotokauri North PPC Area
- Rotokauri North Catchment
- WDC/HCC TA Boundary

Indicative Water Network Required to Support PPC Area

- PPC Area Transmission Line
- PPC Area Trunk Line
- Required for QD (to be abandoned)

HCC Water Network

- NB 100 mm
- NB 150 mm
- NB 225 to 250 mm

Map Projection:
NZGD2000 / Mount Eden 2000 (EPSG: 2105)

Drawn By:	AH	Date: 5/04/2019	Signed:
Checked By:		Date:	Signed:
Approved By:		Date:	Signed:
Plot Date:	10/02/2020		

Project:
Rotokauri North
Private Plan Change (PPC)
Green Seed Consultants Limited

Title:
Water Supply Network Concept
Design of Ultimate Network

McKENZIE&Co CONSULTANTS LTD

Issue Status:	For Information
Project Number:	1693-0
Drawing Number:	671
Revision:	C
A3 Scale:	1:10000