MARAMA TE WAI LTD

30 May 2022

1234 WEST COAST ROAD PLAN CHANGE APPLICATION

Infrastructure Report

e2 environmental
CONSULTING CIVIL ENGINEERS

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Quality Control			
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e2environmental
CONSULTING CIVIL ENGINEERS

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Project Personnel

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1 Introduction

This report details the infrastructure requirements for a proposed 525 lot residential development across the block, as shown in the Concept Scheme Plan in Figure 1 below. The lot yield is comprised as follows:

Greenfield Area = approx 12.64 ha
Caretaker lot = 767 m²
Clubhouse lot = 4,193 m²
Utility Reserves total area = approx 1.28 ha
Net Area = approx 11.36 ha
Number of proposed lots = 220 lots

The proposed plan change area is for a single existing lot with the legal description RS 6619 BLK XI ROLLESTON.

Figure 1 Concept Scheme Plan

The site is bounded by a rural property to the north, Prestons Downs subdivision to the west, West Coast Road to the south, and rural properties to the west.

The site comprises open pastures that have typically been used for farming activities. The land gently slopes to the southeast at 0.6%, from an approximate ground surface elevation of 96.0 m in the northwest site corner to 93.0 m (NZVD 2016) in the lower southeast corner. There is a ridge running roughly northwest to southeast, and there are two low areas in each of the areas created by the ridge.

The site geology has been previously reported by Pattle Delamore Partners Ltd (PDP)[1] as being underlain by 'grey river alluvium beneath plains or low-level terraces.' Their report noted that groundwater would be expected at 30 m below ground level and would generally flow to the east.

In addition to the information provided in this report, Appendix F also includes further information detailed in a revision to our previous response to infrastructure questions from a SDC RFI dated April 27, 2021.

1.1 Surface Water

Surface water bodies within the site and surrounding areas comprise water races, private ponds, and stormwater management areas. There is a local water race in the north part of the site, and another in the south part of the site, both of which are part of the Paparua Water Race Scheme. Within the West Melton township there are various stormwater management areas. A pond is also located in neighbouring land approximately 480 m to the west, as shown in Figure 2 below and in Appendix A.

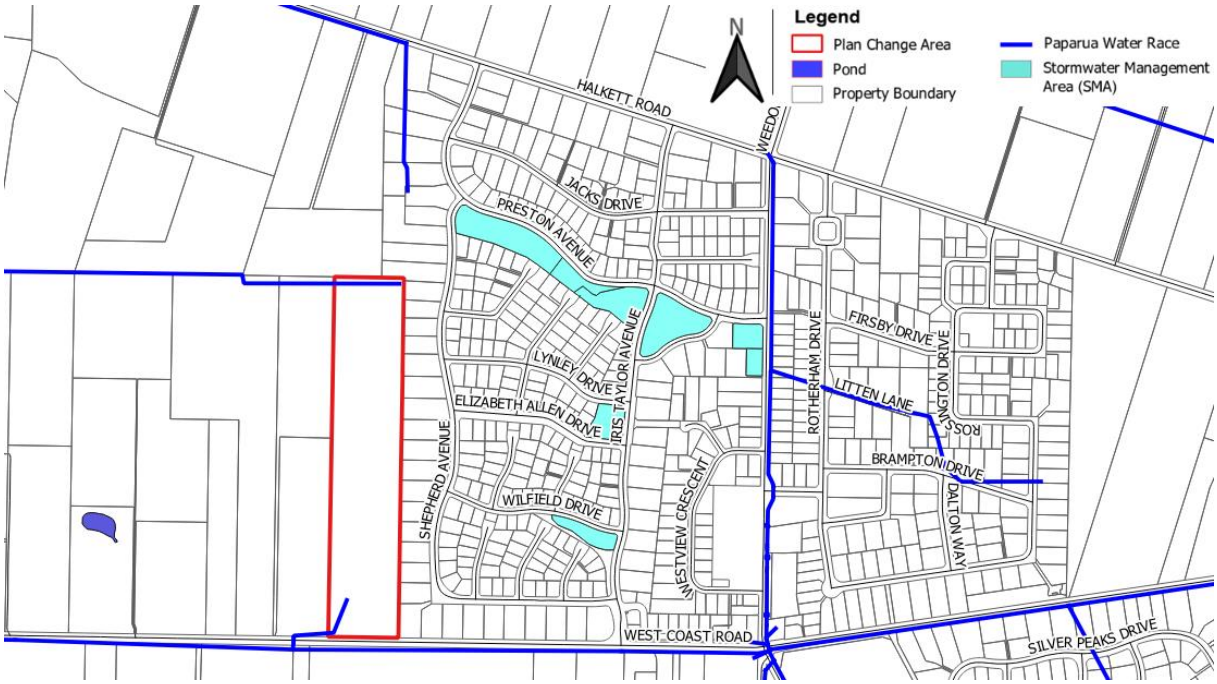


Figure 2 Local Waterbodies

1.2 Site Contamination

Two investigations have been completed across the block as summarised below and included in Appendix C. There is no information available on Environment Canterbury's (ECan) Listed Lan Use Register (LLUR). See Appendix B for further LLUR details.

[1] Pattle Delamore Partners. (August 2018). Detailed Site Investigation – 1234 West Coast Road, West Melton.

1.2.1 Detailed Site Investigation – 1234 West Coast Road, West Melton, PDP Ltd, 31 August 2018.

Key findings:

- 'In summary, the reviewed information and the site inspection shows the only potential HAIL activity at the site relates to the imported fill material used to form the horse training track in the central portion of the site. '
- 'The soil sampling investigation was undertaken, which included the collection of six soil samples from the fill material used to construct the horse training track. Concentrations of the tested analytes (i.e., heavy metals) were measured below the standards/guidelines for residential land use while asbestos was not detected in any of the samples. As such, there is considered to be an acceptably low risk to excavation workers and future land users (e.g., residents) and there is considered to be no restrictions on the reuse or disposal of the surplus soils generated as part of any future redevelopment of the site.'

1.2.2 Preliminary Site Investigation – West Coast Rd & Halkett Rd, West Melton. Malloch Environmental Ltd, December 2020.

Key findings:

- 'The investigations undertaken have indicated two risk areas on the subject site, both within 1234 West Coast Road (RS 6619). There is a risk of contamination by heavy metals from current and historical activities including:
    I. Old buildings potentially painted with lead-based paints
    II. A burn area
- 'The rest of the subject site has been used for general pasture for its known history or until being recently developed for rural residential or residential use. These uses are highly unlikely to have caused a risk to human health or the environment. There is no evidence of HAIL activities or industries having occurred on the rest of the subject site, now or in the past. The rest of the subject site is considered suitable for residential use with no further investigations required.'

2 Earthworks

A geotechnical report for the site was completed by Landtech Consulting Ltd and is provided in Appendix D. The soil testing consisted of machine excavated holes, soakage tests, and penetrometers.

Key findings:

1. The soil typically consists of 300 to 400 mm of topsoil overlaying silt and sand. Gravel was found at 0.5 m below ground (mid-point of the site) to 0.9 m depth (south of the site).
2. Soil bearing capacity is generally 'good' in terms of the NZS3604 definition.
3. The liquefaction vulnerability is very low for the site when subjected to a significant earthquake event. There is also a very low risk of liquefaction-induced ground damage following a significant seismic event.
4. The ground soakage rate in the gravel strata at 2.5 m depth varies between 0.4 m/hr near West Coast Road and 7.2 m/hr near the site mid-point (LandTech, 2020). Further investigation is required to understand the variability.

2.1 Suitability for Development

2.1.1 Filling

The soil types encountered will be suitable for both engineered filling (deeper than 300 mm) and non-engineered filling. No dewatering, dig-outs of poor material, or consolidation is likely to be required.

2.1.2 Foundation Soils

While on-site testing on each lot is recommended for foundation design on future buildings, the soils encountered in the geotechnical study could be classified as 'good' under the NZS3604 definition. Therefore, conventional shallow foundations are likely to be suitable for residential buildings.

2.1.3 Service Trenching

The geotechnical report showed that the soils tested are likely to be suitable for conventional service trenching since they consist of silt, sand and gravel, will not be in groundwater, and have a low liquefaction risk.

2.1.4 Erosion, Sediment and Dust Control

An Erosion, Sediment and Dust Control plan will be required at the construction stage to mitigate the risks of sediment runoff and dust. At a high level, the plan is expected to address:

- *Sediment-laden runoff.* This is likely to be discharged to ground via constructed soak holes. A construction stormwater discharge consent from ECan will be required to authorise this activity.
- *Mitigation of airborne dust during earthworks operations*. This will be covered in a Dust Management Plan submitted to ECan under the Canterbury Air Regional Plan (CARP) rule 7.32. It is likely to include measures to prevent dust beyond the property boundary by wetting via water carts, irrigation, or dust suppressing polymers.

2.2 Consent Requirements

Consent from both ECan and SDC are likely to be required for earthworks at the site relating to any future subdivision construction as follows.

2.2.1 ECan – Canterbury Land and Water Regional Plan (LWRP)

Rule 5.175 applies since the site is located over unconfined and semi-confined aquifers and the earthworks are likely to occur within 50 m of a surface waterbody (i.e., the water races). Any subdivision work is likely to require more than 100 m^3 of excavation work across the entire site, which is limited under this rule, and therefore consent will be needed.

2.2.2 SDC – District Plan

Consent is likely to be required assuming that the volume of earthworks exceeds 2,000 m^3.

3 Roading

The trunk roading network will generally be as shown on the ODP. As described in the Stormwater section, some trunk roads will be designed to convey overland flow. Where required, roadside swales will provide secondary flow paths for conveyance into downstream stormwater networks. These secondary flow paths will need to safely convey floodwaters to their existing flow path locations at the boundary of the proposed development (i.e., the management of secondary flow paths should maintain the site's hydraulic neutrality).

The minor roading network will be developed in detail at the subdivision consent stage. The location of the stormwater management areas, as discussed in the Stormwater section, may influence the location of some roads.

3.1 Road Pavement

The soils encountered in the geotechnical study are likely to be suitable for road construction because:

- The bearing capacity is good, and so the pavement type and depth are likely to be conventional;
- Groundwater is deep, so dewatering will not be required during construction, neither will groundwater control be needed during the operational phase;
- There is a low liquefication potential, so there will be no special pavement requirements to deal with that risk.

4 Stormwater and Flooding

4.1 Introduction

This section focusses on the following:

- Management of on-site stormwater in the first flush and large rainfall events; and
- Management of overland flow paths and ponded water in large flood events.

4.2 Report Purpose

The purpose of this section is to document the high-level analysis undertaken by e2 for the concept design of stormwater management areas. This section demonstrates how the proposed stormwater management meets legislative requirements and documents the methodology behind the calculations. Additional detailed analysis and design will be required at later stages of the subdivision process.

4.3 Design Specifics

4.3.1 Legislative Requirements Specific to the Design

Stormwater discharge in West Melton needs to be authorised by one of the approval options outlined below:

1. A rule in the Environmental Canterbury (Ecan) Land and Water Regional Plan (LWRP). *This activity will not meet the relevant rule(s) in the LWRP*.
2. An existing global stormwater consent held by SDC. *The global consent CRC167467 covers an area east of the site and therefore cannot be used*.
3. A site-specific discharge consent from Ecan. *This is the only approval route available for the proposed site discharges.*

As much of the site is near the west boundary of the SDC global consent area we have assumed that the stormwater treatment and attenuation conditions in the consent will be appropriate for the site.

Relevant design requirements from the global consent include:

- The stormwater drainage network to have capacity to convey stormwater from the contributing catchment from events up to and including a 10% AEP;
- Provide overland flow paths for secondary flows in excess of a 10% AEP event away from habitable buildings;
- Not exacerbate flooding on existing sites;
- Provide retention for all events up to a 2% AEP for discharges to land;
- Roof soak holes to have the capacity to discharge stormwater from a 10% AEP 1hr storm;
- Stormwater treatment to include at least one of a treatment swale, infiltration basin, or detention basin;
- Design of all devices to allow for climate change in scenario RCP8.5 out to the years 2081 to 2100; and
- The ‘first flush’ rainfall depth for water quality treatment of 20 mm.

Additional design performance requirements have been specified based on Christchurch City Council's (CCC) Waterways, Wetlands, and Drainage Guide (WWDG).

4.3.2 Catchments

The site for the proposed development has been split into two catchments identified as the northern catchment, and as the southern catchment. These catchments have been defined based on a natural ridge that runs northwest / southeast, connecting with Shepherd Avenue at its intersection with Wilfield Drive. Refer to Figure 3 for a plan showing the catchment extents, and Table 1 which provides assorted catchment details.

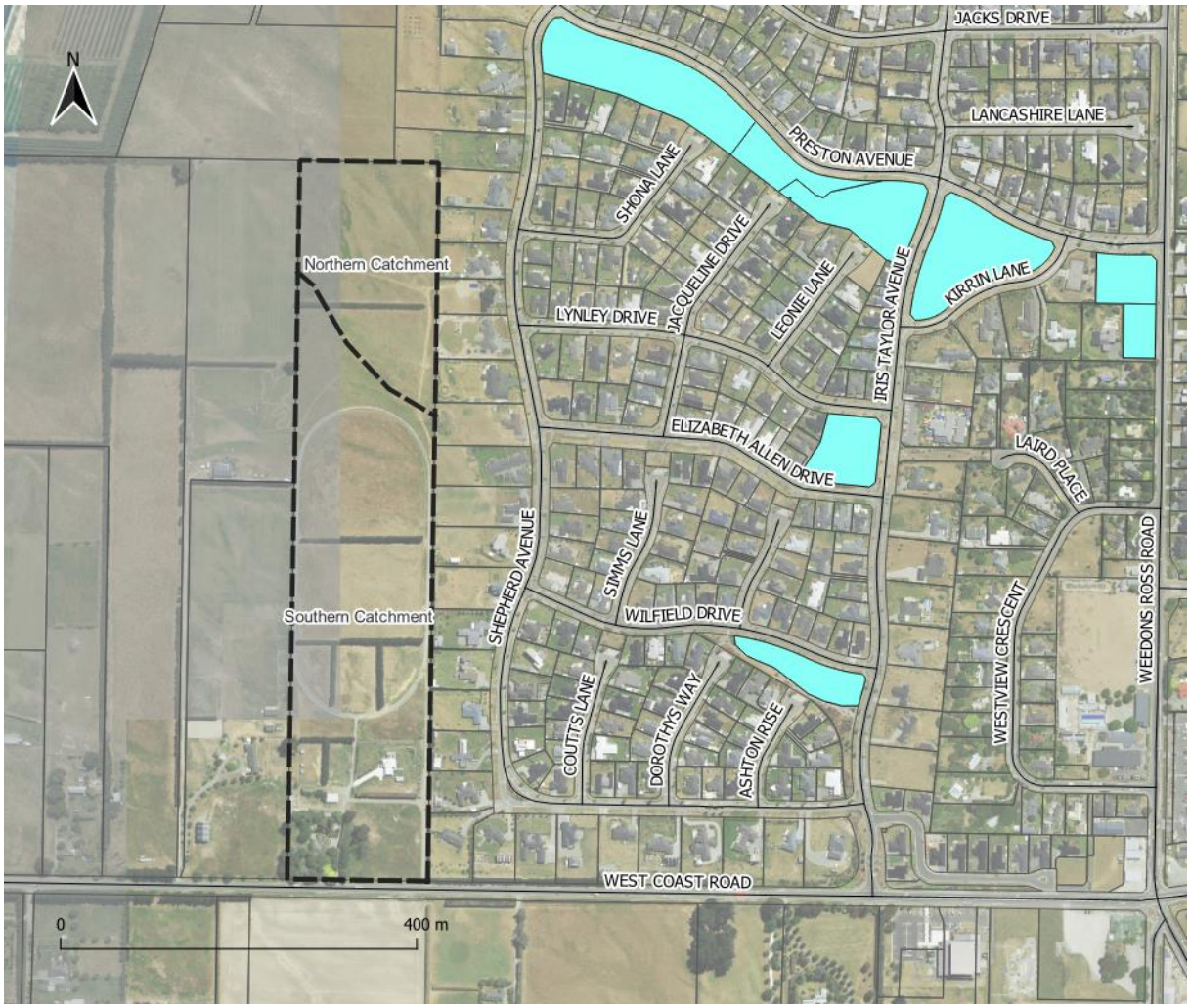


Figure 3 Site catchments (defined by black dashed line)

Table 1 Catchment details

Catchment:	Northern Catchment	Southern Catchment	Source
Area:	3.4 ha	9.2 ha	GIS / 2016 LiDAR
Assumed existing drainage:	Well-drained	Moderately well-drained	Canterbury Maps
Estimated time of concentration (approximate):	30 minutes	1 hour	Calculations based on WWDG

4.3.3 Design Philosophy

The design of the stormwater management area (SMA) has followed the process laid out in the WWDG (CCC, 2012). The SMA will consist of:

- A first flush / infiltration basin to capture and remove total suspended solids in the runoff generated by the first 20 mm of rainfall on the catchment (primary treatment);
- A detention basin to provide water quantity attenuation in large rainfall events greater than the first flush event, but up to the 2% AEP in all durations. This basin will be connected to the first flush basin via an overflow weir;
- A large rapid soakage chamber under the detention basin to discharge stormwater to ground and provide additional storage within the voids of the chamber.

This is presented in a conceptual diagram in Figure 4 below.

A SMA is proposed for each of the two catchments.

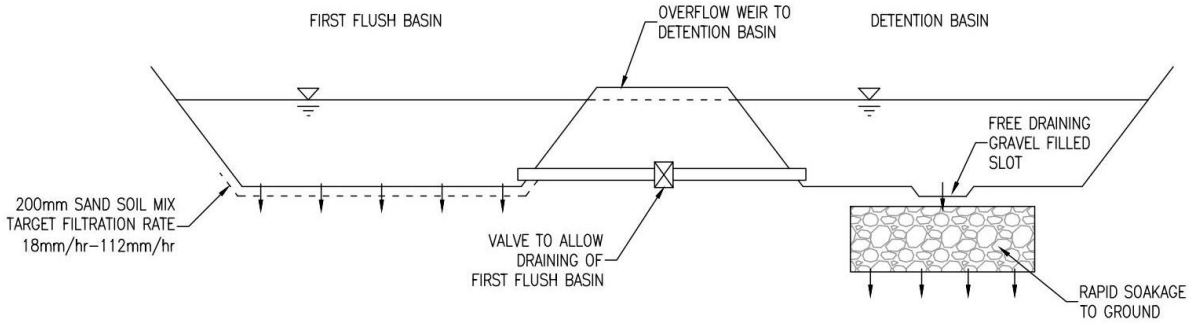


Figure 4 Conceptual stormwater management area

4.3.4 Stormwater Management Areas

The required volumes and areas for each catchment's SMA has been estimated using a high-level rational method calculation (refer to Table 2). Due to the high-level approach, there is some inherent uncertainty for the stormwater runoff volumes; however, the approach taken is expected to be conservative and suitable for the requirements of this report. An additional 20% is recommended to be added to the total areas for the first flush basin and detention basin to allow for shaping of the basin into a natural landscaped design. Further analysis will be required for the detailed design of these SMAs.

Table 2 Stormwater management area details

	Northern Catchment			Southern Catchment		
	Storage Volume	**Total Area**	**Depth**	**Storage Volume**	**Total Area**	**Depth**
First Flush Basin	163 m^3	485 m^2	1.5 m	666 m^3	1,205 m^2	1.5 m
Detention Basin	151 m^3	525 m^2	1.5 m	450 m^3	925 m^2	1.5 m
Rapid Soakage	61 m^3	80 m^2	2.0 m	207 m^3	272 m^2	2.0 m
Design SMA Totals	314 m^3	1,010 m^2	-	1,116 m^3	2,130 m^2	-

The following assumptions have been made:

- First flush basins have been assumed to have an average depth of 1.5 m of live storage;
- Detention basins have been assumed to have an average depth of 1.5 m of storage;
- That the design soakage for the rapid basin will be at least 1000 mm/hr. While on-site soakage tests by LandTech (2020) have demonstrated this to be the case for the northern catchment, the southern catchment had a measured soakage rate of 443 mm/hr. Given the soakage test for the southern catchment was undertaken on the upstream side of the site, not at the location of the proposed SMA, the low groundwater levels, and gravels on site, we expect a greater soakage rate can be found for the southern SMA. This will be confirmed at later stages of the development, or alternatively the SMA will be made larger to accommodate the lower soakge rate.
- The basins will have 4:1 (h:v) side slopes;
- The basins will require a 5 m wide maintenance strip around the perimeter of the SMA;
- That water can be conveyed to each of these stormwater management areas from their contributing catchments;
- That roofs will be able to discharge to ground at a rate based on the 10% AEP 1hr storm;
- That the proposed development will have a density approximately equivalent to the Residential New Neighbourhood in CCC's district plan and outlined in the WWDG (CCC, 2020). This is a convenient way of establishing a runoff coefficient.
- That the stormwater management areas can also be utilised for flood storage in the 0.5% and 0.2% AEP flood events;
- That soakage to ground will be possible – i.e., there is sufficient depth to groundwater, and the soil profile is suitable for soakage (see relevant ECan well logs in Appendix B); and
- That design rainfall depths and intensities are consistent across the development.

4.3.5 Qualitative Flood Management

Flood management is required to ensure that floodwaters in the 0.5% AEP and 0.2% AEP flood events are safely managed away from people and property. These events have been modelled by SDC in a large catchment-wide two-dimensional hydraulic model which represents the floodplain by a coarse 10 m rectangular grid[2]. Detailed model results showing extent and flood depth are available to view on SDC's website, and is shown below in Figure 5.

In general, ground levels on lots will be set above road levels so that in large flood events the roads act as secondary flow paths. Where required, roadside swales will be provided as designated secondary flow paths which will connect into the downstream stormwater network. These secondary flow paths will need to safely convey floodwaters to their existing flow path location at the boundary of the proposed development (i.e., the management of secondary flow paths should maintain the site's hydraulic neutrality). This could be achieved through the reserve buffers on the western and eastern site boundaries which would effectively capture floodwaters on the upstream side, and then return the floodwaters to their

[2] The model simplifies the topography of the land into a grid with cells that are 10m wide by 10m long, where each cell has an average elevation of the true topography in the extent of the cell. This means that small drains common on farms are not as well represented.

existing overland flow paths on the downstream side. Through the site, the reserve buffers allow the hydraulics to normalise water levels where the floodwaters can then flow through designated areas to and from the road network, and not through the proposed lots within the development. Additional detailed design will require extraction of flow rates from the SDC hydraulic model to inform the design of the flood management infrastructure.

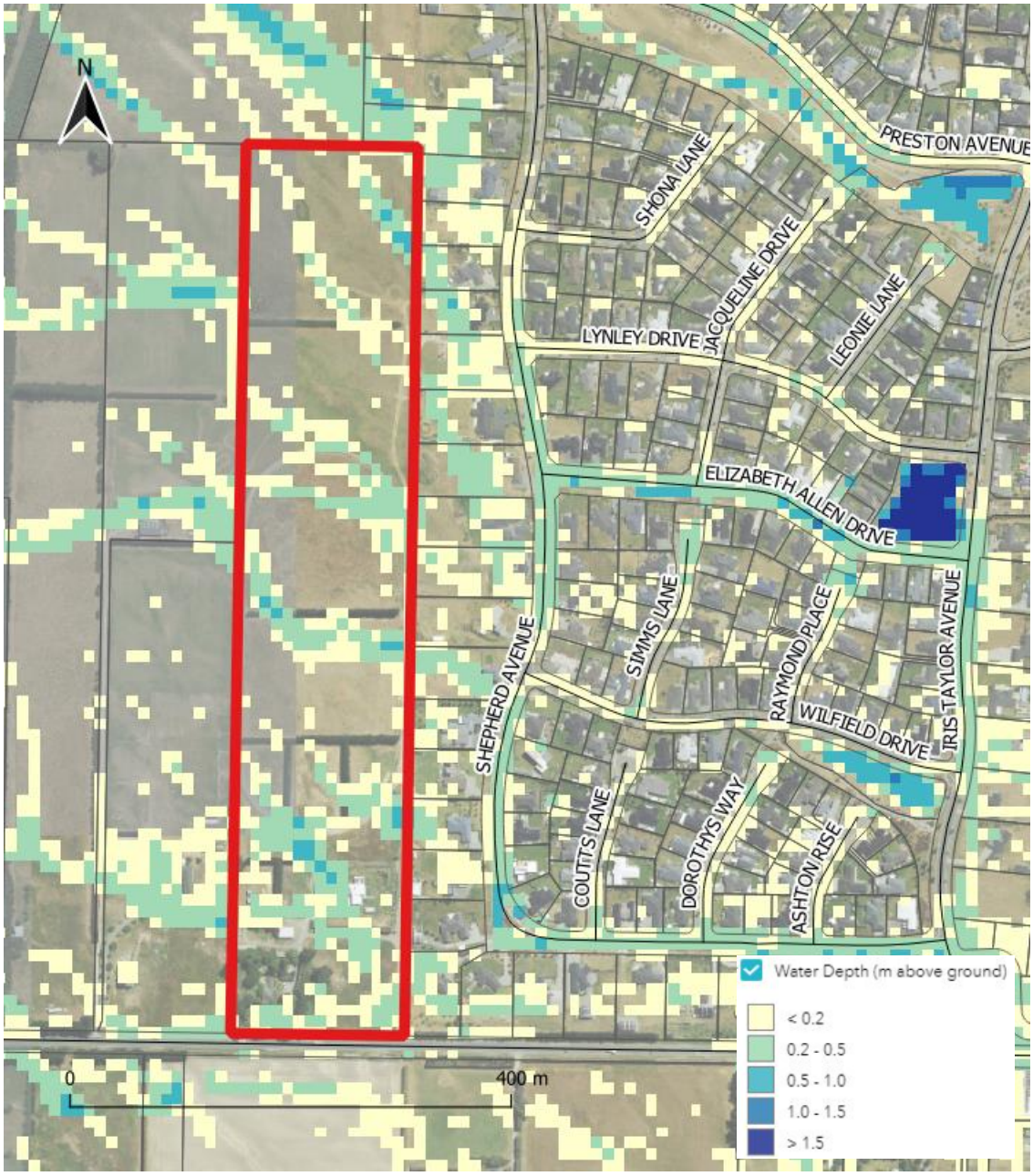


Figure 5 SDC's flood modelling results in a 0.2% AEP flood event [3]

[3] Selwyn District Council. (2019). *Selwyn's flooding and coastal hazards*. Retrieved May 25, 2022 from https://apps.canterburymaps.govt.nz/SelwynNaturalHazards/

A Section 106 (of the Resource Management Act) assessment is required where land proposed for development may be at significant risk from natural hazards such as flooding. In general, the Section 106 assessment should include:

- a combined assessment of the likelihood of the natural hazards occurring;
- the material damage that would result from natural hazards to the development site, other land or structures;
- any likely subsequent use of the land that would accelerate or worsen the damage predicted from a natural hazard; and
- Proposed finished floor levels.

A geotech Section 106 assessment will be completed by Landtech Consulting Ltd.

4.3.6 Additional Information

Table 3 below details the rainfall depths sourced from HIRDS V4 used in the analysis.

Table 3 HIRDS V4 rainfall depths (mm) – RCP8.5 for the period 2081-2100

ARI	AEP	30min	1h	2h	6h	12h	24h	48h	72h	96h	120h
2	**50%**	9.4	13.3	18.9	32.3	44.4	59.3	76.4	86.6	93.6	98.7
5	**20%**	13.5	19.0	26.8	45.2	61.5	81.2	104	117	126	132
10	**10%**	17.0	23.7	33.1	55.4	74.9	98.2	125	140	150	158
50	**2%**	26.5	36.4	50.3	82.4	110	142	177	198	211	220

5 Wastewater

5.1 Existing Wastewater System: Wastewater Rising Main Outfall and treatment plant

The following is key background information on the West Melton Council's Eastern Selwyn Sewerage Scheme (ESSS)[4]:

- The scheme was developed in 2007 to serve the Gainsborough subdivision and future developments. Untreated sewage is pumped via a rising/gravity main to the Pines Treatment Plant (WWTP). As a result of significant earthquake damage to septic tanks and the Preston Downs development, connection to the reticulated sewerage scheme by the majority of the township has now occurred.
- Population served in 2021: 2,434 (901 households at 2.7 pph)
- There are two pump stations
- There are 25 km of pipes comprised of a falling pressure main and a gravity main, as shown in Figure 6 below.
- All treatment is at the Pines WWTP in Rolleston
- Average daily demand: 357 cu.m (396 L/household/day); peak daily: 704 cu.m; minimum daily: 7 cu.m.

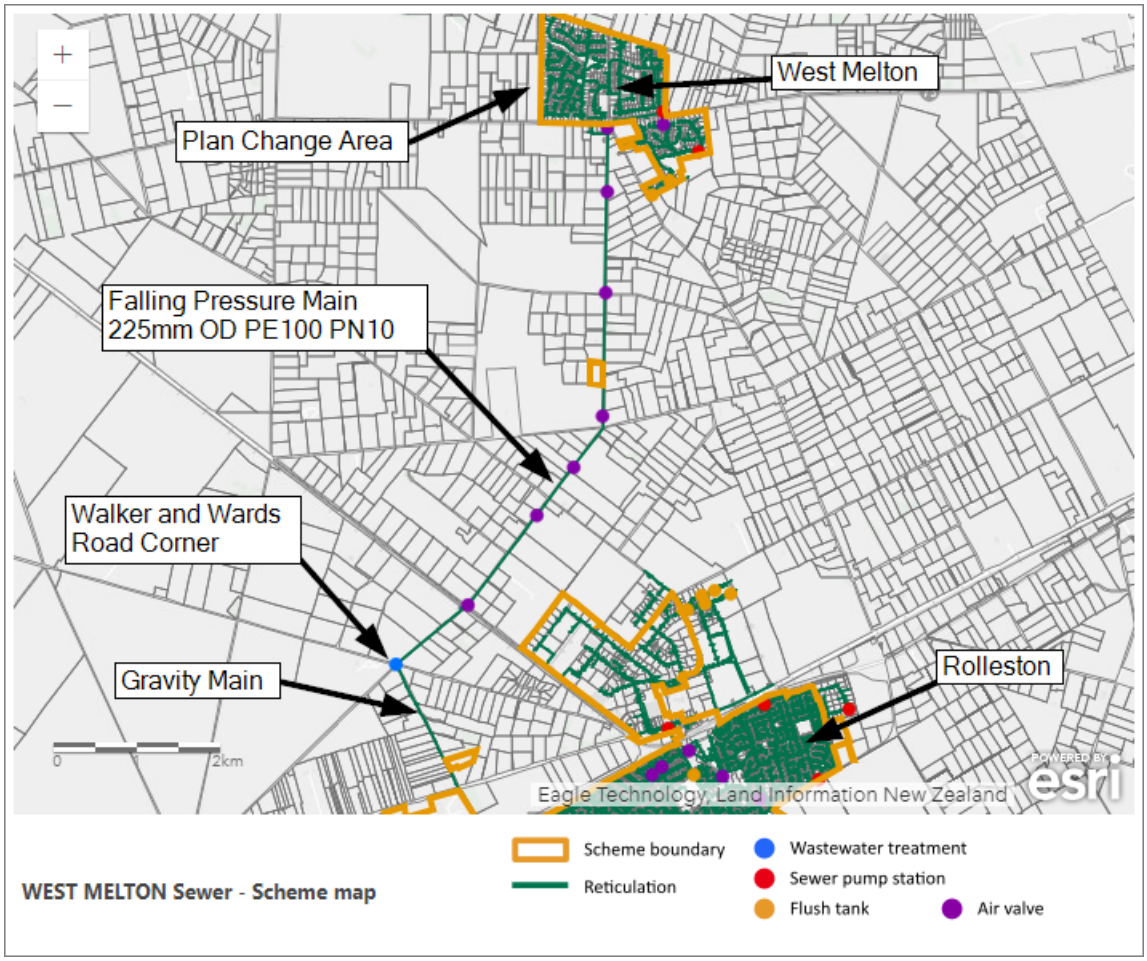


Figure 6 West Melton Wastewater Scheme (SDC AMP, modified by e2 to show details)

[4] SDC Wastewater Activity Management Plan (AMP) Volume 3. 2021

5.2 Current Constraints

The Wastewater AMP notes that 'System discharge capacity is limited by Rolleston reticulation' and that 'All future development shall be required to assess remaining capacity and mitigate peak flows'.

This plan change application is one of several applications currently being considered by the SDC for residential growth in West Melton. Therefore, upgrades to the West Melton to WWTP reticulation may be required, as discussed below.

Recent discussions with the SDC[5] have confirmed that:

1. The WWTP currently serves a population of approximately 42,000 but has capacity for 60,000. The SDC's 2021 to 2031 Long Term Plan (LTP) has earmarked funding to upgrade the plant to a population equivalent of 120,000.
2. The main constraint for West Melton is the reticulation from West Melton to the WWTP. One bottleneck is that the pipe is PN10 pressure class. This limits the additional flow and resulting pressure rise that can be generated during peak pumping times. The biggest bottleneck is the gravity main, which is currently near capacity, and is likely to be under capacity with future peak flows from proposed developments in West Melton. However, recent investigations have indicated that attenuation within the system means that there is greater capacity in the system than originally thought.
3. The SDC has commissioned a study to calculate actual inflow/infiltration in the network. Council believes that the SDC Code of Practise calculation is likely to over-predict inflow/infiltration in the network because of the deep groundwater and lack of surface water flooding in the catchment. Therefore, calculations based on the SDC Code of Practise may overestimate flow generated by new residential development.
4. Options for upgrading the West Melton to WWTP reticulation include:

    - Upgrade of the gravity section specifically to serve West Melton;
    - Upgrade the proposed final section of pipe as part of the proposed Darfield Wastewater scheme by extending the pressure main to Aylesbury Rd and all the way to the WWTP. The capacity of existing pressure main still needs to be checked. However, the Darfield scheme is currently is currently 90% constructed.
    - Leave reticulation as is and pump from new developments outside peak time: see the discussion in Section 5.3 below.

[5] Murray England SDC Asset Manager Water Services, Zani van der Westhuizen, SDC Water Services meeting with Andrew Tisch e2Evironmental Ltd Principal Engineer, 8 December 2020.
Murray has made the following declaration of conflict of interest:
"*I own property and live on land subject to this enquiry. My ownership of this property has not had any influence on the information I have provided in relation to this land as an employee of Selwyn District Council. To ensure transparency at our end, Zani has observed all discussions to date*.' We note that the plan change area has been reduced since 2020 and so it is understood that it no longer includes Murray England's property. Zani also no long works at SDC.

5. SDC are not currently planning to upgrade the West Melton to WWTP reticulation but are likely to formulate plans as part of the plan change assessment process driven by development capacity needs.

5.3 Proposed Wastewater: On-Site and Rising Main

Based on the existing capacity and current constraints discussion above, we have identified three feasible servicing options. All require installing a new pressure main along the West Coast Rd to connect to the existing pressure main at the West Melton Road/West Melton Rd intersection.

1. Each lot gravitates to an SDC vested pump station with storage. The pump station will be set to pump into the pressure main outside peak times when capacity is available.

2. Gravity to pump station option similar to 1 above but without off-peak pumping. This option would be suitable following any SDC initiated West Melton to WWTP reticulation upgrades.

3. Each lot gravitates to an SDC vested pump station with storage at the south of the block. The pump station will be set to pump into the gravity network in Elizabeth Allen Avenue outside peak times when capacity is available.

5.3.1 Feasibility of the Wastewater Proposal

- Option 1 has the advantage that Council could control storage and pumping times due to the available storage.
- All options are likely to require pumping from the site to the existing pressure main.
- Option 3 needs to be further checked to confirm feasibility and Council acceptance. The receiving pipe in Elizabeth Allen Drive is a 150 dia connected to a 150 dia in Iris Taylor Avenue and then to a 225 dia in Laird Place, Rotherham Drive, Rossington Drive, and then into the WWPS via a 300 dia pipe. It may be technically feasible for a system in the plan change block to store and attenuate flows to pump into Elizabeth Allen Avenue during times of available capacity but this needs to be confirmed. Other options such as upgrading the 150 dia in Elizabeth Allen Avenue could also be considered.
- Recent evidence provided by Shane Bishop on Plan Change 67[6], which also considered Plan Change 77, indicates that it is feasible to provide the additional capacity for the wastewater network, and that wastewater can be treated and disposed of as appropriate.

[6] Shane Bishop, Stantec Principal Engineer, August 19, 2021, *Officer comments of Shane Bishop in the Matter of West Melton – Plan Change 67.*

6 Water Supply

6.1 Existing Water Supply Network

The following is key background information on West Melton Water Supply Scheme[7]:

- The original scheme was formed in 1984 and expanded in 2011;
- The population served in 2021 was 2,552 (945 households at 2.7pph);
- Water treatment/disinfection is by filtration (turbidity control via 5-micron filtration) and UV;
- There are 2 pump stations;
- There are 63.9 km of pipes;
- The average daily demand is 1,283 cu.m (1,358 L/household/day); peak daily: 3,719 cu.m; minimum daily: 27 cu.m;
- There are 4 bores/intakes in the scheme; one near Royston Common in Halkett Grove, a second on Elizabeth Drive in Preston Downs, a third on Jacqueline Drive in Preston Downs and a fourth in Wilfield, which is connected to the Rossington reservoir site (see Figure 7 below).

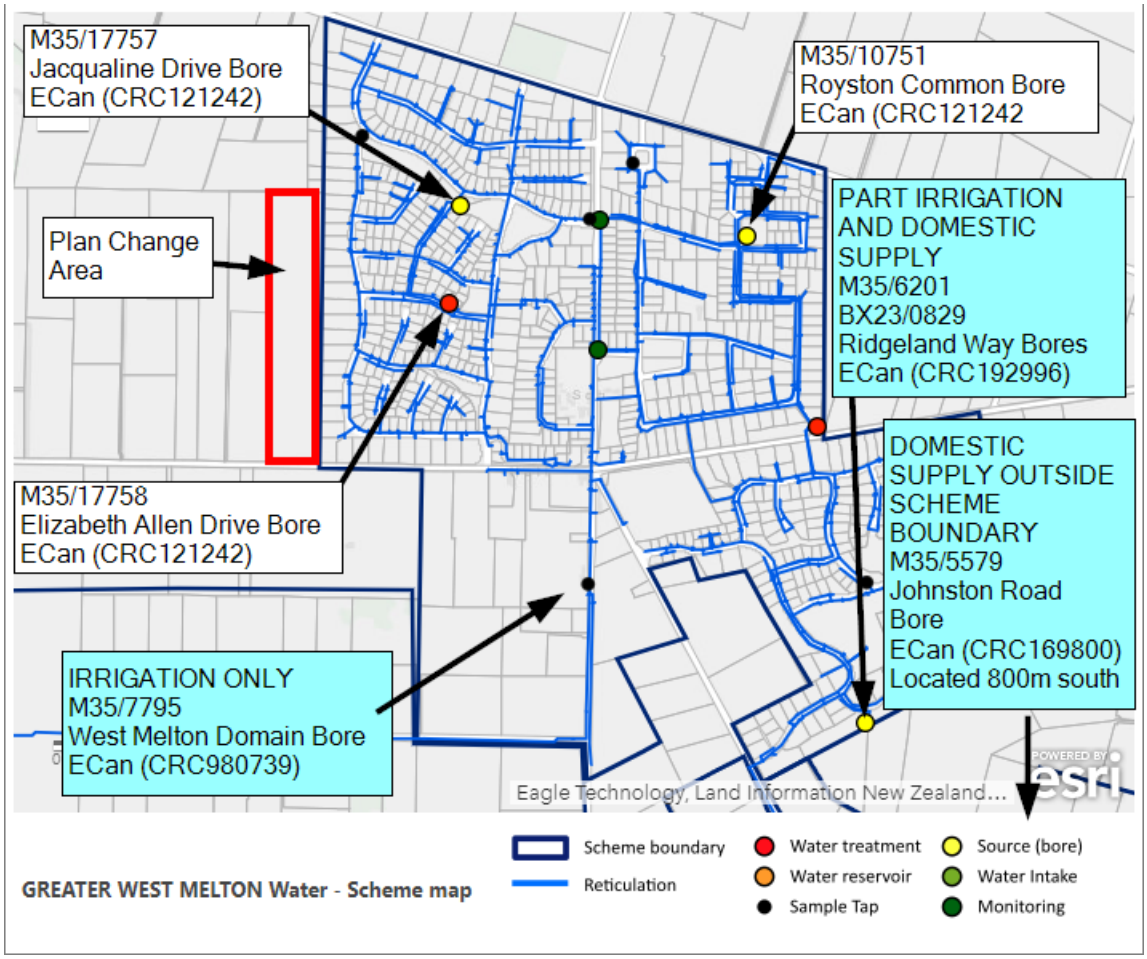


Figure 7 West Melton Water Supply Scheme (SDC AMP, modified by e2 to show well details)

[7] All information from SDC Water Supplies Activity Management Plan (AMP) Volume 2. 2021, unless noted otherwise.

6.2 Water Capacity Constraints

The key constraint in the West Melton water supply network capacity is the availability of consented extraction volumes and rates, as shown in Table 4 below.

Table 4 Key Authorised Groundwater Extractions for West Melton

Consented abstractions relevant to Plan Change Area				**Max. Flow**	**Maximum Volume**		**Consent Expiry Date**
Consent CRC#	**Well**	**Owner**	**Type**	**(L/s)**	**(m^3/day)**	**(m^3/yr)**	
121242	M35/17757	SDC	Drinking	18	Combined 2,563	Combined 373,176	13 Mar 2047
	M35/17758		Drinking	18			
	M35/10751		Drinking	13.5			
192996[1]	M35/6201	SDC	Drinking	26	Consecutive 7-day limit 15,071	Combined 176,295[2] 322,950[3]	26 Feb. 2026
	BX23/0829		Drinking Irrigation	70			
SDC West Melton Scheme				**75.5**[5]		**549,471**[5]	
169800	M35/5579	SDC	Drinking	15	Consecutive 7-day limit 9,072	194,400	14 June 2038
SDC Rural West Melton Development				**15**		**194,400**	
980739	M35/7795	SDC	Irrigation	5	Consecutive 7-day limit 476	no condition	23 Dec. 2032
940293.1	M35/6939	Private-1266 West Coast Rd	Irrigation	11.8[4]	510[4]	no condition	17 Nov. 2028
174423	M35/9779	Private-1266 West Coast Rd	Irrigation	10[4]	272[4]	no condition	1 Nov. 2030
Edendale Scheme							
172478	M35/3673	SDC	Drinking	19	15,071 m^3 per 7 days	no condition	16 Feb. 2040
	BX23/0590		Drinking	65			

Notes:
1. Consent allows for land irrigation in certain areas.
2. Community supply annual limit only.
3. Community and irrigation supply annual combined limit.
4. Consent conditions will limit capacity if the standing water level drops below certain elevations.
5. Drinking water only (excludes irrigation). 7-day limits averaged to daily totals.

6.3 Options to Upgrade Water Supply and Firefighting Water

We have worked on the principle that provided the water is available, reservoirs, treatment, pumping and piped reticulation can be added as part of developer lead upgrades. The proposed plan change block at ultimate development will require an additional water source and treatment plant. On this basis there are several possible scenarios for supplying future demand.

1. Connection to the Edendale scheme. The bulk pipeline has been installed but connection work and reticulation upgrades are yet to be completed at the time of the previous revision of this report (2020). Since then, we have not yet been able to determine the current status of the connection to the Edendale scheme.
2. Upgrade of Wilfield bore. This work is now complete.

3. Transfer water allocation to SDC from a consented bore(s). Council has indicated[8] that they would use this allocation to supplement existing well extractions or provide a new bore to service the plan change area.

Recent evidence provided by Shane Bishop on Plan Change 67[9], which also considered Plan Change 77, indicates that it is feasible to provide capacity upgrades to meet future water demand from this proposed plan change.

7 Water Races

The Paparua Water Race Scheme map, Appendix B, shows that two local races are located within the proposed plan change area. There are two main options for these water races in future development:

I. Apply to have them removed. As the two water races currently terminate within the property, the northern water race could instead terminate at the upstream property boundary. The southern water race off West Coast Road could be closed off, or could be terminated at the site's upstream boundary. This requires consent from SDC and neighbours.

II. Use the water races to feed professionally designed water features in the proposed development. Council has indicated that they would support this[10] provided the water features do not present an unreasonable operation and maintenance burden to the SDC. In particular, the Applicant needs to ensure that the features are lined and do not "leak", leading to features drying-up.

8 Power and Telecommunications

Chorus Ltd have confirmed that they are able to service the proposed development for telecommunications:

'I can confirm that we have infrastructure in the general land area that you are proposing to develop. Chorus will be able to extend our network to provide connection availability.'

A copy of the confirmation email is included in Appendix E.

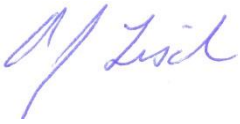
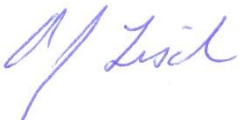
Orion New Zealand Ltd have confirmed that they are able to supply the proposed development for electrical servicing.

A copy of the confirmation letter is included in Appendix E.

[8] Murray England SDC Asset Manager Water Services, meeting with Andrew Tisch e2Evironmental Ltd Principal Engineer, 8 December 2020.
[9] Shane Bishop, Stantec Principal Engineer, August 19, 2021, *Officer comments of Shane Bishop in the Matter of West Melton – Plan Change 67.*
[10] Murray England SDC Asset Manager Water Services, meeting with Andrew Tisch e2Evironmental Ltd Principal Engineer, 8 December 2020

9 Report Approvals

This report has been:

Task	Initial	Signature	Date
Prepared by:	Daniel McMullan, e2		30 May, 2022
Reviewed by:	Andrew Tisch, e2		30 May, 2022
Approved by:	Andrew Tisch, e2		30 May, 2022

Appendix A – Concept Plans

- ODP
- Existing Topographical plan

Appendix B – Council Information

- Well Data
- Well Consents
- LLUR
- Global Stormwater Consent CRC167467 for Area East of Site
- Paparua Water Race Scheme

Appendix C – Preliminary/Detailed Site Reports

- Detailed Site Investigation – 1234 West Coast Road, West Melton, PDP Ltd, 31 August 2018
- Malloch Environmental Ltd, December 2020

Appendix D – Landtech Consulting Ltd Geotech Report

Appendix E – Power and Communication Providers

Appendix F – Revised Response to SDC RFI