



ENVIRONMENTAL MANAGEMENT PLAN

**Ridgeburn Overall, Queenstown
McKenzie & Co Non-billable Co
Revision A**



MCKENZIE & CO.

DOCUMENT CONTROL RECORD

PROJECT:

CLIENT:

PROJECT LOCATION:

Ridgeburn, Queenstown
Gibbons Developments
122 Morven Ferry Road, Arrow Junction, Queenstown

Revision	Date	Originator	Checker	Approver	Description
A	30/01/2026	Mac Stevenson	Mac Stevenson	James Kitchen	For Consent Purposes
B	30/01/2026	Mac Stevenson			For Consent Purposes
C	10/02/2026	Nandini Sharma	Scott Lamason	Scott Lamason	For Consent Purposes
D	25/02/2026	Scott Lamason	Scott Lamason	James Kitchen	For Consent Purposes

1. CONTENTS

1. Contents.....	3
Introduction.....	6
2. Site Description and Project Overview.....	6
3. Ecological assessment & features.....	11
4. Natural flood hazard.....	12
5. Detailed site investigation (DSI).....	13
6. Associated consents.....	14
7. Proposed Works.....	15
7.1. Earthworks and Works Extent.....	15
7.1. Existing Water Race.....	15
7.2. Earthworks description.....	15
8. Construction Methodology.....	21
8.1. Sequencing of works.....	21
9. Administrative Requirements.....	24
9.1. Working Hours.....	24
9.2. Suitably Qualified and Experienced Person.....	24
9.3. Environmental Roles and Responsibilities of Key Personnel.....	24
9.4. Environmental Site Induction.....	27
9.5. Management of Subcontractors.....	27
9.6. Inspection Summary.....	27
9.7. Monthly Environmental Reporting by SQEP.....	28
9.8. Notification and Management of Environmental Incidents.....	29
9.9. Environmental Incident Management.....	29
9.10. Records and registers.....	30
10. Operational requirements.....	31
10.1.Erosion and Sediment Control.....	31
10.1.1 Earthworks Principles.....	31
10.1.2 Responsibilities and Hold Points.....	31
10.1.3 Erosion and Sediment Control Overview.....	32

10.1.4	Erosion and Sediment Control Devices.....	33
(1)	Stabilised Construction Entrance.....	33
(2)	Clean Water Bunds and Diversion Channels.....	34
(3)	Dirty Water Bunds and Diversion Channels.....	35
(4)	Decanting Earth Bunds.....	36
(5)	Sediment Retention Pond.....	38
(6)	Soakage Ponds.....	40
(7)	Drop out pits.....	40
(8)	Super Silt Fence & Standard Silt fencing.....	40
(9)	Contour Drains.....	43
(10)	Existing Stormwater Pipe Removal and Management.....	43
(11)	Temporary culverts.....	44
(12)	Check Dams.....	44
(13)	Stormwater catchpit & sump inlet protection.....	44
10.2.	Dust.....	45
10.3.	Vibration.....	46
10.4.	Contaminated Sites.....	46
10.5.	Water Quality.....	46
10.6.	Chemicals and Fuels.....	50
10.7.	Noise.....	51
10.8.	Waste.....	52
10.9.	Indigenous Vegetation and Protected Trees.....	52
10.10.	Ecological considerations.....	53
10.11.	Cultural Heritage.....	53
11.	Decommissioning.....	53
12.	Conclusion.....	54
13.	References.....	54
14.	APPENDIX A – DRAWINGS.....	55
15.	APPENDIX B – CALCULATIONS.....	56
16.	APPENDIX C – ENVIRONMENTAL SITE INDUCTION.....	57
17.	APPENDIX D – ENVIRONMENTAL INCIDENT FORM.....	58
18.	APPENDIX E – INSPECTION CHECKLISTS.....	59

19.	APPENDIX F – WATER QUALITY CRITERIA.....	60
20.	APPENDIX G – NON-CONFORMANCE AND COMPLAINTS REGISTER.....	61
21.	APPENDIX H –SPECIFIC CONSENT CONDITIONS.....	62

INTRODUCTION

McKenzie & Co. Consultants have been engaged by Gibbons Developments Ltd to provide an Environmental Management Plan (EMP) for the proposed development. The works primarily consist of the construction of approximately 1210 residential dwellings, associated infrastructure, retail, and short-term accommodation at the Ridgeburn site (122 Morven Ferry Road, Arrow Junction, Queenstown).

The EMP addresses the requirements of both the Queenstown Lakes District Council (QLDC) Guidelines for Environmental Management Plan and the Otago Regional Council (ORC) Residential Earthworks Guide in Otago. Through this a framework is created that demonstrates how environmental requirements and best practice can be met, alongside the conditions of the Resource Consent.

A key element of the EMP is that it acts as a live document, and is regularly monitored and reviewed throughout physical works, and is updated as appropriate to best suit site conditions.

This EMP has been prepared for resource consent purposes and is intended to be updated, post consent, through detailed design and prior to construction, to enable collaboration with earthworks contractors and confirm final staging of the development through detailed design & development planning phases.

This EMP has been prepared by Mac Stevenson. Mac through his experience and as a Chartered Member of Engineering NZ (CMEngNZ) is considered a Suitably Qualified and Experienced Professional (SQEP) for the purposes of preparing this EMP and overseeing the environmental aspects of this project. As assessed by ORC & QLDC.

This EMP has also been reviewed & approved by James Kitchen. James as a Chartered Professional Engineer (CPEng) is considered a Suitably Qualified and Experienced Professional (SQEP). James has over 20 years' experience in design and project management in addition to experience in the management and implementation of Environmental Management Plans and Erosion and Sediment Control Plans (ESCPs) on high-risk sites.

2. SITE DESCRIPTION AND PROJECT OVERVIEW

The subject site covers an area of approximately 212.76 ha of rural land in the Wakatipu Basin, near Arrow Junction between Queenstown and Arrowtown. Legally described as;

Lot 2 DP 601937 – 24.7256 ha (RT: 1174254);

Lot 3 DP 529201 – 2.0584 ha (RT: 857180);

Lot 5 DP 300661 and Sections 21, 23, 24, 64, 71 in Blocks VIII & IX Shotover SD – 82.6923 ha (RT: 946021);

Section 22 Block IX Shotover SD – 23.0823 ha (RT: OT406/118);

Section 23 Block IX Shotover SD – 26.5069 ha (RT: OT7D/1456);

Sections 1–2 SO 478164, Section 25 Block IX Shotover SD, Lots 3–4 DP 300661 – 45.1025 ha (RT: 946040); and

Section 1 SO 420327 – 8.5980 ha (RT: 492534).

The site is generally flat near the access from Morven Ferry Road rising gently towards Morven Hill at the rear of the site making it suitable for staged infrastructure development and natural drainage. There are existing irrigation race, small ponds and wetlands running through the site and is in proximity to the Kawarau River to the south. The site location and proposed development plans can be seen in **Figure 1**, **Figure 2** and **Figure 3** below.

Key elements of the proposed earthworks, ground information and site are as follows:

- Total development overall approx. (all stages combined) Disturbed Area – 806,003 m².
- Total overall approx. Earthworks Volumes – 689,052 m³ cut, 632,267 m³ fill.
- Current Site Usage – Light grazing and cropping
- Maximum Cut and Fills Heights – 10 m (cut) and 7 m (fill).
- Subgrade Type – Alluvial Silt & Alluvial Sand, overlaying outwash gravels and Pelitic Schist.

- Sensitive Environmental Receivers – Existing streams/wetlands, existing water irrigation race and Kawarau River.
- Staging – 6 phases with preconstruction works.
- Topsoil Depth – 100mm.
- Contaminated Soil – Possible due to previous farming and land use activities. As identified in the site investigation report.
- No groundwater was encountered in the borehole logs (up to 4.6m bgl)
- No stormwater infrastructure in the site's proximity.

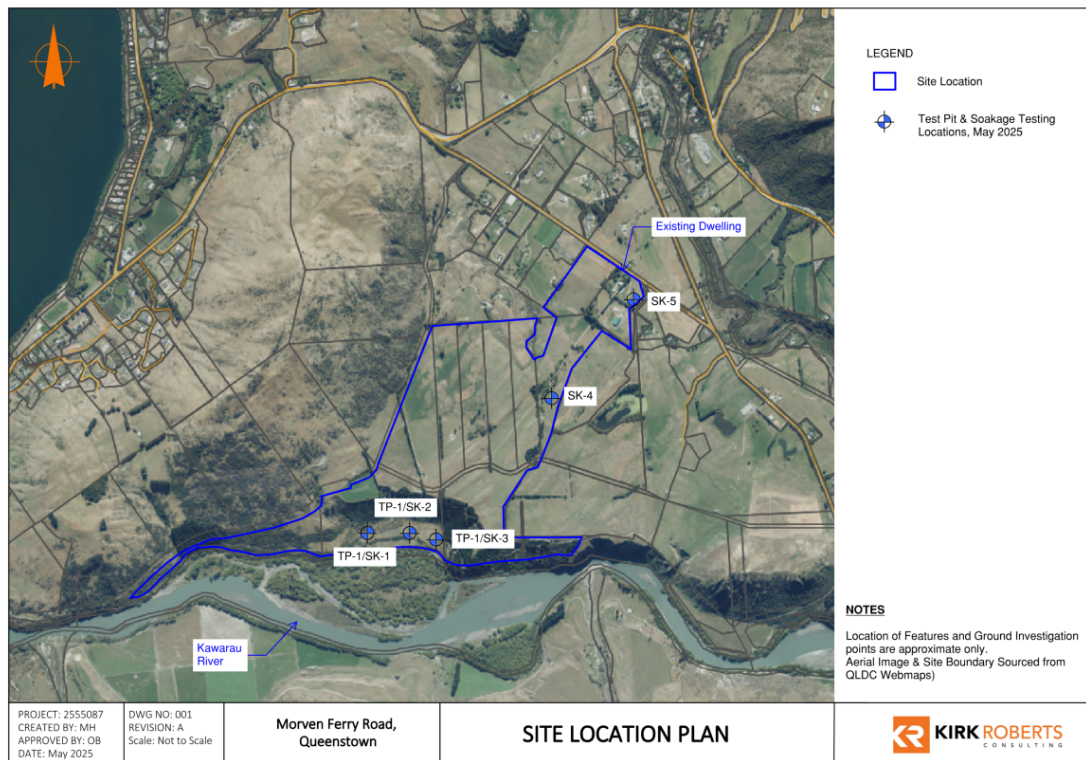


Figure 1: Site Location & Geotech testing Plan (blue outline)

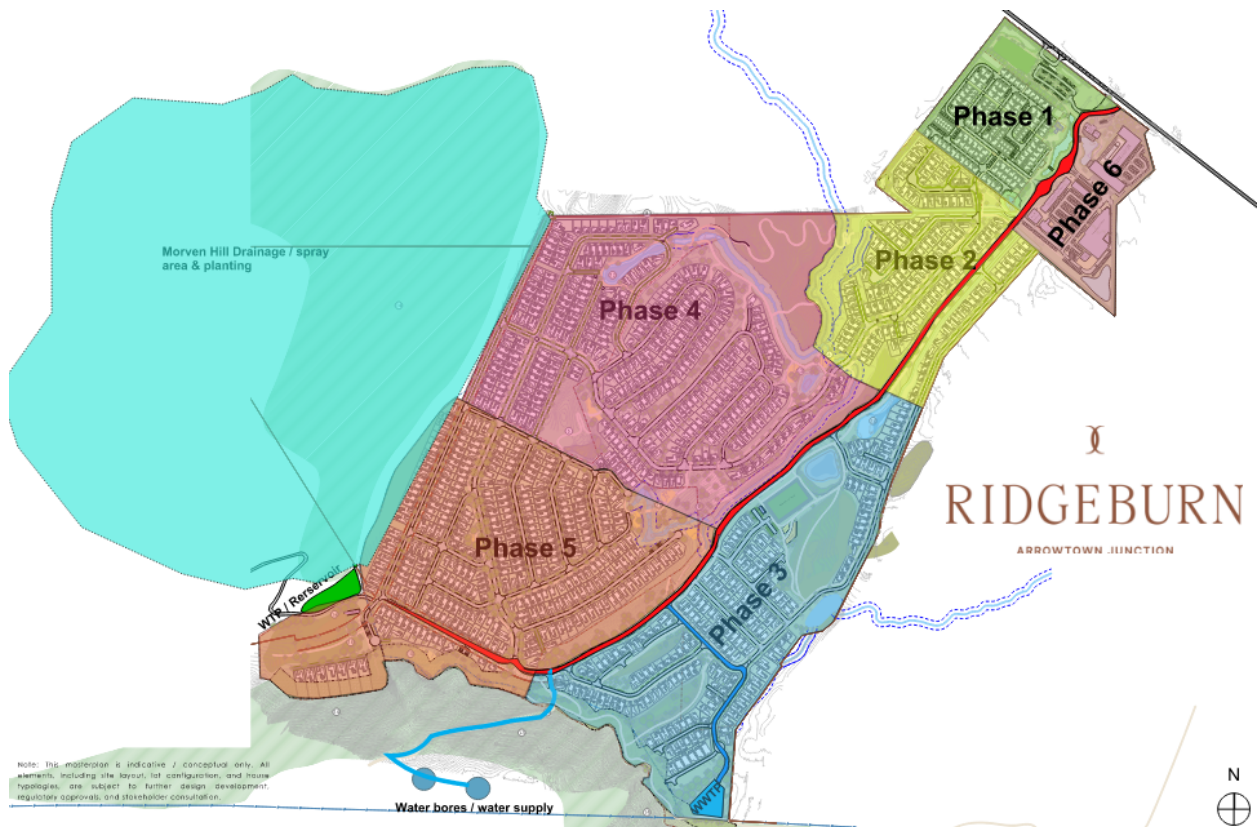


Figure 2: Staging Plan

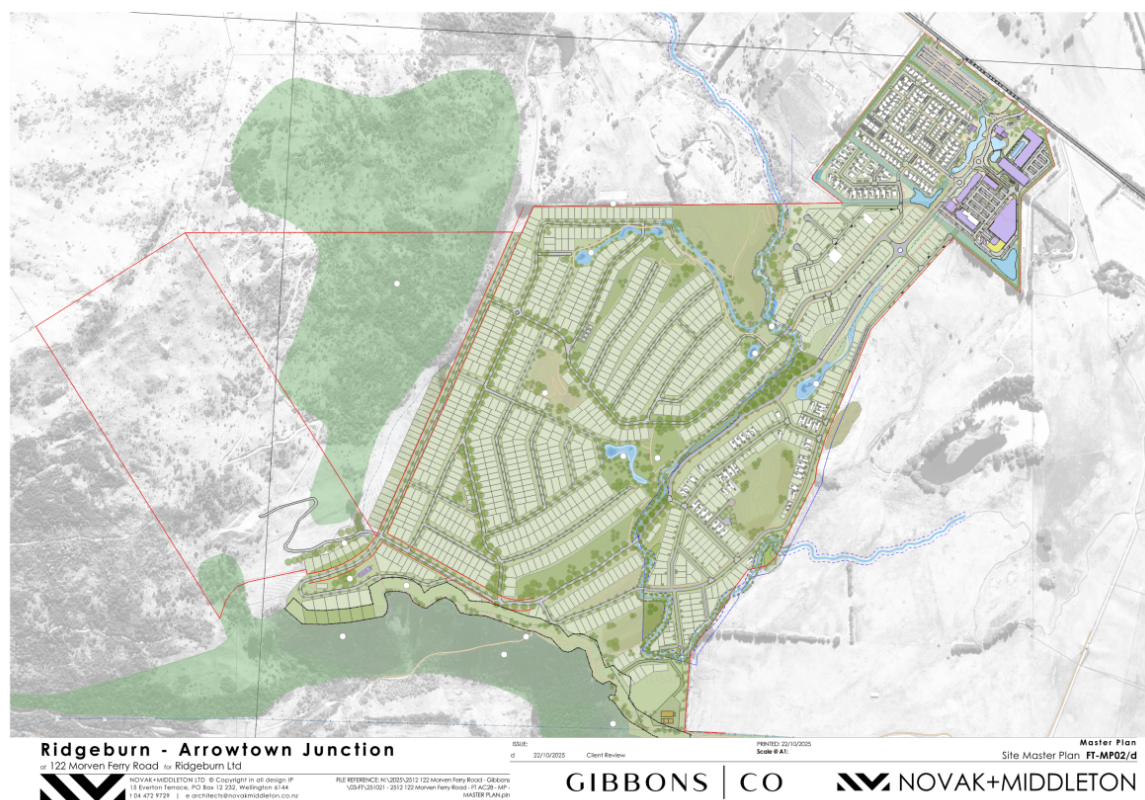


Figure 3: Proposed Development Masterplan

From the QLDC guidelines we believe this site should be categorised as High Risk due to the area

of exposed surface area, presence of silts and areas of the site with grades above 15%. In addition, the Kawarau River and existing streams and wetlands within the site are sensitive receivers in relative proximity to the earthworks areas.

North and east of the development site is considered pastoral grazing land like the site's current usage. To the West is Morven Hill which sits a 750m RL which the site grades up to. Morven Ferry Road sits at the North-East corner of the site and is the only accessible road from the site. The South of the site is the Kawarau River and its banks that slope steeply to the development. The Twin Rivers trail is located on Crown Land running parallel to the river.

The site generally falls from Morven Hill towards the site access to Morven Ferry Road (West to East), with recontouring proposed to improve the land's topography for development purposes. Site topography and features are shown in aerial photographs in Figure 4 & 5.

The prevailing wind direction for the site is North-West as shown in Figure 6.

QLDC GIS data for as-built stormwater shows no infrastructure in proximity to the site.

An open water irrigation race traverses through the site. This irrigation water race services downstream properties for irrigation purposes and is to be piped through the site as part of the civil works design by McKenzie & Co. It is understood this water race will be piped during dry bed conditions and any required ecological requirements undertaken prior to bulk earthworks.

The existing soils & underlying subgrade materials are described and covered in detail in the Kirk Roberts Borehole Logs. Glacial till (Silt & Sand) overlying outwash gravels and schist rock are the predominant type through the site.

Soakage capacity has been identified, although further site investigations and percolation testing is proposed to enable soakage devices to be further considered as part of this development's site & environmental management solutions. It is intended that further percolation/soakage testing will be undertaken to confirm areas of the site can be contained via soakage basins and/or soakage pits as well as suitable discharge areas for the currently proposed sediment retention ponds.

Ground soakage is common across the Queenstown region, and provides a positive & cost effective solution to many sites as an alternative to GD05 sediment ponds. Further testing is proposed, post resource consent, which may result in an update to this EMP and certain devices to manage stormwater (clean & dirty water).



Figure 4: Site Topography (aerial footage facing West)



Figure 5: Site Features (Aerial footage facing South)

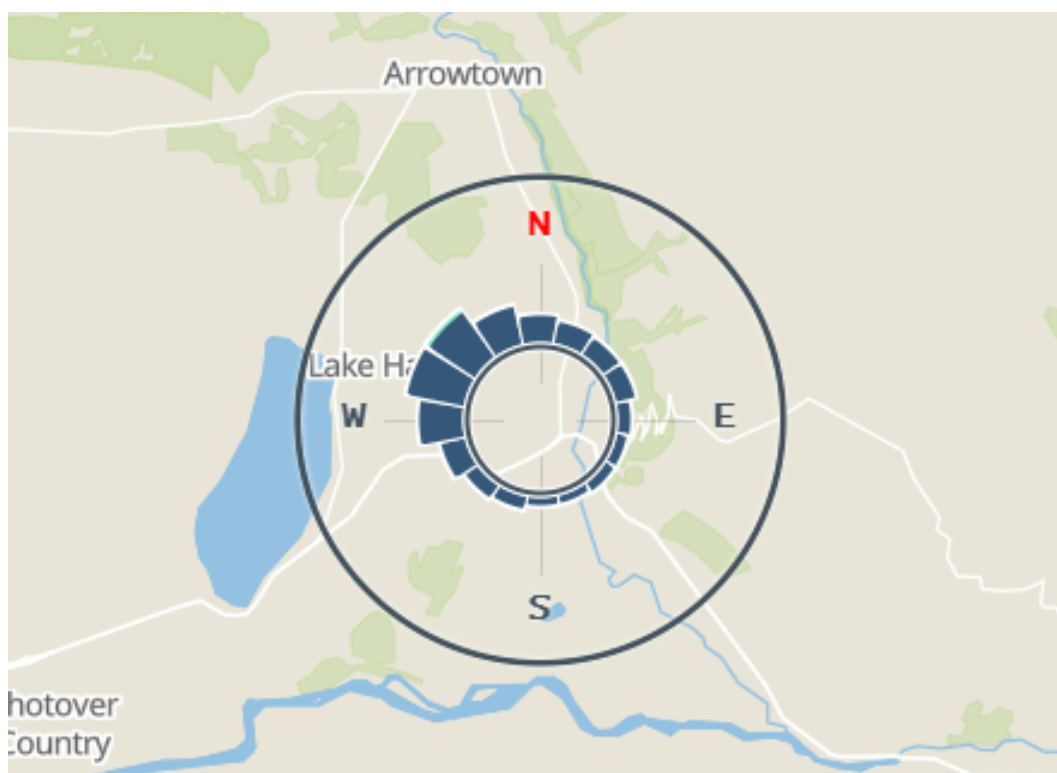


Figure 6: Prevailing winds (Location Hogan's Gully from windy.app)

3. ECOLOGICAL ASSESSMENT & FEATURES

The development proposal includes significant landscaping and ecological works, for example about 60 ha of native vegetation planting around the ridgeline (Morven Hill) and along the Kawarau River border; about 150,000 native plantings.

Viridis Environmental Consultants have been engaged to undertake an ecological assessment dated 22nd January 2026. The following summary outlines the key findings of that assessment as they relate to earthworks activities.

Existing Ecological values;

Viridis describes the site as a highly modified pastoral landscape currently managed for grazing and hay production. Overall ecological values across the earthworks footprint are generally low, however, several ecological features were identified that require specific consideration during earthworks.

Viridis found that vegetation within the site is dominated by exotic pasture, shelterbelts, plantation pines and agricultural weeds with limited indigenous vegetation. While botanical values were generally assessed as low, pockets of higher ecological value are associated with rocky habitats, scrub, ungrazed grass, and areas surrounding wetlands and waterways.

Areas of suitable lizard habitat occur across parts of the site, including rocky outcrops, rock piles, exposed bedrock, long grass, scrub, and wetland margins. Targeted surveys identified McCann's skink as widespread and abundant, with mountain beech gecko confirmed on Morven Hill. Tussock skink was not detected during surveys but was considered likely to be present around wetlands and intermittent streams. Viridis assessed these lizard habitats as having high ecological value where present. Viridis assessed the site as having moderate avifauna habitat value, noting the modified nature of the site but the potential presence of Threatened and At Risk species, including New Zealand falcon and pipit. Ground-nesting birds may use parts of the site, particularly during the breeding season.

The EclA identified four low-value intermittent streams, four low-value natural inland wetlands and an artificial irrigation water race within the site. The Kawarau River forms the southern boundary of the site and was assessed as having high ecological value, however, no direct earthworks and proposed within the river corridor.

Potential Effects of Earthworks;

To limit the potential effects that earthworks may have on native flora, fauna and freshwater environments Viridis recommends the following;

- No vegetation clearance until Ecologist sign-off
- Clear vegetation outside bird breeding season (October to February)
- Implement a lizard management plan
- Limit earthworks within 10 m of wetlands and use sediment control fences to reduce risk of sediment discharge to water bodies
- Use fish salvage procedures where water is present

Overall Ecological Assessment Conclusions;

Viridis concluded that, with the recommended mitigation measures in place, earthworks associated with the Ridgeburn development would result in an overall low level of adverse ecological effects. The assessment notes that these short term construction effects would be more than offset by the extensive native revegetation, wetland and riparian enhancement, and ongoing pest management proposed as part of the development, resulting in a significant long-term ecological gain.

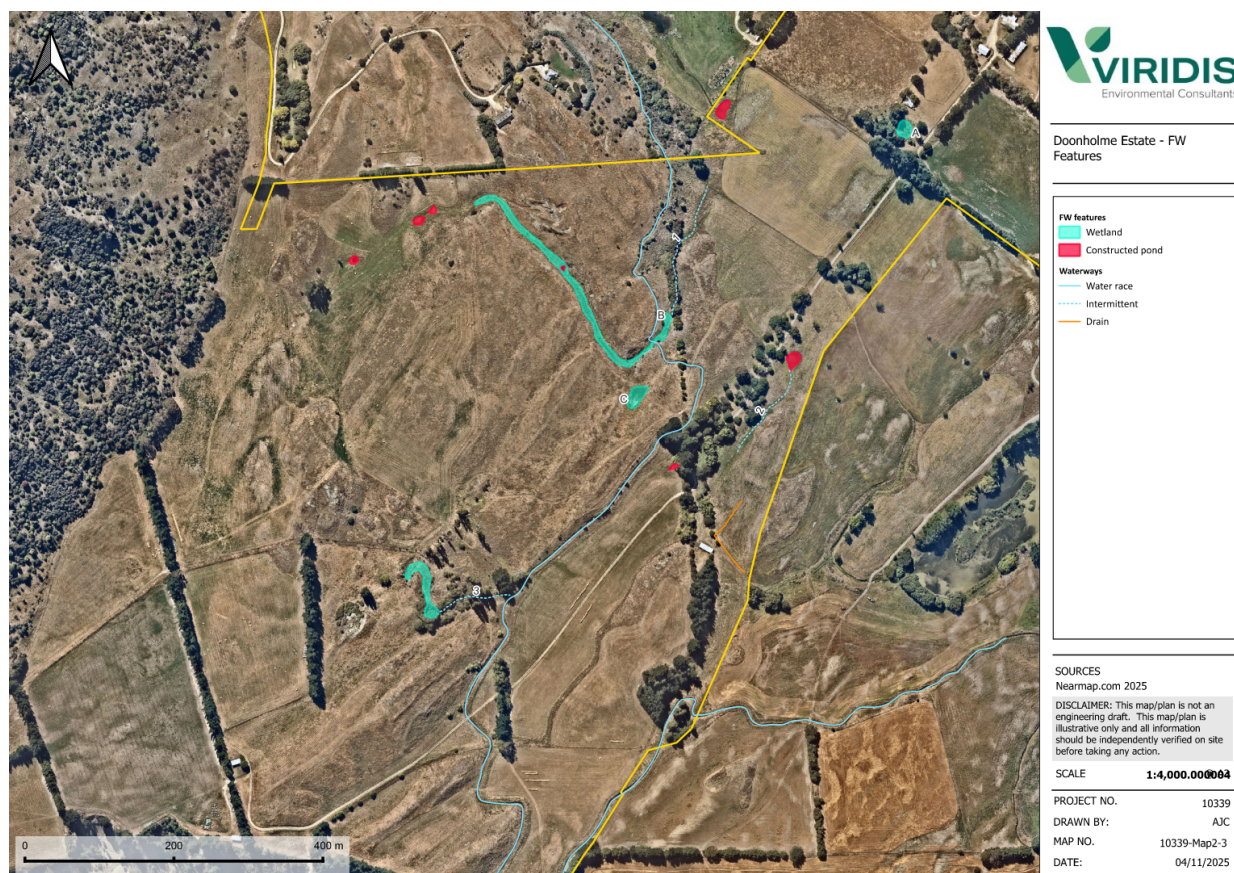


Figure 7: Ecological features on site (Waterways, ponds and wetlands)

4. NATURAL FLOOD HAZARD

A review of the Queenstown Lakes District Council (QLDC) Flood Maps indicates that the 122 Morven Ferry Road site is not identified as being at risk of flooding, however a Stormwater Mitigation Report by McKenzie and Co details a site specific flood study and has indicated that

the site is subject to flooding. Flood risks have been identified along site boundaries and within the site. Key areas include:

1. A large upstream catchment located north of Morven Ferry Road which overtops and enters the site along the western boundary (Refer Section 5.3).
2. An overland flow path enters the western boundary, from 100 Morven Ferry Road (Refer Section 5.4).
3. Morven Ferry Hill catchment enters at south of the site, from two catchments on Morven Ferry hill (refer Section 5.5)
4. Discharge from the site, downstream into 138 Morven Ferry Road, (Refer Section 5.6)
5. Existing Overland flowpath exits the site discharging to 136 Morven Ferry Rd.
6. Ultimate discharge for all Overland Flowpaths associated with the site, adjacent to the Arrow Junction Rd/Morven Ferry Road intersection, into a tributary to the Arrow River.

These are shown below in Figure 6 in the Stormwater Mitigation Report.

The phased development plan ensures that not all the earthwork site will be opened at any one time, and once phase 1 is completed significant attenuation will be provided, significantly reducing the downstream flood effects.

All earthworks within the flood plain have been modelled to ensure that there is no let loss in flood storage volume. Refer to the engineering Drawings 4500-4800 series and the Stormwater Mitigation Report for more information.

5. DETAILED SITE INVESTIGATION (DSI)

A Preliminary Site Investigation (PSI) was completed by Springline in September 2025 & reported in November 2025 to assess whether historical or current land use activities may have resulted in potential soil contamination at the site. The assessment identified several activities consistent with the Ministry for the Environment's (MfE's) Hazardous Activities and Industries List (HAIL), further details of which are provided the report dated 24th November 2025.

The DSI has subsequently been undertaken to characterise soil conditions within the identified HAIL areas and assess the presence or extent of any contamination.

The investigation has been carried out in general accordance with the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NES-CS) and the MfE's Contaminated Land Management Guidelines (CLMG).

The primary purpose of the DSI is to assess the suitability of the site's intended land use, the objective of which is to determine any actual or potential sources of contamination, as required under the Resource Management Act 1991 (RMA).

The report also informs consent requirements and provides guidance on appropriate soil reuse or disposal pathways during future development.

A summary of the key findings and conclusions from the DSI from Springline are as below;

Historic Land use:

The site has predominantly supported pastoral farming and rural residential use. Within this setting, several activities listed on the Hazardous Activities and Industries List (HAIL) have been identified, including:

- Fuel storage (Aboveground storage tanks (ASTs), underground storage tank (UST), and barrels) (HAIL A17)
- Sheep spray race and stock handling facilities (HAIL A8)
- Clay target shooting area (HAIL C2)
- Offal pit (HAIL G5)
- Historic fly-tipping in a gully (HAIL G3)

Painted structures with deteriorated cladding (potential HAIL I) These activities are confined to discrete areas within the wider site.

Investigation:

A targeted Detailed Site Investigation (DSI) was completed to characterise soil conditions in HAIL areas. Soil samples were analysed for heavy metals, hydrocarbons, PAHs, OCPs, and TCLP leachability to inform human health and environmental risk assessment and soil disposal pathways.

Conclusions:

Contamination exceeding relevant human health criteria was identified in several HAIL areas, including:

- Clay target shooting area – widespread lead and PAH in surface soils
- Fuel storage and AST – low-level hydrocarbon and arsenic impact
- Spray race and stockyards – sporadic arsenic and widespread zinc (Eco-SGV exceedances)
- Livestock shed – isolated arsenic hotspot

The UST, offal pit, and fly-tipping area were unable to be accessed during this investigation, further assessment is therefore required during future earthworks.

Recommendations:

Prepare a Remedial Action Plan (RAP) and Contaminated Site Management Plan (CSMP) to guide soil handling, management of contaminated material, and disposal during construction.

RAP and CSMP will be provided as a certified pre-construction condition

Undertake further assessment of naturally occurring arsenic to confirm provenance and extent, and to establish site-specific background concentrations.

6. ASSOCIATED CONSENTS

This EMP has been prepared for the purposes of obtaining resource consent.

It is intended that this section will be updated and related consent conditions will be tabled and further addressed within this EMP where may be required, and updated as described above.

Table 1: Associated Development Consents

Consent Number	Authority	Activity Information	Date of issue
TBC			

Fast Track consent application currently under assessment – consent numbers pending.

Refer to **Appendix H** for a list of specific consent conditions. Anticipated conditions (sediment, ecology, contaminated land) will be incorporated immediately upon decision.

7. PROPOSED WORKS

This EMP addresses earthworks activities and associated environmental controls only. Broader construction staging, infrastructure servicing, and operational delivery are set out in the CMP and Infrastructure Report.

7.1. Earthworks and Works Extent

Earthworks and construction activities for which consent is sought include:

- Residential terraces and development platforms
- Infrastructure corridors (WW, SW, potable water, irrigation race)
- Morven Hill ridgeline planting and stabilisation areas
- Access road corridors including Morven Ferry Road upgrades
- SH1 roundabout construction footprint
- Sediment retention ponds, soakage basins and diversions

All works areas are shown on the Engineering Plan Set.

7.1. Existing Water Race

The existing irrigation water race will be maintained operational throughout construction until the approved diversion/piping works are implemented.

Piping of the race is proposed to be completed during phase 1 works, undertaken during dry-bed conditions, in consultation with the irrigation operator and ecologist.

The final piped alignment will be confirmed through detailed design to achieve the most direct practicable route while maintaining downstream supply and avoiding unnecessary disturbance.

Until piping is complete, appropriate setbacks, temporary protection, and monitoring will apply.

7.2. Earthworks description

Geotechnical Appraisal Report

A geotechnical appraisal report for the site has been prepared by Kirk Roberts.

The matters contained in the geotechnical assessment will be addressed through the construction works. All geotechnical related construction works shall be undertaken in accordance with the recommendations in the geotechnical report, and under the supervision of geotechnical engineer.

A geotechnical completion report will be prepared at the completion of all civil works pertaining to this earthwork's application by a suitably qualified Geotechnical Engineer.

Proposed Earthworks

The proposed earthworks for this application include general bulk earthworks for establishing roads, treatment ponds, and building platforms.

For comprehensive information relating to the proposed bulk earthworks, including earthwork extents, cut and fill volumes, and finished surface levels, refer to the Civil Earthworks Plan set numbered **4048-0-2100 to 4048-0-2111**. These drawings illustrate the scope of the proposed earthworks works across the site.

To minimize the extent of earthworks as far as practicable, the design approach incorporates the following measures:

Road Geometries Aligned with Existing Landforms to minimise earthworks quantities:

Road geometries have been carefully designed to align with the existing landform wherever feasible. This reduces the need for excessive cutting or filling while maintaining the necessary maximum grades for safe and functional roading.

Cut/Fill Balancing: A cut/fill balance within a number of zones within the development has been sought minimizes the need to transport materials across the site, thereby reducing construction movements and associated environmental and logistical impacts.

Lot Formation: Flat building lots have been formed to accommodate future development needs while minimizing the impact on surrounding topography.

Re-profiling and Material Relocation: The design focuses on re-profiling the existing ground primarily along the spines of the proposed sub-catchments. The cut material from these areas will be relocated for engineered filling along the periphery of stream zones, minimizing waste and optimizing resource use. By implementing these design strategies, the extent of earthworks has been minimized to the greatest extent practicable, balancing environmental, functional, and construction considerations. The detailed earthworks extent is illustrated in Figure 4 – Overall Contour Plan. The earthworks balance has been achieved by the following actions:

Bulk Cut - Fill

The amount of bulk cut material taken and final shaping from the site has been informed by the amount of fill material needed (including compaction factors) to facilitate flat lot platforms and transport corridors.

Topsoil Strip and Respread Philosophy

As identified by Kirk Roberts, the average topsoil depth across the site is approximately 100mm. The topsoil strip and respread philosophy is to minimise topsoil removal off site after the resspreading process is complete, and to place topsoil in thicker layers in landscaping areas to facilitate revegetation up to 300mm. Topsoil respread depths are proposed to be varied based on proposed land use at various locations within the site to maximise topsoil respread volumes on site. A summary of the earthworks is included in Table 1 below.

Table 2: Earthworks

Area	Unit	Bulk	Assumptions
Earthworks area	m ²	806,003	Earthworks to be staged, not all open at once.
Net Cut Volume	m ³	689,052	Finish surface to existing topo level
Topsoil Strip Volume	m ³	83,000	Assumed 100mm deep topsoil across earthworks area
Maximum Cut Depth	m	10	
Net Fill Volume	m ³	632,267	Finish surface to existing topo level
Topsoil Respread Volume	m ³	83,000	Assumed 100mm deep across earthworks area
Maximum Fill depth	m	7	
Clay Deficit/(surplus)	m ³	0	
Topsoil Deficit/(surplus)	m ³	0	There are several locations throughout site for excess topsoil to be disposed safely.
Total Earthworks Balance (Cut + Fill)	m ³	56,785	Surplus volume assumes there is no spoils. An approximately 10% surplus allows for fill required for backfilling from unsuitable, higher complication rates than expected, to allow for a contingency.

Waterways Management

The design has been developed to ensure that there is no stream removal, thus there are no permanent streams being reclaimed as part of earthworks operations in any stage of the

project. the two identified ephemeral streams will be realigned to better align with the development and will be enhanced further from their current form to meander to increase the length and replace the existing grass channels with native vegetation.

Waterways Margins

Some filling is required with the 10m waterway setback margins, to form the batters and enable the development. The margins have been defined as a 10m from the stream bank and are shown on the civil earthwork drawing package.

The total earthworks area and volumes are shown below in Table 3.

Table 3: Stream margin encroachment areas / volumes

	Area (m ²)	Volume (m ³)
Overall	32,079	92,438

These earthworks are required to accommodate the height of the development in relation to the existing ground levels. All earthworks within the waterways have been reduced to minimise the works involved. The majority of this area and volume of earthworks relates to the proposed stream re-alignment of two ephemeral streams. The catchments to the affected waterways have been maintained ensuring that the ecological function of the waterways are not affected in perpetuity and the temporary effects of the earthworks will be managed by robust sediment and erosion control measures as detailed in the Construction and Environmental Management Plans prepared by McKenzie and Co. The full 10m setback margin can be maintained, enhanced and protected once the works are completed.

Wetland Setback Area

The below table shows the extent of earthworks within the 10m wetland setback area.

Table 4: Wetland area encroachment areas / volumes

	Area (m ²)	Volume (m ³)
Overall	3938	15,712

These earthworks are required to accommodate the height of the development in relation to the existing ground levels. All earthworks within the wetland setback have been reduced to minimise the works involved. The catchments to the affected wetlands have been maintained ensuring that the ecological function of the wetlands are not affected in perpetuity and the temporary effects of the earthworks will be managed by robust sediment and erosion control measures as detailed in the Construction and Environmental Management Plans prepared by McKenzie and Co. The full 10m setback margin can be maintained, enhanced and protected once the works are completed.

Stream Works

1. Earthworks will avoid works within streams, where possible. Earthworks within streams will be only for the following purposes – realign streams to create more natural alignment and enhance the environment. Also to cater for flows from the development.

Two of the ephemeral streams are to be realigned to integrate the stream alignments into the development for the future. The methodology for these realignments will be –

- 1) Carry out the works when there is no rain forecast and is in the dry season.
- 2) install bunds and erosion sediment controls around the area of the new stream.
- 3) excavate new channel alongside the existing channel
- 4) stabilise the new channel and install landscaping where possible.

- 5) Once stabilised, connect the existing stream at the inlet and outlet, to allow flows to be diverted the flows from the existing channel into the new channel alignment. As the existing channel has no permanent water, this will be done on a dry day.
- 6) Once the flow is diverted, erosion and sediment controls can be moved, and the existing channel can be filled in from upstream to downstream.
- 7) Stabilise and plant the filled in channel.

10 Degree Slope

The area of earthworks across the project with slope above and below 10 degrees is shown in the table below.

Table 5 - Area of earthworks with varied slopes

	Slope above 10 degrees
Area of earthworks(m ²)	155,593

Maximum design slope

The area of earthworks across the project with maximum slopes shown in the table below. Note areas are plan areas, not slope face areas.

Table 6 - Area of earthworks at maximum slopes

	1 in 1 Slopes	1 in 2 slopes	1 in 3 slopes
Area of earthworks(m ²)	4,295	33,246	12,821

1% AEP Floodplain

The total volume of earthworks within the 1% AEP floodplain is shown in Table 7 below. Note this is the taken from existing surface, to design surface. The volume of displaced water within the flood plain is not included in the below.

Table 7 - Volume of earthworks within 1% AEP floodplain

	Cut	Fill	Total
Volume of earthworks (m ³)	30,000 (approx.)	50,000 (approx.)	20,000 (approx.)

The earthworks within the flood plain areas have been designed to raise the proposed lots above the flood plain, and divert flows within the site to designated overland flow paths. Flows entering and exiting the site are consistent with the predevelopment scenarios. Refer to the Flood Report by Mckenzie and Co for further information. Its noted that additional onsite attenuation is provided via a number of large stormwater basins adequately mitigating the increased runoff from the proposed change in pervious coverage within the site. A large diameter stormwater line has also been proposed to further reduce flooding effects on the downstream catchments.

Wastewater disposal fields

As there is no existing public wastewater infrastructure network available to service the proposed subdivision, an onsite wastewater system has been designed to meet the development's needs. The use of low level spray irrigation is proposed on the nearby Morven Ferry Hill with reserve fields located within the development.

The earthworks (if any) associated with any wastewater fields shall be carried out in accordance with the wastewater disposal report by WGA consultants.

Cultural Heritage and Archaeological

According to QLDC Archaeological & Cultural Site database the site has not been identified to have any significant Cultural Heritage. The archaeological assessment titled *Archaeological Assessment for Morven Ferry, Arrow Junction* (prepared by Riley Christie of Origin Consultants Ltd, January 2026) was commissioned to identify and assess archaeological values within the Morven Ferry site prior to development. The assessment involved detailed desktop research, GIS analysis, and pedestrian and drone surveys. It identified two recorded archaeological sites within the wider project area: the 19th-century Doonholme farmstead complex (NZAA Site F41/62), which has high archaeological value due to its intact historic buildings, and the remains of a small stone hut likely associated with Henry Steele (NZAA Site F41/890), which has low archaeological value due to its degraded condition. The report also notes areas of moderate to high archaeological potential, particularly near the Kawarau River where small-scale historic gold-mining activity and possible sluicing features may be present, although many features are obscured by vegetation or later land use.

The report concludes that while much of the site has been heavily modified by 20th-century agricultural activity, there remains potential for subsurface archaeological material to be encountered during earthworks, particularly in proximity to recorded sites and along the Kawarau River terrace. It recommends that an Archaeological Authority under the Heritage New Zealand Pouhere Taonga Act 2014 be obtained prior to earthworks, that known and potential archaeological features be avoided where practicable, and that archaeological monitoring and recording be undertaken where ground disturbance cannot be avoided. All proposed earthworks will be undertaken in accordance with the findings, recommendations, and management measures set out in the *Archaeological Assessment for Morven Ferry, Arrow Junction* to ensure that archaeological values are appropriately managed and any effects are suitably avoided, remedied, or mitigated.

Please refer to the Construction Management Plan by McKenzie and Co for construction methodology for working in these areas and accidental discovery protocols.

Overall Contour Plan

Refer to plans 4080-0-2000 to 2011 for final contours.

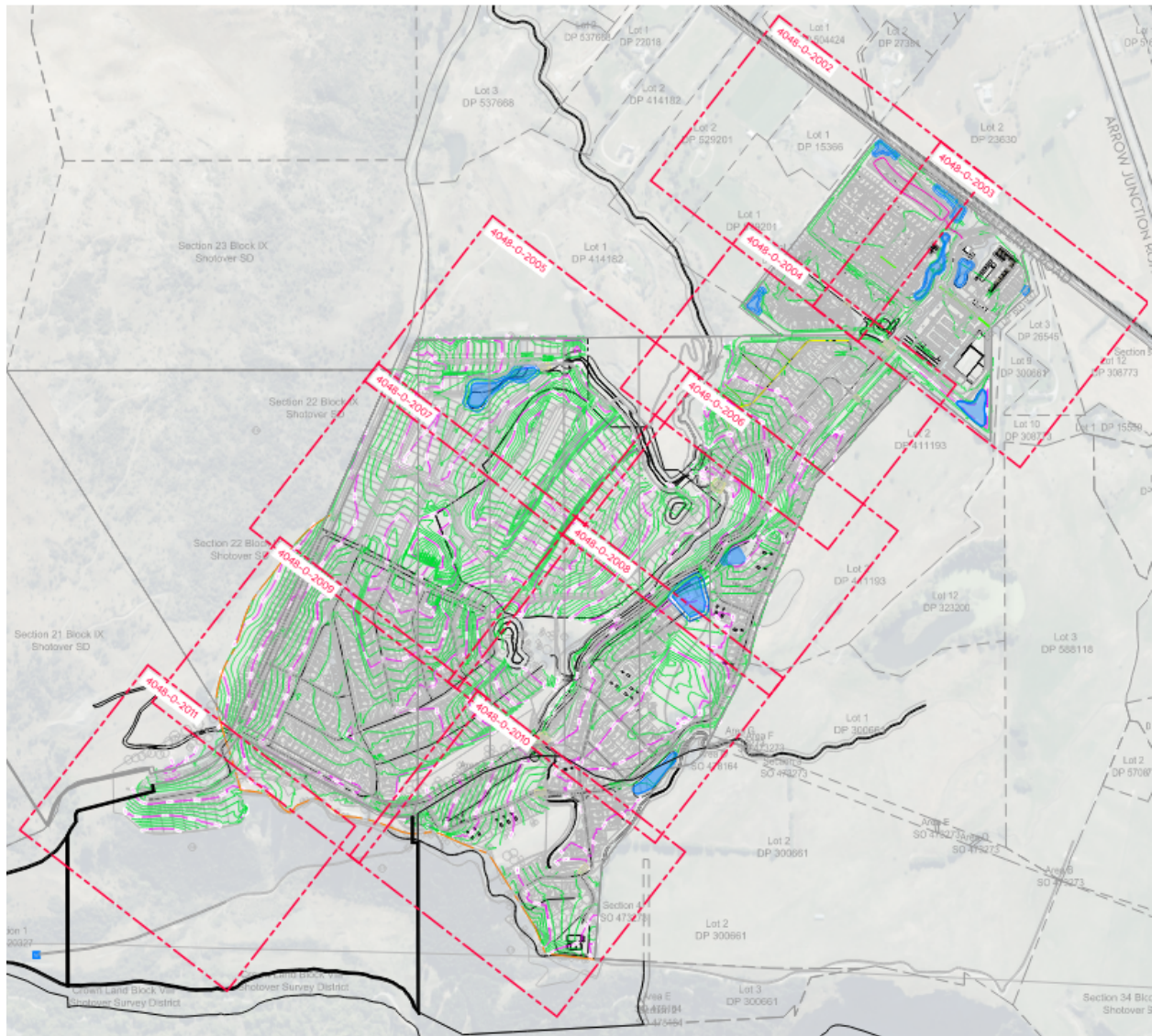


Figure 4 – Overall Contour Plan

Earthworks phasing Plan

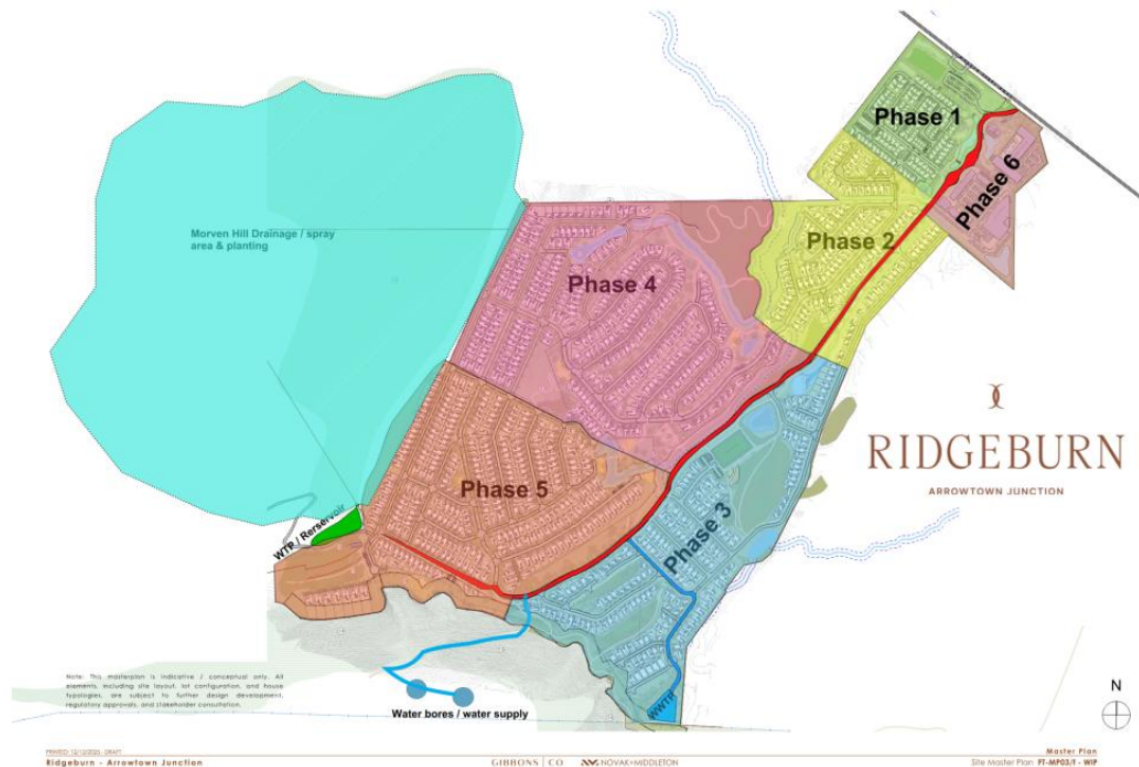


Figure 5 – Earthworks Phasing

8. CONSTRUCTION METHODOLOGY

8.1. Sequencing of works

Construction of the subdivision development will be undertaken in the order as outlined below to ensure that the works are done as efficiently as possible whilst achieving the environmental objectives as outlined in this EMP.

The following construction sequencing procedure and methodology may be subject to change based on site conditions upon commencement planning. This construction methodology should be read in conjunction with the Resource Consent and the Erosion and Sediment Control Plan (ESCP).

Prior to establishing onsite and commencing works the project team is to be issued the EMP and ensure all relevant parties;

1. Have the latest EMP copy available onsite at all times.
2. Complete site & environmental inductions.
3. Ensure resources are available for installation of environmental controls & measures.

Construction Sequencing Procedure

Note:

- a) All imported earthworks fill to be structural hardfill aggregate (unless for landscaping)
- b) All dirty water diversion (DWD) & ESCP controls (Sediment retention pond (SRP) etc) to be lined with Enviroforce Geotextile (or similar equivalent).
- c) Completed roadways & associated Stormwater (SW) systems to act as staged clean water diversions which are to reduce any upstream SW run off contributing to the SRP or basins.

Initial site set up & construction;

1. Erect silt fences where needed.
2. Construct stabilised construction entrance, laydown and haul roads.
3. Construct clean water diversions.
4. Construct SRP and associated controlled outlets to suitable location as directed by SQEP.
5. Construct and form DWD's and drop out pits. Line with Geotextile.
6. Install Floc system prior to SRP inlet in DWD channel.
7. As-built controls & document.
8. Deploy silt socks, cut off/contour drains & sump protection as required prior to rain events.
9. Commence stripping and undertake earthworks once all hold points are met and notice is given.
10. Strip topsoil progressively placing stockpiles clear of clean and dirty water diversion bunds.
11. Complete earthworks, retaining wall construction and civil infrastructure works.
12. Stabilise earth worked areas as completed.
13. Decommission under the direction of the SQEP, who will advise this sequence further.

Erosion & Sediment Control Sequencing Procedure

The following to be read in conjunction with the Construction Management Plan CMP.

Pre-Construction Phase:

1. Establish site laydown and form stabilised accesses off Morven Ferry Road.
2. Establish haul roads and form with hard road aggregate. All Haul roads to be co-ordinated onsite by Civil Engineer.
3. Set out boundaries and control benchmarks and establish grid for machine control.
4. Install clean water diversion bunds (CWDB) along the north-western boundary of the site to redirect flows from Morven Hill with check dams installed where required as directed on-site by SQEP and rip rap installed at CWD end.
5. Install super silt fences around all natural water channels, ponds and wetlands and/or stabilised diversions as directed on site.
6. Install dirty water diversion bund (DWDB) along the west and south of Phase 1 boundary with drop out pits installed within DWDB prior to any pond forebay.
7. Install sediment retention ponds (SRP) as required to enable bulk earthworks with outlets to be confirmed on-site with SQEP and piped outlet to open ground to be installed with a flexi flumed outlet where required.

Stage 1 – Bulk Earthworks Phase:

1. Strip topsoil progressively placing stockpiles clear of clean and dirty water diversion bunds and compact the exposed subgrade where required.
2. Undertake excavation of internal road corridors, progressively applying a clean aggregate cap once subgrade is reached to reduce potential erosion. Progressively form DWDCs and associated drop-out pits, check dams and trafficable swales leading to the retention devices.

3. Stabilise earth worked areas as completed and replace topsoil in landscaped areas, install any planting, mulch and hydroseed as per landscape plan.

Stage 2 – Civil Infrastructure & Stabilisation Phase:

1. Once the contributing catchment for the SRP has reached 80% stabilisation, this device may be decommissioned to facilitate the remaining bulk earthworks to form unit platforms and retaining walls. Apply aggregate cap to remaining unit footprints following decommissioning of SRP.

General Decommission Sequence Guideline;

1. Ensure site & all earthworked areas are fully stabilised where there is no longer risk of erosion or sedimentation. This includes but not limited to 80% thick grass sward for grassed areas (or approved mulch alternative) or hardfill aggregate for roads & building platforms, where dust or sedimentation is low risk of occurring.
2. Remove CWD's and stabilise associated area.
3. Remove DWD's and stabilise associated area.
4. Decommission SRP and stabilise associated area.
5. Reinstate construction entranceways where required.
6. Remove silt fences as directed by SQEP.
7. Remove sump and/or SW inlet protection measures.

9. ADMINISTRATIVE REQUIREMENTS

9.1. Working Hours

All construction activity will adhere strictly within the approved hours of work. These are as follows, or as otherwise stated as a specific consent condition.

- Quiet preparation work is permitted from 6.30am – 7.30am, and non-noisy work is permitted from 6pm – 8pm during Monday to Friday.
- Noisy construction work (including earthworks) is only permitted from Monday to Saturday between the hours of 7.30am to 6.00pm.
- No noisy construction works are to be undertaken on Sundays or Public Holidays.

Refer to Section 10.7 for further detail and guidelines on noise limits and management practices.

9.2. Suitably Qualified and Experienced Person

A Suitably Qualified and Experienced Person (SQEP) who has the abilities, formal qualifications, relevant experience, skills and competencies necessary to perform a particular job. The qualification and experience level required will be commensurate to the specific complexities, constraints and issues associated with the project (as defined in the QLDC & ORC Guidelines for Environmental Management).

This EMP has been prepared by Mac Stevenson. Mac through his experience and as a Chartered Member of Engineering NZ (CMEngNZ) is considered a Suitably Qualified and Experienced Professional (SQEP) for the purposes of preparing this EMP and overseeing the environmental aspects of this project. As assessed by ORC & QLDC.

This EMP has also been reviewed & approved by James Kitchen. James as a Chartered Professional Engineer (CPEng) is considered a Suitably Qualified and Experienced Professional (SQEP). James has over 20 years' experience in design and project management in addition to experience in the management and implementation of Environmental Management Plans and Erosion and Sediment Control Plans (ESCPs) on high-risk sites.

9.3. Environmental Roles and Responsibilities of Key Personnel

Detail on the environmental roles and responsibilities of key personnel can be seen below in the tables below. The Environmental Advisor (SQEP) can provide further clarification if required.

Table 8: Project Contact Summary

Role	Name	Contact Number	Email
Project Development Manager	Cameron Hodgson	02108851148	cam@gibbonsco.co.nz
Environmental Adviser (SQEP)	Mac Stevenson	0273008667	mac.stevenson@mckenzieandco.co.nz
Environmental Adviser (SQEP)	James Kitchen	021951230	james@mckenzieandco.co.nz
Site Supervisor	TBC		
Environmental Representative	TBC		
Regional Council	Otago Regional Council	0800 800033	pollution@orc.govt.nz compliance@orc.govt.nz
District Council	Queenstown Lakes District Council	03 4410499 (QT) 034430024 (WKA)	rcmonitoring@qldc.govt.nz

Emergency	Human discoveries, Serious injury, Fire	111	Phone 111
-----------	---	-----	-----------

Table 9: Project Specific Roles

Role and Contact Details	Description
<u>Project Manager</u>	The Project Manager has responsibility for the effective implementation of the EMP and has overall responsibility for the environmental performance of the project. The Project Manager is primarily responsible for: • Ensuring adequate resources are in place to implement the EMP. • Appoint staff/personnel responsible for successful EMP implementation and ensure the staff operates within the standards set by the EMP. • Ensuring Project Managers, Supervisors, Subcontractors and other Employees operate within the guidelines of the EMP. • Ensuring that an EMP is prepared and that environmental standard, processes and procedures meet relevant resource consent conditions. • Overseeing the successful implementation, monitoring and review of the EMP. • Providing reporting of environmental incidents to the QLDC and other periodic environmental reports to QLDC as required by The Guidelines. • Ensuring that inspections and audits are carried out in accordance with the relevant EMP. • Restrict or stop work if the EMP is not appropriately implemented and the work undertaken has potential to cause harm to the environment. • Delegate authority of the above responsibilities.
<u>Site Supervisor</u> TBC once a contractor is engaged	The Site Supervisors report directly to the Project Manager and responsible for: • Ensuring they understand and comply with EMP. • Directly responsible of implementation of the EMP • Coordinating and identifying resources required for the implementation of the EMP. • Ensuring that site employees and subcontractors are working in compliance with environmental requirements and work activities are not impacting the environment. • Coordinating actions in emergency situations/rapid stabilisation of site and

	allocating appropriate resource for these activities. • Restrict or stop any activity on the Project that has the potential to or has caused environmental effects. • Ensuring that adequate instructions and information is provided to Operators which relate to environmental risks onsite.
<u>Environmental Representative</u> TBC once a contractor is engaged	The Environmental Representative is accountable to the Project Manager and supports the Project Manager and Site Supervisor in the day-to-day implementation of the EMP. This is a key environmental role for the Project and includes the following responsibilities: • Coordinate the Implementation of the EMP • Ensure installation of environmental controls as per the EMP. • Undertake environmental site inspections of the project including end-of-day inspections of controls. • Oversee the maintenance and improvement of defective environmental controls. • Undertake Environmental Incident reporting. <i>Communication</i> • Keep project leadership informed of environmental performance of the project. • Inform staff of procedures and constraints applicable to managing specific environmental issues. • May be responsible for providing environmental inductions to all staff and sub- Contractors. <i>Complaints and Incidents</i> • Assist the project leadership in attending to Environmental Incidents and Complaints. <i>Familiarity</i> The Environmental Representative will be familiar with: • Environmental aspects of the project. • Environmental Management Plan. • Best practice erosion and sediment control from: - Guidance Document 2016/005: Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region (GDOS); and/or, - Similar Regional Council guidelines from throughout New Zealand based on GD05 or internationally recognised best practice.
<u>Environmental Advisor/Consultant (SQEP):</u>	The Environmental Advisor/Consultant will oversee the environmental management of the site and provide technical environmental management advice as and

Mac Stevenson p.0273008667 e. mac.stevenson@mckenzieandco.co.nz <u>Secondary contact:</u> James Kitchen p. 021951230 e. james@mckenzieandco.co.nz	when required. The Environmental Adviser/Consultant will deliver the Site Environmental Induction to core staff and check the erosion and sediment controls around the dwelling site to ensure they have been correctly installed and provide QLDC & ORC with As-built confirmation of this where required. The Environmental Adviser/Consultant will undertake monthly monitoring of the site to ensure that the EMP continues to provide adequate environmental management for the Project. The Environmental Adviser/Consultant will also prepare and submit Monthly Environmental Reports to QLDC/ORC.
<u>All Staff</u>	All Project staff have responsibility for their own environmental performance and the impact they have on Project environmental performance. In particular, all staff are required to: • Undertake all activities in accordance with the requirements of the EMP. • Ensure they are aware of the contact person related to environmental matters. • Report to the Site Supervisor or Environmental Representative, any activity that has the potential to or has resulted in an Environmental Incident.
<u>Subcontractors</u>	All persons involved with the Project, including subcontractors/suppliers/consultants and their employees shall comply with relevant environmental requirements. All subcontractor personnel are considered equivalent to staff personnel. This includes all aspects of environmental management and control; their responsibilities will mirror that of staff. All subcontractors and their employees shall participate in the Site Environmental Induction prior to commencing works.

9.4. Environmental Site Induction

The purpose of the Environmental Site Induction (ESI) is to ensure that all staff, consultants, and subcontractors onsite are aware of their environmental responsibilities.

The ESI will be delivered to all key staff, including the Site Supervisor and Environmental Representative by the Environmental Advisor (SQEP).

Following this the Environmental Representative shall deliver the project specific ESI to persons upon entering the site. This includes at a minimum, all site management staff, employees, and subcontractors working on activities which disturb the ground surface. The Site Supervisor shall maintain a register signed by those inducted. Any new staff will also need to be inducted as the works progress.

The Site Supervisor shall maintain a register signed by all those inducted (including subcontractors). A copy of ESI document (including register) is found in Appendix C.

9.5. Management of Subcontractors

The Contractor must ensure that all subcontractors always comply with the EMP.

9.6. Inspection Summary

A summary of the required regular environmental inspections can be found in 4 below. These are done to confirm that the site controls are working to prevent negative environmental effects. These are to be undertaken by the Environmental Representative.

Table 10: Summary of Environmental Inspections

Inspection type and frequency	Details
Weekly inspection (every 7 days)	Done weekly and recorded in the form provided in Appendix D. Purpose of the inspection is to: • Verify management measures prescribed in EMP are present, functional and adequate. • Observe the site for actual, potential adverse environmental effects. • Identify maintenance requirements for implemented management measures.
Daily inspection (beginning of each working day)	This is quick a walkover of the site to ensure no new environmental issues have arisen or mitigation measures have been compromised from the previous day's work. Observations should be recorded (e.g.in a works diary).
Significant Rain Event inspection	Note: A 'Significant Rain Event' is defined as a rain event at an intensity of 20mm or more within a 12-hour period. This is done prior to, and immediately after a 'Significant Rain Event' The purpose of this is to: • Ensure all erosion and sediment controls are present, functional, and adequate to perform in the upcoming event based upon the forecast accumulation of rainfall • Check the performance of controls, check for any damage, and remediate and adjust if required These are to be recorded in the form provided in Appendix D.

The Weekly and Significant Rain Event inspection records shall be made available to QLDC or ORC within 48 hours of a request being made online or immediately if the request is made on site by a Council officer.

The Contractor shall undertake corrective actions to rectify issues identified by Environmental Representative during the site inspections.

In some situations, such as High Risk sites, during sensitive phases in the construction methodology, or following Environmental Incidents, weekly inspections may need to be undertaken by a SQEP. The requirements and details for this are to be confirmed by Environmental Advisor as the project progresses.

9.7. Monthly Environmental Reporting by SQEP

A SQEP shall monitor the site monthly to ensure that the site is complying with its EMP, identify any new environmental risks arising that could cause an environmental effect and suggest alternative solutions that will result in more effective and efficient management. The SQEP will update the EMP accordingly if required and submit it to QLDC and ORC for acceptance.

The Environmental Advisor shall complete and submit exception reporting in the form of a monthly environmental report. Further, the monthly environmental report shall also be submitted by the Environmental Advisor to QLDC's and ORC's Regulatory Department within five (5) working days of the end of each month.

The monthly environmental report shall include exception reporting and statements actively addressing but not limited to the following that occurred during the reporting month:

1. Any updates to the sites ESC measures and/or overall EMP document.

2. Weekly and event inspections completed.
3. Outcomes and/or solutions from audits, inspections and monitoring will be summarised in the reporting.
4. Any maintenance corrections or non-conformance corrections undertaken.
5. Commentary on overall performance.

Where exception reporting demonstrates repeated or multiple non-conformances of the same issue, QLDC or ORC may instruct to undertake a review of the adequacy of management measures outlined in the EMP and provide a response back to QLDC or ORC within five (5) working days, either confirming and justifying the suitability of the existing EMP or notifying of updates to the EMP and the justification.

The Environmental Advisor who authored this report will be working closely with the site and is considered suitable to undertake this monthly monitoring is an SQEP. As a result, no independent environmental audits are considered required unless requested by QLDC or ORC.

9.8. Notification and Management of Environmental Incidents

Environmental incidents should be responded to immediately as soon as identified by anyone on site. This includes:

- Stopping the activity causing incident immediately.
- Notifying Project Manager, Site Supervisor and Environmental Representative of the incident.
- Investigating the cause of the incident.
- Implementing solutions to stop the incident, remediate damage, and take any learnings to prevent a similar incident from happening in future.
- Project Manager to engage Environmental Advisor for advice if required.

The Project Manager thereafter shall present all Environmental Incidents to the QLDC Monitoring and Enforcement team on RCMonitoring@qldc.govt.nz and ORC Pollution team on Pollution@orc.govt.nz and 0800 800 033 within 12 hours of becoming aware of the incident.

9.9. Environmental Incident Management

An environmental incident review is triggered when a complaint from the adjacent property owners, general public, Council, or other person or member of the project team is received.

The Contractor shall immediately undertake identified remedial actions to mitigate adverse environmental effects.

Environmental incidents shall be responded to immediately as the project team becomes aware of them. This will involve:

- Immediate cessation of the activity that caused the incident.
- Investigation into the cause of the incident.
- Contact the Environmental Advisor for advice where site staff are unsure of how to correct the issue
- Formulation of a solution to bring the incident under control or remediate any environmental damage.
- Implement any remediation works.
- Document incident for associated reporting.

Once the immediate risk from the Environmental Incident is alleviated, the Project Manager (on behalf on Consent Holder) shall investigate the cause of the breach and/or adverse environmental effects, then identify and implement corrective actions as soon as practicable. It is likely the Environmental Advisor will have input in this process.

The Project Manager shall provide an Environmental Incident Report to QLDC and ORC within 10 working days of the incident occurring. The template for this report is provided in Appendix D.

9.10. Records and registers

The following records will be collated onsite and shall be available to QLDC or ORC on request within 24 hours of a request being made by a QLDC or ORC official. These records will include the following:

- Environmental Induction attendance register.
- Environmental Incident reports and associated corrective actions undertaken.
- Complaints register and associated corrective actions undertaken.
- Daily diary entries (including pre-start inspection observations).
- Post-Rain event inspection observations and corrective actions.
- Weekly Site Inspection checklists.
- Monitoring results (e.g. water quality).
- EMP Non-conformance register (based on weekly inspection results or otherwise identified) and associated corrective actions are taken.

All records will be kept in an organised central location and will be managed by the Site Supervisor and/or Environmental Representative. All records will be uploaded or amended by the Environmental Representative as inspections, monitoring, corrective actions, etc are completed.

10. OPERATIONAL REQUIREMENTS

Operational requirements have been detailed to effectively mitigate or avoid adverse effects on the environment. These are to be followed by the Contractor and relate to both the physical environment and contract operations. They include the following:

- Erosion and Sediment Control
- Noise
- Contaminated sites
- Vibration
- Water Quality
- Waste
- Indigenous vegetation and protected trees
- Dust control
- Chemicals and fuels
- Cultural heritage

Refer to the following sections below.

10.1. Erosion and Sediment Control

Earthworks encompass a broad spectrum of activities, ranging from clean filling operations to those associated with road construction, park development, and maintenance. These activities have the potential to generate significant sediment, and if not managed effectively, can result in substantial sediment discharges.

10.1.1 *Earthworks Principles*

Key principles of the plan are as follows.

- Execute bulk earthworks during favourable weather conditions to minimize the risk of erosion and sediment runoff.
- Prioritize erosion control over sediment control, recognizing that preventing erosion is the most effective way to mitigate sediment discharge from earthworks sites.
- Implement appropriate controls in accordance with the approved Sediment and Erosion Control Plan, ensuring that the design specifications align with the operation's requirements.
- Implement roading and associated earthworks in manageable sections to expedite the stabilization of disturbed earth and minimize exposed catchment areas.
- Redirect clean water runoff from upstream catchments away from exposed earthworks whenever possible.
- Stabilize all works promptly after completion. Hydroseed, mulch, Ecomat Hessian, or similar products should be used to stabilize cut and fill slopes, considering runoff from these areas as clean. Water discharge from roads with clean aggregate is also deemed as clean runoff.
- Retain erosion and sediment control devices until the completed works are fully stabilized. Additional stabilization may be necessary in certain areas to ensure complete grass cover where required.

10.1.2 *Responsibilities and Hold Points*

The Contractor is responsible for temporary erosion and sediment control across the earthworks site and for ensuring that controls are adequately designed, installed, adapted, maintained, and decommissioned in accordance with the directions of the Engineer and in accordance with

The Contractor shall:

- Implement ESCP measures as directed by the Engineer.
- Submit improvement proposals where the Contractor can see an improved environmental outcome or enhanced workflow on site.
- Monitor the continued effectiveness of the ESCP during the contract.
- Always maintain all erosion and sediment controls in effective working order.
- Prepare for a predicted rain and wind “event” by inspection, recommended pre-event ESCP maintenance and initiating a prompt inspection by the Environmental Representative.
- Update the ESCP where necessary in conjunction with the SQEP.
- Provide As-Built plans of the ESCP measures.

Bulk earthworks may not commence until the following has been completed to satisfy the conditions of the resource consent:

- The Contractor has been issued an approved copy of QLDC and ORC consents for the site.
- The updated ESCP is submitted and deemed acceptable by the QLDC and ORC in conjunction with the overarching EMP.
- The erosion and sediment control devices are installed correctly and approved by the SQEP.

10.1.3 Erosion and Sediment Control Overview

An Erosion and Sediment Control Plan (ESCP) has been produced and is shown in Appendix A. Additional detail on the sizing of devices is as in Appendix B. Key elements are as follows.

- A Sediment Retention Pond (SRP) will be utilised to capture and treat the sediment-laden runoff from the site.
- Silt fences as required to form a barrier to the sheet flow where there is the possibility of sediment-laden surface runoff leaving the site.
- A diversion bund will be installed around the earthworks area to divert the sediment-laden runoff to the DEBs.
- Clean water diversion bunds will be constructed to divert and collect upstream catchment runoff away from the earthwork areas.
- Establish stabilised construction entrances to the site.
- Topsoil will be stripped and stockpiled on site.
- Earthworks zones minimised to reduce risk wherever possible.
- Topsoil will be re-spread upon completion of earthworks.
- Keep topsoil stockpile away from the boundary.
- Cover and protect the topsoil to prevent spilling due to rain.
- Conduct daily inspections to ensure sediment control measures follow the designs.
- The erosion and sediment control measures will be removed, once the earthwork area stabilizes.
- Stabilising the building platforms, accessway, and carparking area (i.e. metal/concrete)

as soon as practical to ensure safe and tidy access for the following building construction stage of the dwellings.

- Ensure any new catchpits on the proposed accessway and any existing catchpits in the road reserve are protected as described in this document.
- Monitor weather forecasts and check erosion and sediment measures are in place before leaving the site, especially on weekends.
- Monitor the site after any inclement weather events and repair and mitigation devices, as necessary.
- Daily inspections to ensure sediment control measures are operating efficiently.
- Regular maintenance of the devices will also be necessary to ensure their effectiveness during bulk earthworks operations.

Further details on the different devices are in Section 10.1.4 below.

To conserve water onsite, where possible stormwater that has been captured and treated within the sediment retention devices will be utilised for dust suppression purposes. The pH of water to be reused, should be tested to ensure it is in accordance with the water quality limits before being reused.

10.1.4 Erosion and Sediment Control Devices

(1) Stabilised Construction Entrance

Stabilised entranceways will be installed at the point of construction site entry and exit on Morven Ferry Road.

The stabilised entranceways are to follow typical details, design parameters, installation and maintenance requirements outlined in the *Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region Guideline Document 2016/05 (GD05) (pp. 65-69)*. A detail can be seen in

Figure 6 below.

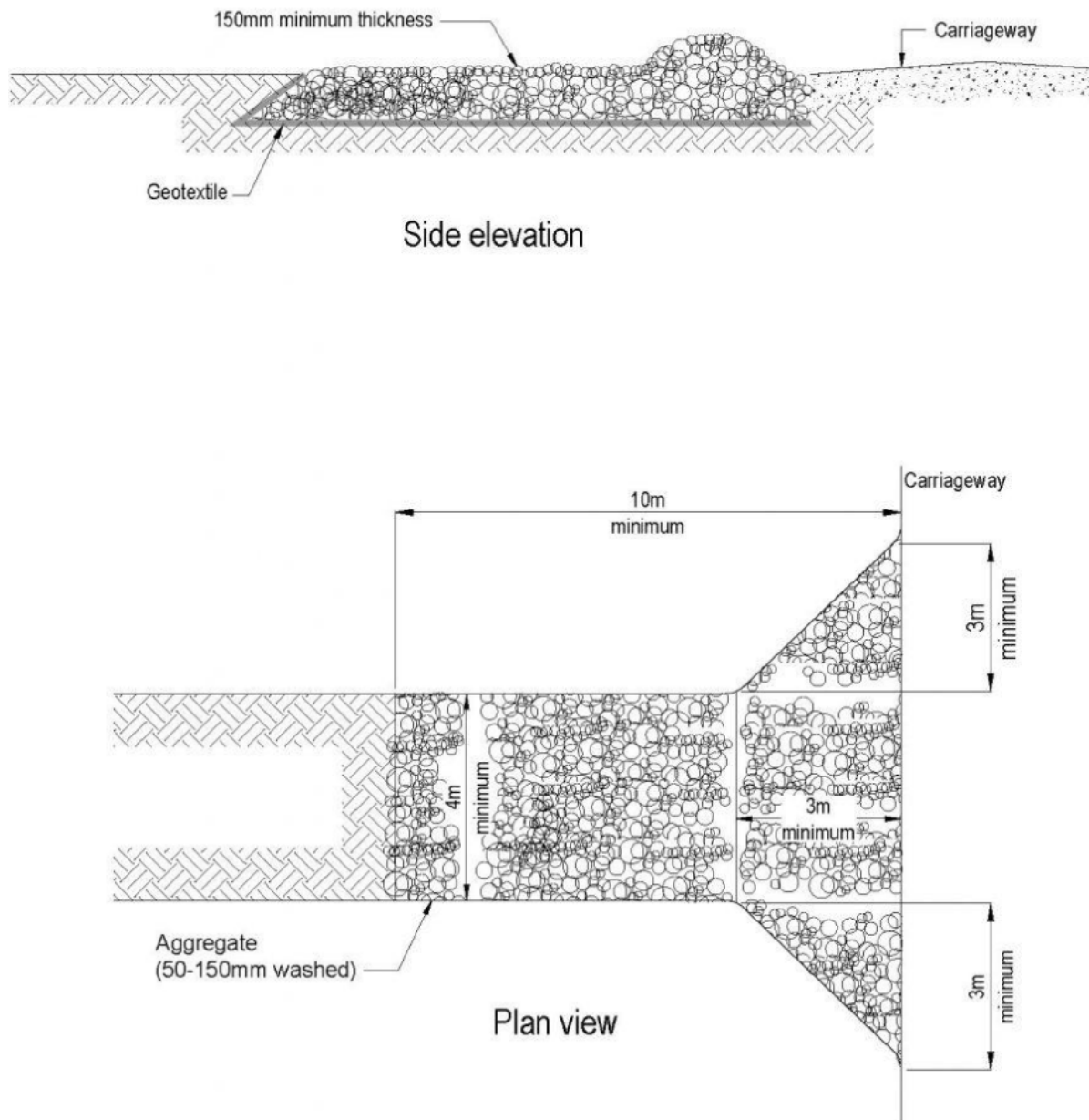


Figure 6: Stabilised Entrance Detail

(2) Clean Water Bunds and Diversion Channels

Clean water bunds (CWB's) will be installed at various locations across the site. These ensure runoff is diverted away from the site without entering the earthworks area.

The clean water bund is to follow typical details, installation and maintenance requirements outlined in the *Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region Guideline Document 2016/05 (GD05)* (pp. 38-41). A detail can be seen in Figure 7 below.

Refer to Appendix B for minimum swale dimensions.

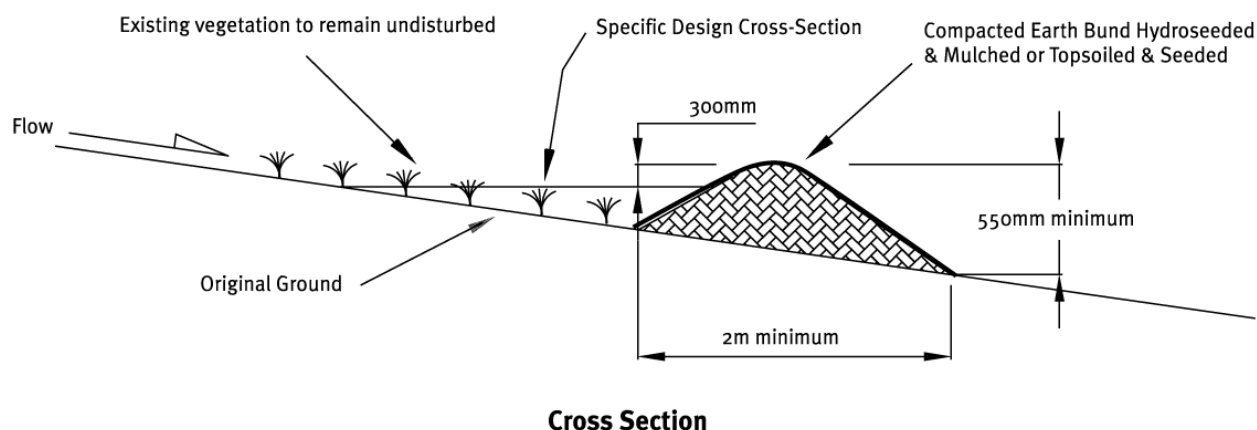


Figure 7: Clean Water Bund Detail

Other options for diverting clean water include dug diversion channels. For these when longitudinal grades are over 2% the drain is to be lined with erosion-resistant materials such as spray-on copolymer or needle-punched fabric.

An adequate outlet is required for each diversion. This may be a rip-rap, geotextile, vegetated or paved area or a stable watercourse.

Maintenance requirements are as follows:

- Conduct weekly inspections of the diversions, after each instance of rainfall, and during extended periods of rainfall to identify signs of scour and potential breaches. Swiftly address any issues to ensure the preservation of the design capacity.
- Regularly eliminate accumulated sediment in the diversion channel, especially in areas prone to overtopping due to insufficient freeboard.
- Examine inverts and outlets regularly to confirm their resistance to scour and erosion.
- Survey for low spots, water ponding areas, the development of tunnel gullies, sediment buildup, and debris blockage.
- Verify the presence of stabilization cover and perform necessary remedial work.
- Exercise caution to prevent damage from earthmoving operations and promptly reinstate the diversion if damage occurs.

Decommissioning requirements are as follows:

- Only remove diversions once the disturbed areas under the clean water diversion are stable.
- Fill, compact, and shape all disturbed areas to match the final landform.
- Stabilize all areas disturbed during the removal. Apply seed and fertilizer and use mulch or erosion-control blankets if needed for protection.

(3) Dirty Water Bunds and Diversion Channels

Dirty water diversions (DWD's) will be installed at various locations across the site. These ensure runoff from exposed earthworks areas is collected and can be treated before it leaves the site.

The dirty water diversions are to follow typical details, installation and maintenance requirements outlined in the *Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region Guideline Document 2016/05 (GD05)* (pp. 47-49). A detail can be seen in Figure 8 below.

The dirty water diversions are sized to convey a minimum of the 5% AEP event plus a 300mm freeboard. Sizing and calculations for these are in Appendix B.

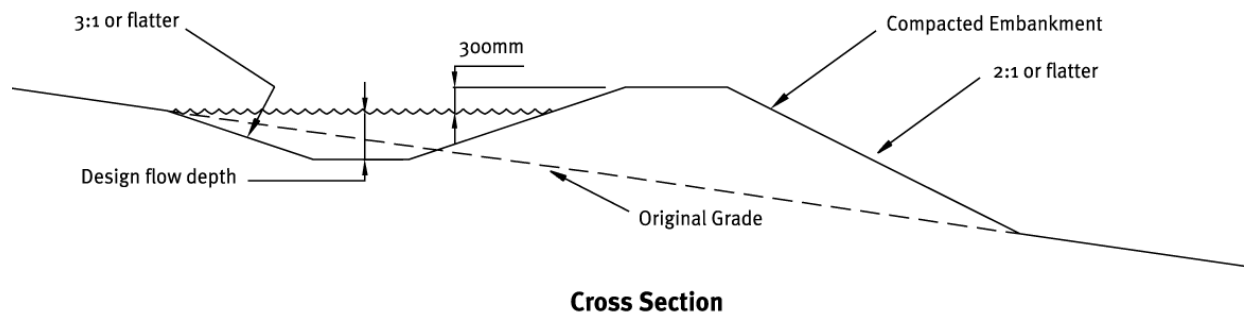


Figure 8: Dirty Water Diversion Detail

Where practicable, the route chosen for structures should avoid existing or proposed service infrastructure, existing or proposed fence lines, and other natural or built features.

Maintenance requirements are as follows:

- Inspect weekly, after rainfall, and during prolonged rain for scour and potential breaches in diversions. Repair promptly to maintain design capacity.
- Remove accumulated sediment in the diversion channel where overtopping risk exists due to insufficient freeboard.
- Check inverts and outlets for scour and erosion; consider geotextile lining if needed.
- Look for low spots, water ponding, tunnel gullies, sediment, and debris blockage.
- Check and maintain stabilization cover as required.
- Exercise caution with perimeter diversions to prevent damage during earthmoving, reinstate if damaged.

Decommissioning requirements are as follows:

- Remove diversions only when all disturbed areas above the dirty water diversion have been stabilised.
- Fill, compact, and shape all disturbed areas to match the final landform.
- Stabilize all areas disturbed during the removal. Apply seed and fertilizer and use mulch or erosion-control blankets if needed for protection.

(4)Decanting Earth Bunds

A decanting earth bund may be installed at the lowest point prior to discharge for the southernmost major earthworks area. These ensure dirty water from exposed earthworks is treated prior to discharge. Although this only proposed should small earth worked areas not freely soak away via localised small soakage pits.

The decanting earth bunds are to follow typical details, installation and maintenance requirements outlined in *Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region Guideline Document 2016/05 (GD05)* (pp. 106-112). A detail and sketch can be seen in *Figure 9* and *Figure 10* below.

Sizing and calculations for these are in Appendix B.

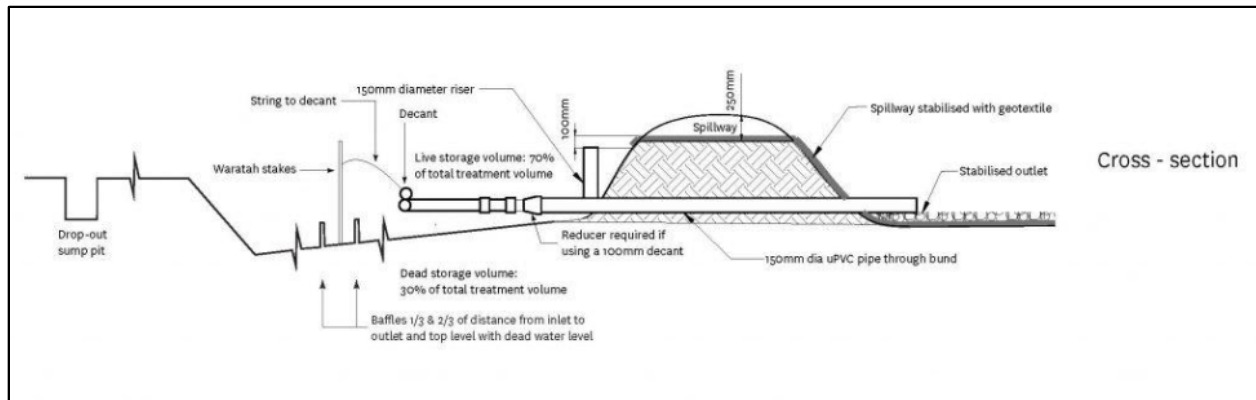


Figure 9: Cross Section of Decanting Earth Bund

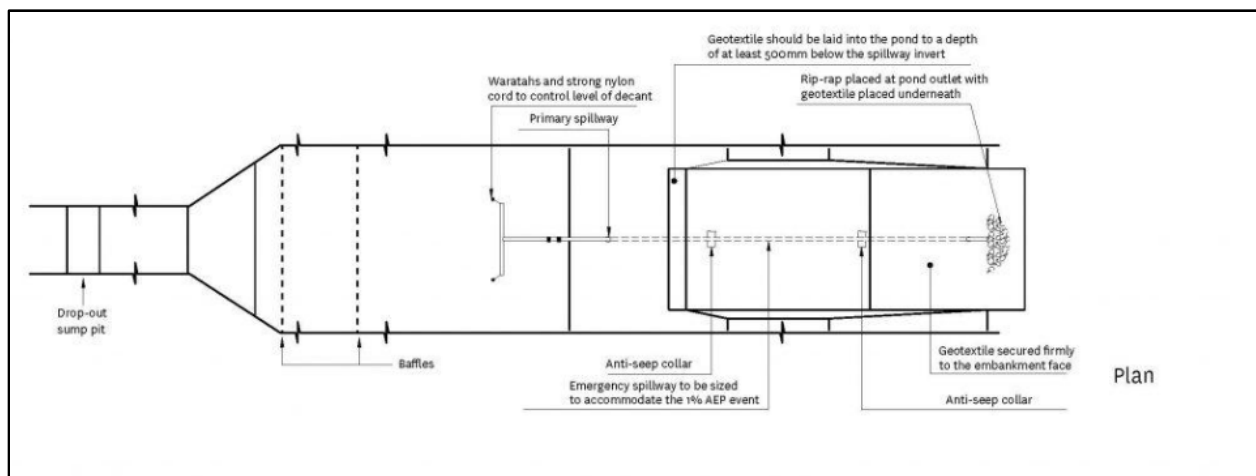


Figure 10: Plan of Decanting Earth Bund

Maintenance requirements are as follows:

- Inspect DEBs daily and before and after each rainfall event.
- Clean out DEBs before the volume of accumulated sediment reaches 20% of the total DEB volume. To assist in gauging sediment loads, consider installing a marker post
- Clean out DEBs with high-capacity sludge pumps, or with excavators (long reach excavators if needed), loading onto sealed tip trucks or to a secure area
- The ESC Plan should identify disposal locations for the sediment removed from the DEB. Deposit the sediment in such a location so that it does not lead to a direct discharge to receiving environments. Stabilise all disposal sites as required and approved in the site's ESC Plan
- Immediately repair any damage to DEBs caused by erosion or construction equipment.
- Use outlet pipes to discharge directly to streams or overland flow paths via 150dia non-perforated Novacoil if necessary.

The decommissioning of the DEBs should only occur once the contributing catchment has been fully stabilised or alternative appropriate sediment retention devices have been installed.

The following steps should be followed:

- Dewater the DEB (refer Section G1.0)
- Remove and correctly dispose of all accumulated sediment
- Remove fabric, concrete, pipes, and other construction materials.

- Backfill the DEB and compact soil, re-grade as required
- Stabilize all exposed surfaces.

(5) Sediment Retention Pond

Sediment Retention Ponds (SRP) are proposed to cater for the overall development site, ensuring water from exposed earthworks is treated prior to discharge. Soakage basins & capacity are also proposed to allow increased sizing of the proposed sediment ponds.

The sediment retention pond is to follow typical details, installation and maintenance requirements outlined in *Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region Guideline Document 2016/05 (GD05) (pp. 100-104)*. With an increase in typical sizing where possible on flat areas with site soakage, due to the subgrade conditions.

The sizing of the ponds have taken into consideration site specific rainfall intensities as follows;

Ponds catered for 20 year ARI (5% AEP) RCP8.5 (2031-2050) 24 hr storm.

Emergency spillway catered for 100 year ARI (1% AEP) RCP8.5 (2031-2050) 24 hr storm.

Further soakage testing is proposed at the locations of the SRPs to demonstrate further location specific soakage capacity and suitability for the increased pond sizes.

Sizing and calculations for these are in Appendix B.

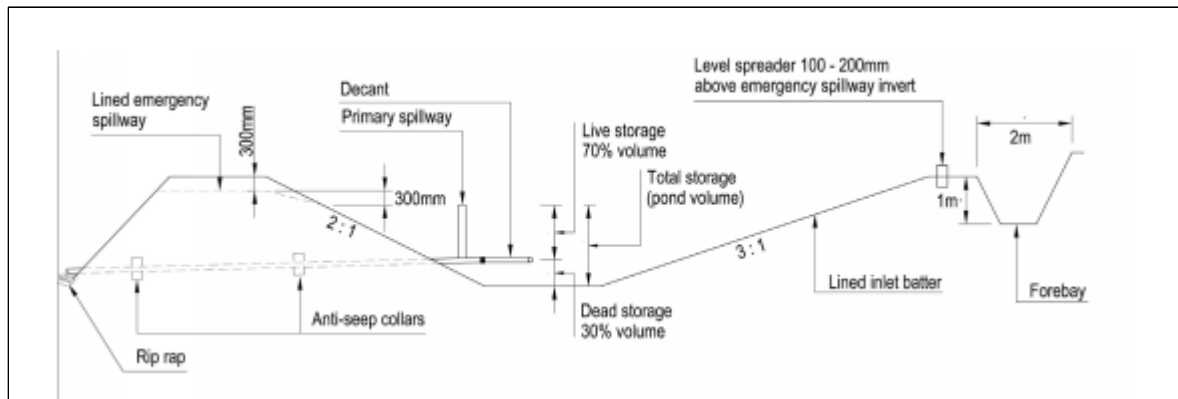


Figure 13: Cross Section of Erosion and Sediment Control Pond

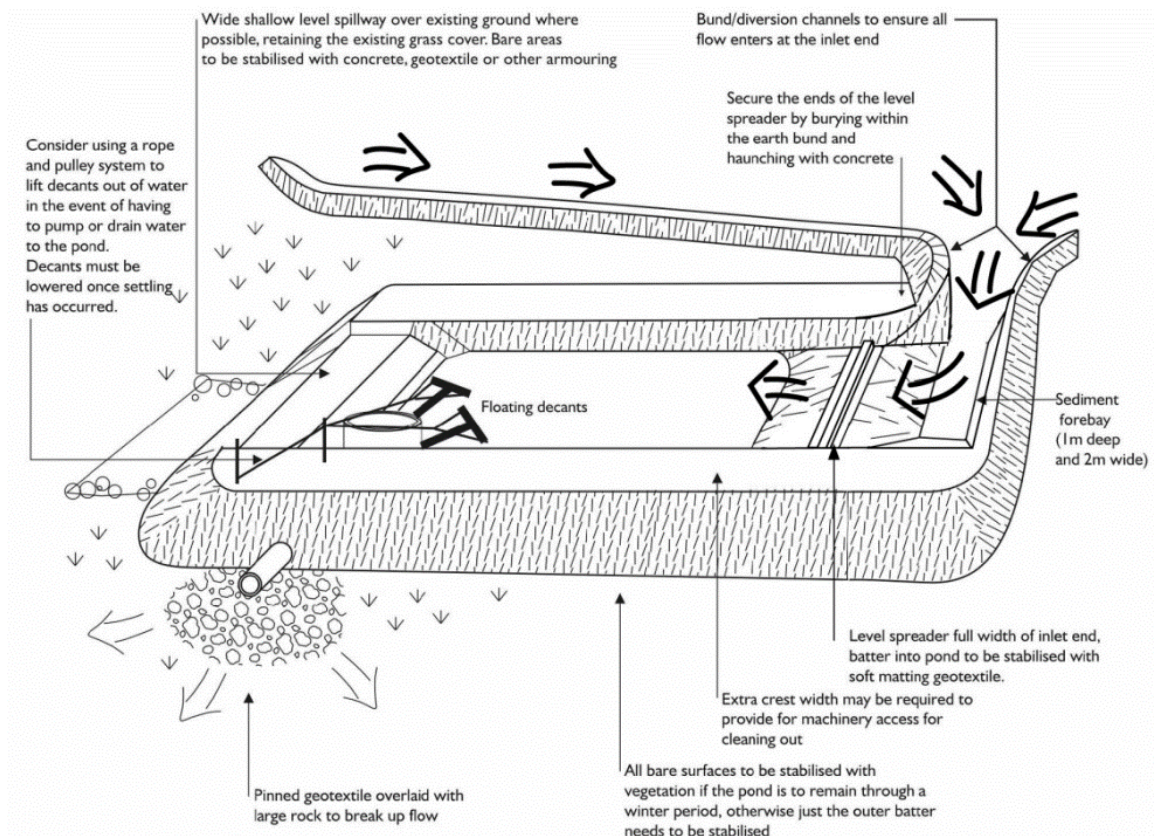


Figure 14: Schematic of Erosion and Sediment Control Pond

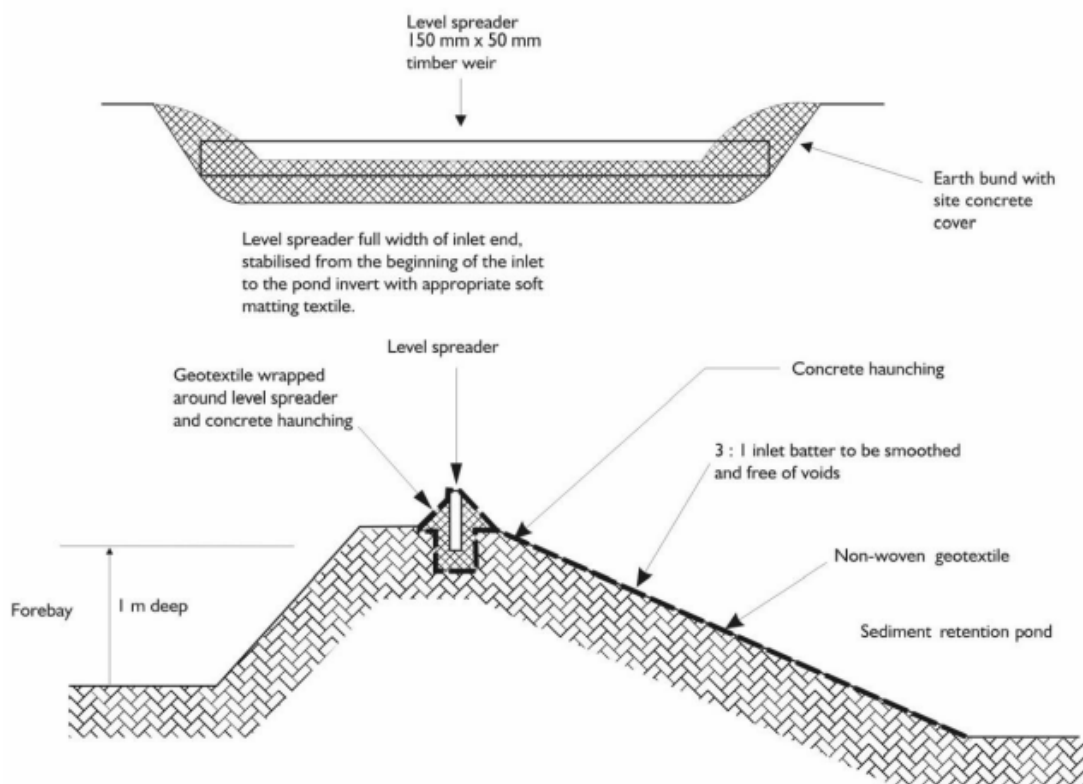


Figure 15: Level Spreader Detail

Maintenance requirements are as follows:

- Inspect SRPs daily and before and after each rainfall.
- Clean out SRPs before sediment reaches 20% of the total volume, using high-capacity sludge pumps or excavators loading onto sealed tip trucks or secure bunded areas.
- Ensure constant access to the forebay for sediment removal; clean it after every runoff event with evidence of sediment deposition.
- Identify disposal locations in the ESC Plan, depositing sediment away from direct discharge to receiving environments. Stabilize disposal sites as per the ESC Plan, with all-weather access for desilting, especially in winter.
- Swiftly repair any damage to SRPs caused by erosion or construction equipment.
- Use outlet pipes to discharge directly to streams or overland flow paths via 150–300dia non-perforated Novacoil if necessary.

The decommissioning of the DEBs should only occur once the contributing catchment has been fully stabilised or alternative appropriate sediment retention devices have been installed.

The following steps should be followed:

- Drain the pond.
- Dispose of accumulated sediment properly.
- Remove fabric, concrete, pipes, and other construction materials.
- Fill the pond, compact the soil, and re-grade as needed.
- Stabilize all exposed surfaces.

(6) Soakage Ponds

The existing soils & underlying subgrade materials are described and covered in detail in the Kirk Roberts Borehole Logs. Glacial till (Silt & Sand) overlying outwash gravels and schist rock are the predominant type through the site.

Soakage testing has been undertaken across the site, with rates between 0.020 to 0.230 m³/hr-m². These rates and the variable nature of the results mean that soakage is not feasible on this site.

(7) Drop out pits

Drop out pits are an effective measure in the Otago region incorporating soakage where possible as well as allowing heavier coarse sediments to drop out minimising sediments entering the sediment ponds and/or primary soakage ponds.

Drop out pits are to be installed within the DWD's and prior to any pond.

Drop out pits are to be cleaned prior to and after any rain events.

(8) Super Silt Fence & Standard Silt fencing

Super Silt Fences will be installed site wide, further from the extents of the earthworked area as a secondary control measure. They may also be used across various areas throughout the site as works progress (i.e. around significant stockpiles if present). Silt fences are used for sediment control for small catchment areas that cannot be effectively captured and treated with other methods.

The Super Silt Fence is to follow typical details, installation and maintenance requirements outlined in *Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region Guideline*

Document 2016/05 (GD05) (pp. 112-119). A detail and sketch can be seen in *Figure 16* and Figure 17 below.

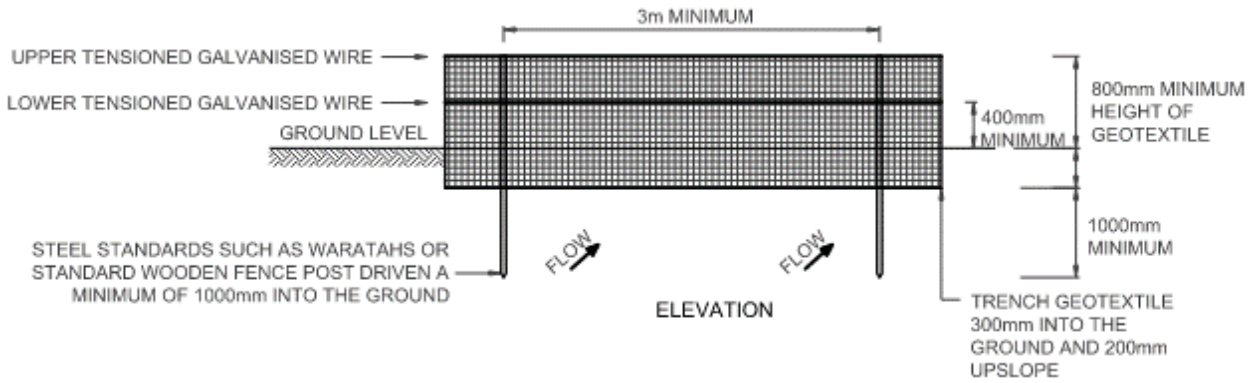
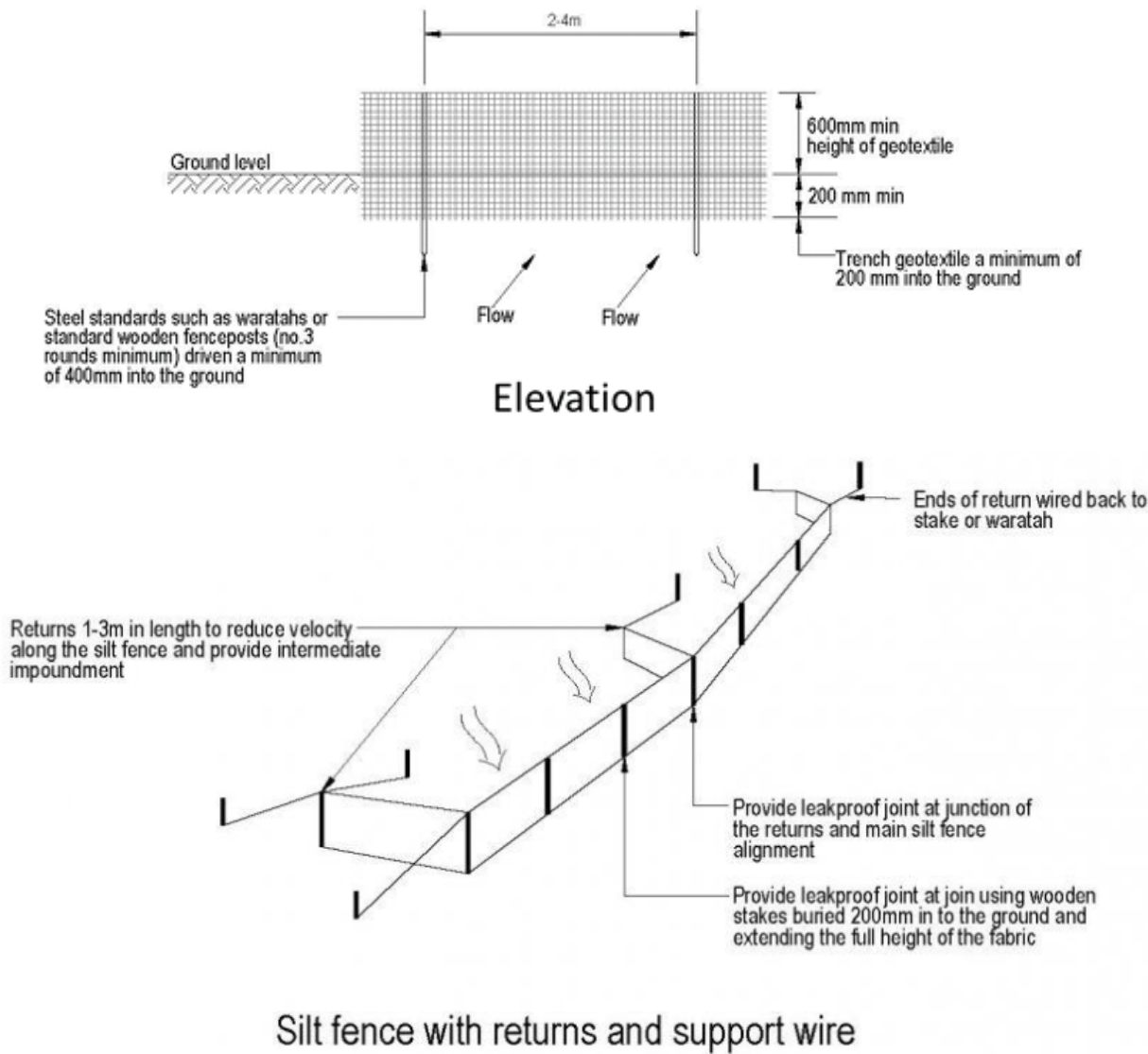
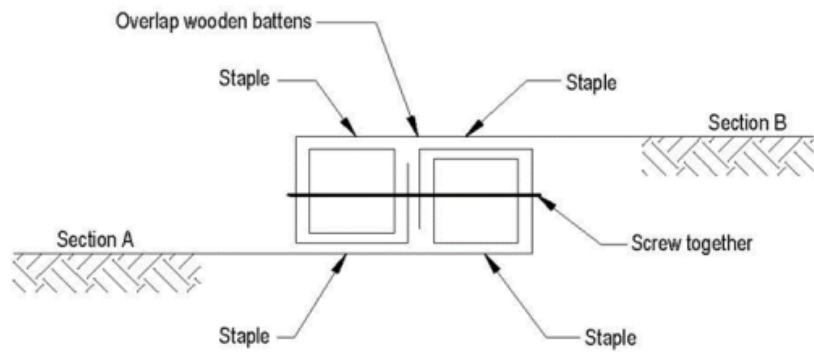


Figure 16: Super Silt Fence Elevation





Standard fabric joint

Figure 17: Standard Silt Fence Drawing

Silt fence spacing requirements can be seen in table 4 below.

Table 11: Silt Fence Guidelines

Slope steepness	Slope length (m) (maximum)	Spacing of returns (m)	Silt fence length (m) (maximum)
Flatter than 2%	Unlimited	N/A	Unlimited
2-10%	40	60	300
10-20%	30	50	230
20-33%	20	40	150
33-50%	15	30	75
>50%	6	20	40

Maintenance requirements are as follows:

- Check for damage including rips, tears, bulges in the fabric, broken support wires, loose waratahs, overtopping, outflanking, undercutting, and leaking. Make any necessary repairs as soon as identified. Cleaning the geotextile with a light broom or brush may be required.
- Check at least once a week and after each rainfall.
- Remove sediment deposits as necessary (prior to reaching 20% of height)
- Dispose of sediment to a secure area to ensure it does not discharge to the receiving environment.

Decommissioning requirements are as follows:

- Do not remove silt fence until upstream catchment fully stabilised.
- Remove accumulated sediment prior to removing fence.

- Remove silt fence, backfill trench, regrade and stabilise the disturbed area.

(9) Contour Drains

Contour drains (CD's) will be installed as required to capture and carry water to the dirty water bunds, breaking up the catchment and reducing high velocity concentrated flows. These will be installed as part of response to forecast significant rainfall events. More detail is in *Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region Guideline Document 2016/05 (GD05)* (pp. 47-50). These are to have a simple 'u-shaped' profile. Refer to Figure below.

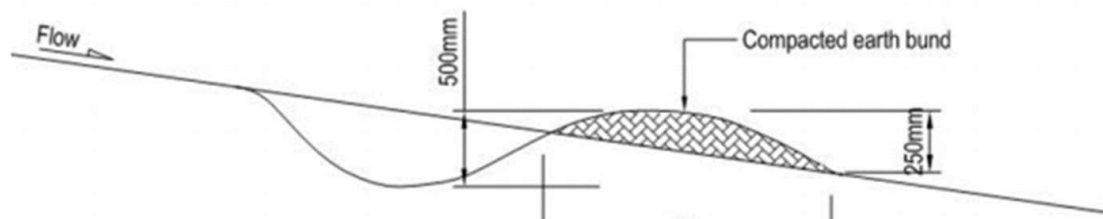


Figure 18: Example Contour Drain

Drop-out pits will be located at the intersections of several dirty water flow paths, and in the dirty water channel.

Drop-out pits serve as a precautionary measure along dirty water diversion channels, serving two main purposes:

- Primarily, they function as velocity dissipaters, facilitating the smooth merging of two intersecting channels.
- Additionally, they allow the heavier coarse sediments to settle out, preventing them from entering sediment retention devices and reducing the burden on these devices. Moreover, they are easier to clean compared to sediment ponds.

These drop-out pits will ideally be up to 1 meter deep and have a minimum width of 1 meter. Adjustments in size are possible based on specific needs, and lining options are available to prevent scour of the pit.

(10) Existing Stormwater Pipe Removal and Management

Although not identified within the developments extents. Should any existing pipelines be identified and to ensure effective stormwater management during the earthworks phase and to address any concerns regarding the conveyance of clean stormwater, the following approach will be adopted:

The first step will be to install the proposed permanent stormwater management system including outlet, prior to any earthworks in the vicinity of the existing pipe. This will ensure that the new system is fully operational and capable of managing all stormwater flows before the existing infrastructure is disturbed.

Once the proposed system is in place, the existing stormwater pipe will be carefully diverted into the newly installed system. This will ensure a continuous and controlled conveyance of stormwater flows off-site, with no interruption or risk of water pooling within the development area during construction.

The new stormwater system is designed to effectively manage and direct all stormwater flows away from the site, complying with council standards. This permanent solution ensures that clean stormwater will be handled appropriately throughout the construction process and beyond.

The Erosion and Sediment Control plan supports this methodology and will mean earthworks on site can proceed unencumbered including the removal of the existing SW lines

By implementing this strategy, we can mitigate any potential risks related to stormwater during earthworks and provide a seamless transition from the existing system to the proposed

stormwater management network.

(11) Temporary culverts

Culverts shall be used onsite to divert and convey stormwater through accessways, & crossing points. All temporary culverts are to be confirmed with the Engineer and Environmental Advisor. As a minimum all temporary culverts should be sized as minimum 300mmØ, unless otherwise stated.

Rip-Rap rock laid on Geotextile apron, shall be included for outlet erosion control & prevent any scouring.

(12) Check Dams

Rock check dams will be strategically positioned primarily to diminish the water velocity within dirty water diversion channels. Additionally, they will serve to trap coarse sediment. Check dams will be situated at intervals of every 25 meters on slopes with less than a 7% grade and every 10 meters on channel sections where the slope exceeds 7%.

More detail is in *Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region Guideline Document 2016/05 (GD05) (pp. 50-54)*. Also, refer Figure 19 below.

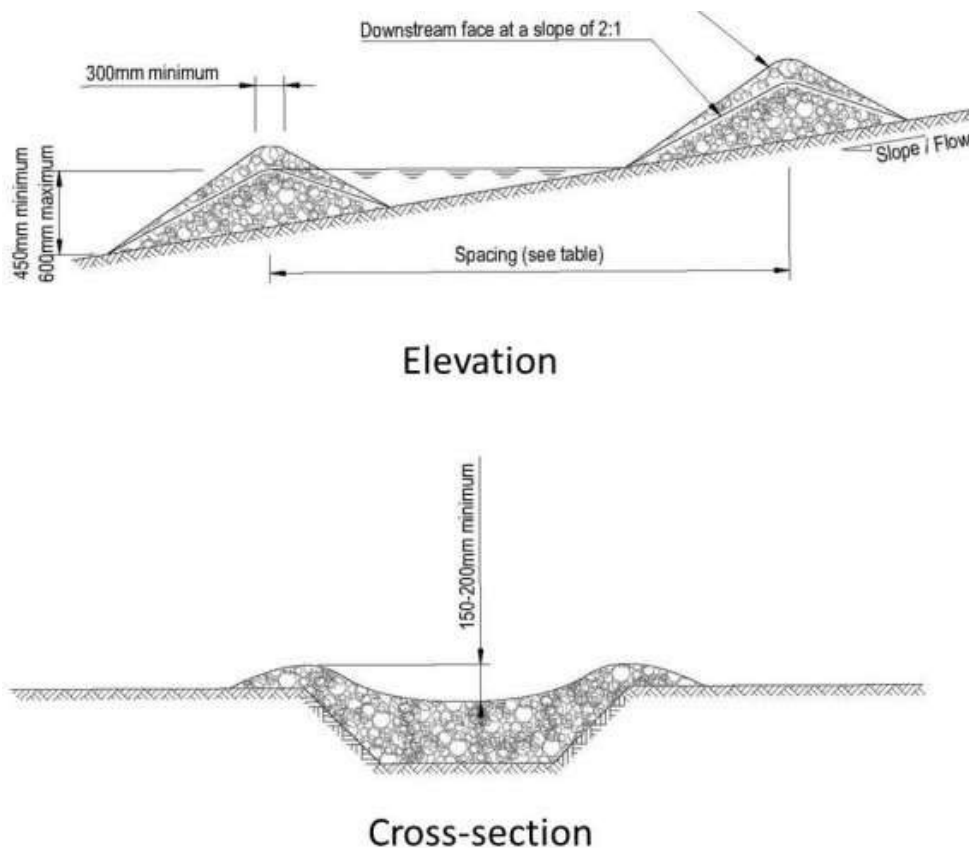


Figure 19: Check Dam Detail

(13) Stormwater catchpit & sump inlet protection

Adjacent stormwater (SW) network sump catch pits shall be protected via silt socks and a geotextile filter bag to protect the SW network from possible sedimentation.



Figure 20: SW sump catch pit protection example with filter bag & silt sock

10.2. Dust

Dust from construction can lead to health or ecological risks and create a nuisance for the public, neighbouring properties, and environment.

The Contractor shall be responsible for managing construction works to appropriately avoid and mitigate effects from dust. They must ensure all reasonable and practical measures are undertaken to avoid any dust moving beyond the site boundaries.

Activities that are likely to cause dust on-site include:

- Disturbance of soil particularly during bulk earthworks
- Vehicle movements (especially at higher speeds)
- Large areas of exposed soil without staging
- Lack of ground covers and temporary stabilisation
- Removal of vegetation, and slow revegetation

The predominant winds that the site experiences are from the West to South West.

To minimise and control dust the following measures are to be taken:

- Stripping and disturbance of ground will be limited when practical.
- On completion of cut/fill areas revegetation is to be carried out as early as possible to allow growth to establish.
- Grass-seed topsoil stockpiles where possible to establish growth until re-spreading.
- Reduce vehicle speeds onsite.
- Any temporary stockpiles on site to be regularly watered for dust suppression. Any longer-term stockpiles (8+weeks of storage) to be covered in geofabric, hydro seeded or covered in polymer film.
- Checking weather forecasts for future high wind, hot temperatures and dry days.

In the drier and windy conditions, watering of the site will be required on a regular basis through the day.

- Water will be obtained from an suitable source for the water cart until permanent water supply is established onsite.

- Sprinklers will be used to water revegetated areas once an onsite water supply is established. This is to be spread across the site and provide adequate cover.
- A water cart will be used onsite to dampen all haul roads, stockpiles, and disturbed ground regularly.

Application of a Polymer may also be used as an alternative to watering, depending on site constraints.

Dust formation will be monitored visually onsite during the periods of operation. In the event of high winds where cast dust is visible all works contributing to the dust must cease until dust suppression is implemented and deemed controlled.

Any complaints are to be dealt with in a pro-active manner and all practical steps taken to minimise disturbance, with an investigation future response to follow to prevent reoccurrence.

10.3. Vibration

The Contractor shall always take reasonable and practicable management measures to mitigate:

- Vibration effects associated with the project to minimise Environmental Nuisance effects on Sensitive Environmental Receptors outside of the site.
- Environmental effects to buildings, structures, services, and utilities within or beyond the boundary of the site in accordance with DIN 4150-3:1999 Effects of vibration on structures.

Some construction vibrations are inevitable, and the site currently is close to the existing residential area; however, the vibration generated from construction works will be managed properly under standard NZ6803 conditions. Therefore, any construction vibration reaching the residence will be in accordance with the permitted limit. Thus, at this stage no special Vibration Management Plan is required.

Vibration must be controlled and managed to reduce its impact and nuisance on the surrounding environment. Expected consent hours of work are in Section 9.1. As such, potential vibration generating activities will be limited to these time frames.

Compaction methods will be tested prior to the bulk fill works with a geotechnical engineer. If alternate methods of compaction are practical which could limit vibration caused, these will be explored.

10.4. Contaminated Sites

The Contractor shall be responsible for work to mitigate the risks of environmental effects from contaminated sites within the work site. The Contractor shall always take reasonable and practicable management measures to manage known contamination sites to avoid and prevent the spread of contaminants either within the site or beyond the boundary of the site. Management shall be in accordance with the Ministry for the Environment's User's Guide, National Environmental Standards for Assessing and Managing Contaminants in Soil to Protect Human Health.

As a minimum where unidentified contaminated material is encountered on-site, the Contractor is required to notify the Project Manager, Environmental Advisor, QLDC and ORC within 24 hours of discovery. Works in the area affected by contamination can only recommence once any required approvals are obtained.

Following recommendations from the DSI, the contractor is to carefully follow the procedure outlined in the specific remedial action plan (RAP) and the contaminated site management plan (CSMP). These separate documents are to be supplied prior to works planning and be incorporated into the sites overall inductions to all effected or related personnel.

Areas of contamination are to be isolated from other areas as to avoid any cross contamination and all machinery and personnel to follow the guidance from these documents for implementation onsite.

10.5. Water Quality

The Contractor shall be responsible for the management of the water quality to ensure that there are no adverse environmental effects on the waterbodies into which the site discharges.

Waterbodies

- On site wetlands and ponds
- Water race running through site
- Kawarau River (approx. 500m south of the site boundary)

Effects on Waterbodies

Whilst the primary sediment ponds (SRPs) are proposed to be discharged to open stabilised ground, or a water irrigation race, sediment concentration of the discharge from the SRPs varies throughout a rainfall event. Short-term exceedances may occur during extreme events but will be managed through adaptive controls and reporting. Turbidity and clarity are well-understood proxies for water quality within sediment control devices and can be easily measured in real time along with the other site inspection and management activities that will occur during or immediately after a storm event.

The SRPs should only discharge when at capacity, during or following significant rainfall events, and allow soakage & evaporation to occur in dry spells, being common in the summer months of central Otago.

The most important element of ensuring that sediment and other contaminant effects are acceptably minimised, is the diligent implementation of the ESCP, water quality management plan and supporting systems through staff inductions and device design, construction, maintenance and reporting.

Water Treatment

Upon further analysis of the subgrade materials, which vary from sandy silt to silty sand and schist rock, further investigation and/or testing will be undertaken to determine if chemical treatment is required to treat sediment laden dirty water.

Chemical treatment may be required given the restricted area suitable for basins and the presence of glacial silt. Should chemical treatment be required, a chemical treatment plan will be produced and submitted as an update to this EMP, prior to construction.

Discharge Criteria and Monitoring

Water quality management measures are designed to achieve discharges from site that are compliant with the QLDC and ORC guidelines below in 5. This is an important part of protecting the environmental, cultural and recreational values of downstream water bodies.

The discharge criteria apply to any flows moving that could enter waterbodies, stormwater networks within or adjacent to the site, or leave the sites environmental management devices.

Table 12: Discharge Criteria and Testing Procedures

Parameter	Criteria	Testing Process
Total Suspended Solids	<50 mg/L suspended solids or 100 NTU	Laboratory analysis for suspended solids or using a turbidity meter for NTU. Using a turbidity meter is the preferred method of testing as results are instantaneous and immediate action can be undertaken, rather than laboratory analysis which can result in delays in getting information back to site.
pH	Stable pH reading between 5.5 and 8.5	Done through pH test meter or test strips. Testing is only done if chemical treatment is used.
Hydrocarbons, Tannins, Paint	No visible trace	Visual inspection by contractor and photos. Looking for any discolouration or darkening of water, odours and oily films on water.
Waste	No waste or litter visible	Visual inspection by contractor and photos

Since the site has been identified as a high-risk site the Contractors appointed Environmental Representative is to implement the following (but not limited to) monitoring programme:

- Taking the samples and undertaking testing. Proposed sampling locations are shown in Appendix A.
- Every sample must be kept on-site for 24 hours after the sample was taken in suitable conditions, and testing logged for reporting & compliance.
- The timing of the discharge monitoring should occur prior to dewatering sediment retention devices or during rain events when 'controlled' or 'uncontrolled' discharge crosses the boundary of the site.
- Sampling is to be done during the peak of rainfall event, or if this is outside of working hours, as soon as possible the following morning.
- Water quality monitoring results are to be recorded by the Contractors appointed Environmental Representative using the form provided in Appendix F. Results from the monitoring are to be kept on-site and provided to QLDC and ORC on a monthly basis if requested.

If there is any confusion on monitoring requirements or testing methodology the Environmental Representative is to contact the SQEP immediately.

Non-Conformance

For any monitoring result that does not conform to the water quality criteria, the Environmental Representative shall notify the SQEP immediately. The SQEP will then:

- Report the non-conformance to QLDC and ORC including the water quality parameter that exceeded the criteria and level that was recorded.
- Where the discharged water was as the result of the erosion and sediment controls failing or exceeding capacity the following should be reported:
 - The depth of rain recorded at the nearest meteorological station that collects daily rain data.
 - Size of the Rain Event Average Recurrence Interval (ARI6).
 - Duration of the Rain Event.
- Identify the cause and develop and instruct corrective actions such as improved work procedures or management measures to improve water quality and prevent re-occurrence of monitoring non-conformances.

Water Quality Risks and Actions

Erosion and Sediment Controls for the earthworks are implemented and maintained as in Section 10.1 above, which will act to mitigate these risks.

Other water quality risks and methodologies to mitigate these are as follows. These actions are always required.

Table 13: Additional Water Quality Risks and Mitigations

Risk	Mitigation
Fuels and Chemicals from works	Plant and equipment on site are inspected regularly to ensure an acceptable standard with no leaks.
Washdown of vehicles and concrete trucks and mixes	Pits provided are to be provided for any runoff from washdown to travel to. These are to be located away from overland flow paths. These are to be used for any washdown activities. The Site Supervisor and Environmental Representative are to make sure these are in place and are

	to instruct all relevant staff on their location and use.
Runoff from stockpiles	Stockpiles of any organic, erodible, or hazardous material are to be located away from overland flow paths and are not to be placed within 30m of a watercourse or major drainage line. Silt fences are to be installed at the downstream slope of any stockpiles deemed to be a significant erodibility risk by the Environmental Representative or SQEP due to the materials or length of time to be exposed. Any stockpiles containing silts and clays are to be covered before significant rain events.
Flocculants/Coagulants	Flocculants & Coagulants are to be only used if required. If flocculation is undertaken on-site, the consent holder shall select, store, apply and monitor in accordance with best practice guidelines. Testing as per Section 7.5. Application to be as per the Chemical Treatment Plan Removal of sludge following manufacturer's advice and instructions.

Water Quality Sampling General Procedure

The procedure for collecting a water sample is to include collection of water at any water outlet location onsite or as directed by the SQEP. Water samples are to be carefully collected in a container with a clear label stating site name, location, date & time undertaken as a minimum. The container is to be filled with enough water for testing purposes. Water sample containers will be supplied, if containers are not readily available or if undertaken by the contractor a minimum of 1 litre is to be taken unless advised by the SQEP & clearly labelled for later testing.

Sampling within waterway (stream, creek, race, river, lakes & ponds);

Collection of a water sample within a water course should be taken at the upper middle/centre of the waterway, generally within the top 200mm or upper 1/3 depending on available depth.

Care must be taken as to not disturb the water way in the process of obtaining the sample, which may impact test readings. E.g. if taking sample in water way take sample upstream.

Sampling a discharge (at discharge point of spillway, SRP outlet or breach area);

Collection of a water sample at a discharge location at the specific outlet, generally at the upper water levels. In breach locations care must be taken as to not suck or scrape the ground whilst obtaining the sample which may impact test readings.

Measuring for key criteria;

The Environmental Rep & Advisor/SQEP will induct site staff on measuring results and specific turbidity testing, depending on the device type being used.

Measuring pH for site staff is recommended to be undertaken via litmus paper testing strips following the specific procedure & measurable chart.

Water Quality Contingency Plan & Incident Procedure

Should it be identified that the water quality criteria has not been met or concern is raised that water quality may or does exceed this criteria, the following procedure is to be followed;

1. Contact the Environmental Advisor & Project Manager as soon as possible and without

delay.

2. Associated construction works to cease, and attention raised onsite with Environmental Rep & site staff to reduce any further environmental risks.
3. Water sample taken & tested against quality criteria.
4. ORC and QLDC to be notified & incident procedure followed and carried out.
5. If water sample is outside criteria range, then a sample may need to be sent to a local Laboratory for further analysis. Samples are to be kept in safe & secure manor. The Environmental Rep will collect and send to the lab upon following incident procedure & advising on conditions. This will be co-ordinated in conjunction with the Environmental Advisor.
6. Any corrections, remedial works and improvements implemented.
7. SQEP to review proposals and update documents as required
8. Formal reporting made available to appropriate project personal & relative council (ORC/QLDC).
9. Outcomes discussed in depth with site staff to reduce any further risks.

10.6. Chemicals and Fuels

The Contractor holds the responsibility for overseeing the handling of all chemicals and fuels on the site to prevent any detrimental environmental impact, including off-site environmental disturbances. Before commencing work, a Chemical and Fuel Management plan must be submitted to the SQEP and council for approval.

In cases where the nature of the work necessitates approval for chemical storage, it is the duty of the Consent Holder to secure and adhere to the necessary approval requirements.

Performance Requirements

The Contractor is required to guarantee the presence of spill response equipment on the site for emergency situations. The selection of spill response equipment shall take into account the site's location, topographical characteristics, and the nature and volume of chemicals and fuels stored on-site.

In the event of spills, leaks, or discharges, the Contractor must promptly address and remediate any contamination, restoring the affected area to a condition similar to its state before the contamination occurred.

Refuelling of machinery shall conform to the following requirements:

- Occur at least 30m from a waterway, ideally by the site entrance.
- To take place in a flat and stable area.
- Fuelling activity to be always supervised.
- Hoses to be fitted with a stop valve at the nozzle end.

Machinery shall be maintained to minimise the leakage of oil, fuel, hydraulic and other fluids.

The Contractor shall provide before commencing works on site:

- List of chemicals and fuels stored onsite in volumes greater than 2000L, the maximum quantity to be stored at any one time and the storage location.
- Type and number/size of spill response equipment stored onsite.
- Management measures, including containment, to avoid contamination or discharge to land or water.
- Details of any approvals held about fuel and chemical storage or use.
- Contingency plan in the event of a contamination or discharge.

- Confirmation of the performance requirements above.

This needs to be submitted and approved by the council before the commencement of any work on site.

Storage of Fuels and Chemicals

The table below is a list of chemicals and fuels anticipated to handled/stored on site.

Table 14: List of Fuels and Chemicals

Types of fuel or chemical	Use	Storage area on site	Amount
Fuel/Diesel	Construction equipment	Fuel trailer kept at site entrance	Maximum 2000L at any one time
Oil	Construction equipment	Only on site to top up construction equipment	Maximum 20L
Grease/Lubricant	Construction equipment	Grease gun in toolboxes in all machines	5L at any one time
Paint	Spot marking	In diggers and other equipment	2L at any one time

Except for the above list, no additional chemicals are expected to be stored on-site, and any storage of such chemicals requires approval from the SQEP.

Spill management

If anyone on site encounters a spill, they are to find out where it's coming from and check if it can be stopped safely. The Site Supervisor is to be notified immediately. Safeguard waterways by putting earth, sand, or absorbent material around stormwater entry points and along water bodies to prevent pollution until the spill kit is found. Utilize the spill kits to control and clean up the spill. Remove all contaminated soil to an approved facility. As soon as the spill kit equipment is used, it is to be replaced immediately with a new one.

Spill kit equipment suppliers' users' manuals are to be always kept on site and are to be reviewed during the ESI process.

Refer table below for details on the standard spill kit to be maintained on-site.

Table 15: Spill Kit Required

Spill Kit Type	Quantity	Location
240L Oil and Hydrocarbon Spill Kit	1	Site storage yard
240L Chemical Spill Kit	1	Site storage yard
30L Mobile General Purpose Spill Kit	1	Plant Machinery

10.7. Noise

The Contractor shall always take reasonable and practicable management measures to avoid and mitigate effects from noise associated with construction works. The Contractor shall ensure

that all works are undertaken in accordance with the noise limits specified in the Zone Standards and onsite noise management practices to be adhered and must comply with NZS 6803:1999.

Construction noise is inevitable, and the site currently is close to existing residential area; however, the noise generated from construction works will be managed properly under standard NZ6803 conditions. Therefore, any construction noise reaching the residence will be in accordance with the permitted limit. Thus, at this stage no special Noise Management Plan is required.

Below is a list of basic measures that will be taken to ensure minimal disturbance:

- No construction machinery will operate outside the hours of work stated on this Site Management Plan and described in Resource Consent Conditions.
- All noise affecting surrounding public or neighbours must be managed practicably.
- Stockpile bunds to be used as buffer where practicable.
- All construction machinery must have an adequate muffler installed and be regularly serviced.

Complaints will be dealt with first-hand by the site construction manager and pro-actively followed up on. There will be a complaint register of record detailing investigation and response.

10.8. Waste

The Contractor is responsible for the management of all wastes within the site so as not to cause adverse environmental effects (including environmental nuisance off site).

Performance Requirements

- The Contractor shall ensure that all construction waste has been removed from site. No waste shall be burnt onsite.
- The Contractor shall provide bins at common areas at all times. Bins shall be fitted with lids and serviced prior to being filled. During construction, the Contractor shall maintain the site free of litter and ensure that no litter leaves the boundary of the site or enters any waterway within the site.
- Vegetation waste from clearing and striping, that is free of noxious plants, may be used in conjunction with soil erosion and sediment measures such as brush matting or mulching.

If any waste or rubbish leaves the sites extents, then this will be assessed by the Environmental Representative and Environmental Manager/Advisor whom will assess the situation and after assessing the situation, environmental incident procedures will follow. Site staff will also be advised on the incident to ensure any future risk is minimised.

10.9. Indigenous Vegetation and Protected Trees

The Contractor shall adhere to any limit of clearing specified within relevant resource consents.

Areas of trees and bush contribute to the amenity values in rural and urban areas. They also contribute to landscape quality and are important as habitats for indigenous fauna. Trees and bush also have a function in maintaining and enhancing the quality of the environment by preventing non-point source erosion and retaining soils in place.

The Contractor shall adhere to any limit of clearing specified within relevant resource consents.

The Contractor shall always take reasonable and practicable management measures to avoid disturbance to vegetation or ground surface outside the limits of clearing and to minimise disturbance to vegetation or ground surface outside of the limits of clearing.

An ecological Assessment has been completed, and is to be referred to for protection areas. This is to be discussed and understood prior to any construction onsite.

Specific vegetation and wetland areas are to be marked out and isolated from effects from earthworks.

The Contractor shall install identification markers along the limits of clearing prior to

commencing vegetation clearing and ground disturbance. Identification markers shall be maintained for the duration of the works or at least until works are complete in the adjacent area.

Where works encroach on individual trees or vegetation to be protected/retained, ground disturbance or other works including stockpiling, shall not encroach within the dripline of the tree unless otherwise deemed suitable under the relevant resource consent.

10.10. Ecological considerations.

The implementation of ecological considerations are to be undertaken prior to bulk earthworks commencing.

Any areas left through bulk earthworks are to be inducted on and isolated wherever possible. A site inspection and walk over will be undertaken prior to establishing environmental controls and prior to bulk earthworks to ensure works are safe to commence.

As a minimum where unidentified ecological considerations are encountered on-site, the Contractor is required to notify the Project Manager, Environmental Advisor, QLDC and ORC within 24 hours of discovery. Works in the area affected can only recommence once any required remedials and/or approvals are obtained.

10.11. Cultural Heritage

The Contractor is responsible for appropriate management and protection of Cultural Heritage within and adjacent to the site to avoid any damage or adverse effects to Cultural Heritage from construction works. The works shall be undertaken, and the protection of the Cultural Heritages is to be managed in accordance with the guidelines set by Heritage New Zealand Pouhere Tāonga Act, 2014 (HNZPTA).

According to QLDC Archaeological & Cultural Site database the site has not been identified to have any significant Cultural Heritage. For further details on this please refer to the Archaeological Assessment done by Origin dated 27 January 2026.

It is required that during the daily site walkover, a visual assessment is undertaken to cover the Cultural Heritage aspects and ensure that any accidental items are found.

In the event of accidental discovery, the Environmental Representative is to inform the Site Supervisor and appropriate actions outlined in the Resource Consent Conditions and HNZPTA must be followed.

11. DECOMMISSIONING

Decommissioning of site and environmental controls is not to be undertaken without acceptance by the SQEP who will advise on the proposed change and confirm that the site is safe for decommissioning.

The SQEP will confirm to the contractor that it is suitable to decommission. The contractor is not to proceed without this confirmation.

Generally decommissioning criteria is as outlined within GD05, specifically when all exposed areas are fully stabilised with no erosion risks and grassed areas have achieved 'thick grass sward' or 80% thick grass coverage.



Figure 21: Stabilised grass cover example (GD05 fig.45)

Silt fences (where installed) are to stay intact for the full duration of construction until there is no longer erosion or sedimentation risk. The final removal of silt fences and structures will also include mechanical removal of the waratahs or support posts used for the fences.

Any vehicle tracking externally as a result of decommissioning activities will be cleaned immediately.

12. CONCLUSION

In summary, the EMP proposed for this development serves as a practical guide for environmental responsibility during construction of the project.

It systematically addresses the requirements set by both the Queenstown Lakes District Council (QLDC) and the Otago Regional Council (ORC), providing a solid framework to meet environmental standards and adhere to Resource Consent conditions.

The administrative requirements, including working hours, qualifications of personnel, environmental site induction, and thorough inspection and reporting mechanisms, establish a solid foundation for effective environmental management. The emphasis on immediate response and incident management reflects a commitment to proactive environmental protection and rapid resolution of any unforeseen issues.

The operational requirements outlined in Section 7 delineate specific measures for erosion and sediment control, dust management, vibration control, handling contaminated sites, and maintaining water quality standards. These operational guidelines, coupled with the detailed considerations for chemicals, fuels, noise, waste, indigenous vegetation, and cultural heritage, underscore the EMP's holistic approach.

Acknowledging the ongoing nature of the project, the EMP is designed as a living document, ready for continuous monitoring, regular review, and updates as needed during construction.

13. REFERENCES

Auckland Council. (2016). *Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region*. pp. 1-188 <http://content.aucklanddesignmanual.co.nz/regulations/technical-guidance/Documents/GD05%20Erosion%20and%20Sediment%20Control.pdf>

Queenstown Lakes District Council. (2019). *Queenstown Lakes District Council Guidelines for Environmental Management Plans*. pp. 1-42. <https://www.qldc.govt.nz/media/pf5ez5gf/6a-emp-guidelines-c.pdf>

Otago Regional Council. (2023). *Residential Earthworks in Otago: A guide for developers, landowners, Contractors, and service providers*. pp. 1-55. <https://www.orc.govt.nz/media/14398/residential-earthworks-in-otago-3-2023.pdf>