WINSTONE AGGREGATES

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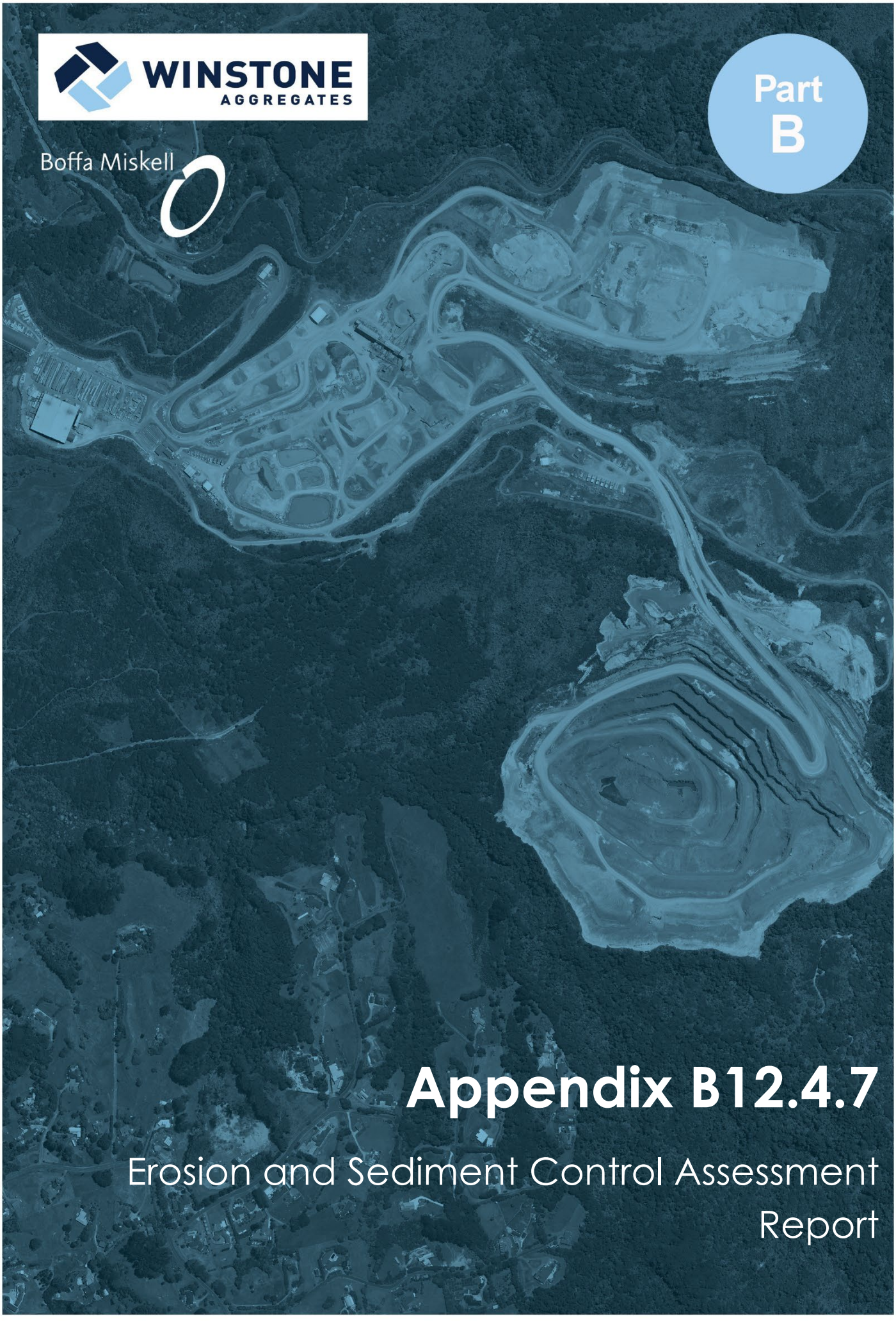
Part B



Appendix B12.4.7

Erosion and Sediment Control Assessment Report

EROSION AND SEDIMENT CONTROL ASSESSMENT REPORT

Hunua Quarry – Substantive Application under the Fast Track Approvals Act 2025

Prepared for

Winstone Aggregates

Prepared by

MPD Environmental Limited

Date

April 2026

Document Control

Revision	Revision Description	Date of Issue
1	ESCP for Substantive Application under the Fast Track Approvals Act 2024	27/03/2026

Document Acceptance

Action	Name	Signed	Date
Prepared by	**Megan Dredge** (BSc (Tech) REP, CEnvp #1704) MPD Environmental Limited		
On behalf of	Winstone Aggregates Hunua Quarry		

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1 Report Release and Reliance

This report has been prepared by MPD Environmental Limited on the instructions of our client, in accordance with the agreed scope of work. If it is intended to support an application under the Fast-track Approvals Act 2024, it may be relied upon by the Expert Panel and relevant administering agencies for the purposes of assessing the application.

While MPD Environmental Limited has exercised due care in preparing this report, it does not accept liability for any use of the report beyond its intended purpose. Where information has been supplied by the Client or obtained from external sources, it has been assumed to be accurate unless otherwise stated.

2 Introduction

Winstone Aggregates (**"Winstone"**), a division of Fletcher Concrete and Infrastructure Limited, has engaged **MPD Environmental Limited** to assess the potential erosion and sediment control effects of the proposed expansion of Hunua Quarry at 489 Hunua Road, Hunua, Auckland.

Winstone is seeking approval to the project under the Fast-Track Approvals Act 2024 (FTAA). The Hunua Quarry Development is a Listed Project in Schedule 2 of the FTAA, reflecting its regional and national significance. The proposal is to expand the existing quarry to increase annual quarry production to a peak of approximately 5.4 million tonnes of aggregate, and to enable the continued extraction of aggregate for a further 80 years (**"the Project"**) or also referred to as the "**quarry development area**". Through this approval process, Winstone propose to update the consent conditions and quarry management plans applying to the site to incorporate the changes and enable greater operational efficiency.

3 Site Description

The Hunua Quarry is in South Auckland, approximately 5 kilometres (km) southeast of Papakura and 35 km southeast of the Auckland Central Business District (**"CBD"**). The Hunua Quarry has been operating on the site since the 1920's and produces greywacke rock and supplies a significant part of the Auckland region's aggregate requirements, primarily for use in civil infrastructure such as roading and concrete. The Quarry is recognised as one of Auckland's three most strategically important sources of aggregate. The location of the site is illustrated in Figure 1.

Figure 1: Hunua Quarry general location. Source: Google Earth

Currently, material is extracted from the Symonds Hill Pit and processed on-site, with material with no value (referred to as overburden) being deposited on-site in the overburden disposal area (the previous Hunua Pit). See Figure 2.

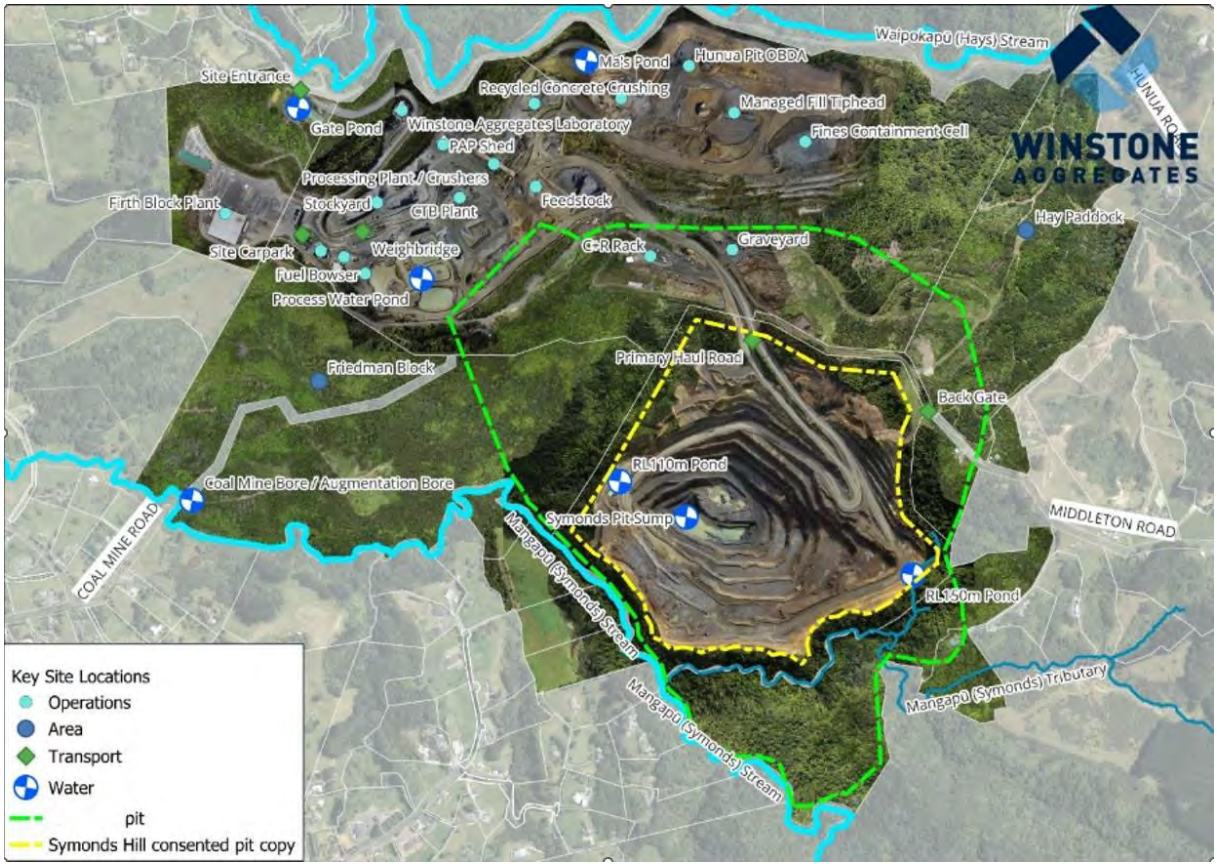

Figure 2: Existing operations layout

To extend the site's operational life, Winstone proposes a 50ha expansion and to deepen the existing Symonds Hill Pit to access additional high quality greywacke resource. Initial investigations confirm that the site contains a substantial greywacke resource, sufficient to meet projected demand for up to 80 years, based on current rates of extraction and known site constraints. The project is proposed to be undertaken in 8 stages, as shown in Figure 3.

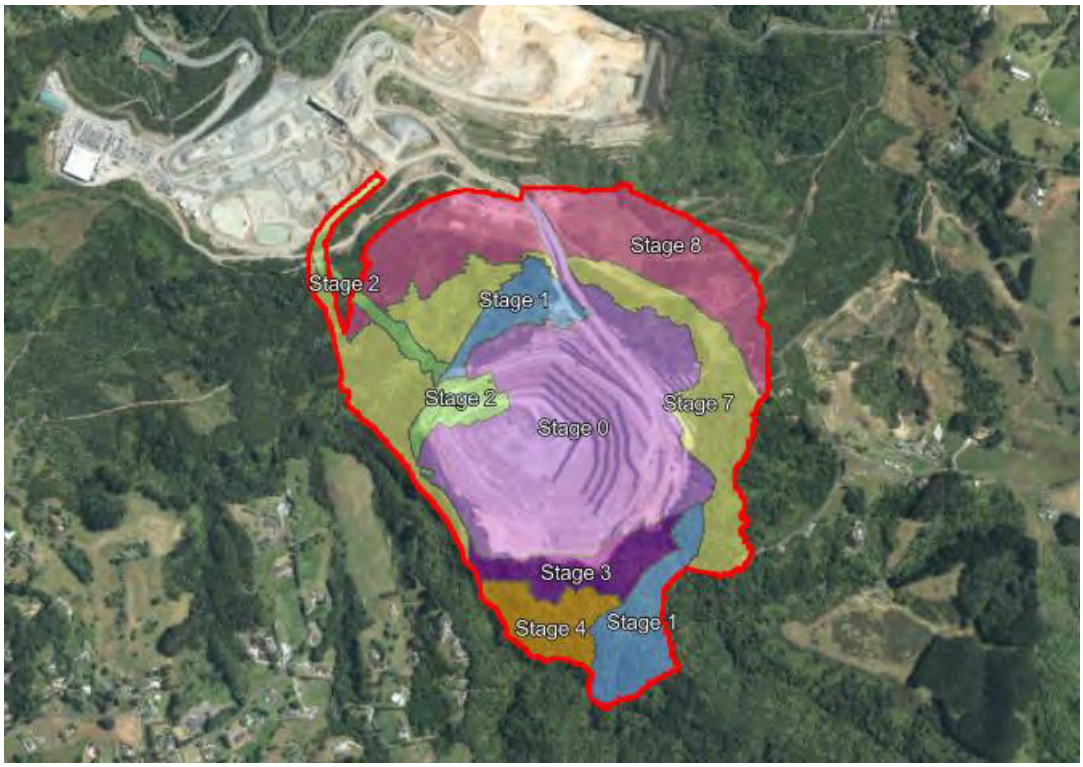

Figure 3: 8 stage development of the quarry (noting Stages 5 and 6 have the same footprint as Stage 4)

Under the provisions of the Auckland Unitary Plan (Operative in Part) the existing quarry is zoned Special Purpose – Quarry Zone (SPQZ) but the proposed pit extent will extend the quarry into the adjoining Rural - Mixed Rural Zone. The quarry development area is also subject to the following overlays:

- Quarry Buffer Area (Chapter D27);
- Outstanding Natural Landscape (ONL) (Area 60 Ponga Road);
- Significant Ecological Areas (SEA) (SEA_T_5323 and SEA_T_7032);
- High Use Stream Management Area (HUSMA); and
- Natural Stream Management Area (NSMA).

The site is also subject to the Council's Proposed Plan Change 120 Housing Intensification and Resilience (PC 120). This proposed plan change includes provisions to better manage development for natural hazards across the region. In the case of the Hunua Quarry, the site and wider area is identified as flood plains. These provisions have immediate legal effect.

Copies of the relevant planning maps and overlays are set out in Appendix B.

4 Purpose

This Erosion and Sediment Control Assessment Report (ESCAR) has been prepared to accompany the substantive application for approvals under the Fast track Approvals Act 2024 (FTAA). The purpose of this report is to support the substantive application. It incorporates a Draft Erosion and Sediment Control Plan (ESCP) that identifies the erosion and sediment control (ESC) measures proposed to manage site runoff associated with the earthworks and streamworks required for the development of the site and for the ongoing operational quarrying associated activities within the quarry pit. It then assesses the suitability of those measures to minimise the potential discharge of sediment to an acceptable level.

The ESCAR and Draft ESCP have been prepared in accordance with design principles of the Auckland Council Guideline Document 2016/005 Erosion and Sediment Control Guideline for Land Disturbing Activities in the Auckland Region (**GD05**).

The technical report and the Draft ESCP address the following earthwork and streamwork activities:

- Establishment of the erosion and sediment controls;
- Site establishment and enabling works; and
- General earthworks, streamworks and quarry activities

Additionally, the Draft ESCP will address the following matters:

a) Overall staging details of earthworks activities and expected open areas during each stage.

b) Specific erosion and sediment control measures which are to be utilised during general cut to fill earthworks for each stage (location, dimensions, capacity), including works in and near streams and wetlands, in accordance with GD05;

c) Supporting calculations and design drawings as necessary;

d) Catchment boundaries and contour information as necessary;

e) Details relating to the management of exposed areas (e.g. grassing, mulching, aggregate); and

f) Monitoring and maintenance requirements, including details of excavator access to the bend of the quarry pond to remove built up sediment during extraction stages.

This report should be read together with the other technical assessments prepared in support of the substantive application for approvals.

5 Basis of Assessment

Our assessment is based on site visits, desktop exercises, aerial surveys, operation and design information provided by the project team, and the application plans.

Our calculations and assessments comply with the following standards and guidance where relevant:

- Auckland Council Guideline Document 2016/005 Erosion and Sediment Control Guideline for Land Disturbing Activities in the Auckland Region (**GD05**).

6 Author and Code of Conduct Statement

The author of this report, Megan Dredge, is a professional ESC Consultant and Director of MPD Environmental Limited. Megan has 10 years' experience in the ESC industry, is a Certified Environmental Practitioner (CEnVP #1704) and holds a Bachelor of Science and Technology. Megan and her team have been recognised in the ESC industry on many occasions, most recently receiving the International Erosion Control Association Global Environmental Excellence Award in 2025.

The respective curriculum vitae for Megan Dredge is included in Appendix F.

This report has been prepared and reviewed in accordance with the Environment Court's Code of Conduct for Expert Witnesses, contained in the Environment Court Practice Note 2023. Other than where it is stated that reliance is placed on the advice of another person, the author(s) confirm that the issues addressed in this report are within their area of expertise. The author(s) have not omitted consideration of any material facts known to them that might alter or detract from the opinions expressed.

7 Project Description

The Hunua Quarry development seeks to expand and deepen the existing Symonds Hill Pit, enabling sustainable extraction of additional greywacke resource, and the continuation of quarrying within Winstone's existing site for up to 80 years. The proposed development initially focuses on the southern and northwestern ends of the quarry complex. The new extraction footprint will initially expand the existing Symonds Hill Pit to the south and east, followed by areas to the north and west. These development works will occur entirely within Winstone-owned land and integrate with existing quarry infrastructure.

The quarry will utilise the existing access from Hunua Road, although a right turning lane is proposed to improve the safe operation of the access for turning trucks and other road users. This also reflects the increase in truck volumes accessing the Site as production on the Site increases.

The proposed Symonds Hill Pit expansion will cover an area of approximately 108 hectares, with a maximum depth of approximately – (minus) 50 metres RL, and enabling quarrying beyond that in later years to access further resource. Quarry development will use benches ranging from 10m – 15m in height and 9 – 20m in width. The resource comprises Waipapa Group greywacke, with an estimated total volume exceeding 225 million tonnes. Over the life of the quarry, anticipated to be around 80 years, approximately 24 million m^3 of overburden will be removed, supporting a peak production rate of 5.4 million tonnes per annum.

This expansion will necessitate the realignment of a tributary of Mangapū Stream to allow for the pit expansion. This will include clearance of indigenous and exotic vegetation, overburden stripping and earthworks, stream realignment, followed by revegetation within the new stream corridor. Ecological offset planting will also occur within other parts of the landholding, and this will also achieve landscape mitigation and compensation for the removal of an area of the ONL. Additional ecological offset planting and compensation works will also be undertaken in locations beyond the Site.

The proposal will also utilise the current site access, along with the existing processing facilities, staff facilities and bores.

In summary, the key aspects of the proposed quarry development include:

- Diversion and reclamation of approximately 941m length of a tributary to Mangapū Stream to enable the expansion of the extraction footprint. This includes construction of a temporary 7m wide bridge to enable access for construction of the stream realignment channel.
- Draining and modification of up to 21 identified natural inland wetlands.
- Providing additional overburden capacity within the Site (from Stage 7), primarily by backfilling the Symonds Hill Pit;
- Construction of new sediment retention ponds, haul road, drainage networks, and Mangapū Stream Tributary diversion integrated with the existing quarry systems.
- Increasing average daily traffic movements during both the AM and PM peak hours when the quarry is operating at peak capacity:
    - AM peak hour – 161 truck movements corresponding to approximately 80 entry and 80 exit truck movements; and
    - PM peak hour – 135 truck movements corresponding to approximately 68 entry and 68 exit truck movements.
- Removal of 44.46ha of indigenous vegetation, associated with the stripping of overburden including within an SEA and ONL, and removal of 4.15ha of exotic scrub.
- Constructing the western haul road, including two culverts, to provide a more efficient connection between the pit and the processing yard as part Stage 2. The haul road will then be removed during Stage 7 and a new haul road constructed.
- Amending the consented groundwater takes and discharges to Mangapū Stream.

- Providing for some in-pit crushing to enable a greater volume, and more efficient, processing of aggregate.
- Providing for the placement of a greater volume of overburden within the Site.
- Implementing progressive rehabilitation (where practicable), ecological offsetting, landscape mitigation, compensation and stream enhancement measures throughout quarry development. The expansion necessitating the Mangapū Stream Tributary diversion is the first stage of the project, and the ecological offsetting needed for this will occur in the early phases.
- Enable quarry development below RL-50m as part of the long-term development of the Symonds Hill Pit, recognising that this deeper resource would only be accessed once the earlier stages of the pit have been quarried. The final Life of Quarry Strategy will be confirmed prior to any excavation below RL-50m, and will detail further investigations necessary to ensure that adverse environmental effects associated with later-stage extraction and/or rehabilitation are appropriately identified, assessed, and managed (including obtaining any regional consents required).

Winstone is seeking resource consent under the FTAA for both district and regional activities to enable the development of the Symonds Hill Pit. The land use consents (earthworks, vegetation clearance and the disposal of overburden) are being sought in perpetuity (unlimited duration), and a 35-year duration on all water take and use and all discharge permits. Winstone are also seeking a Wildlife Act Authority, an Archaeological Authority and a Complex Freshwater Fisheries Activity Authority.

Additionally, consent may also be sought by Winstone later (approximately during years 50-80) to drop the pit below -RL50 once Stage 8 is completed, subject to further investigations and the approval of any required regional consents. This will have the same footprint as the existing quarry pit but will go deeper. Full investigations, including groundwater and geotechnical, would be needed to support a new consent application for those activities, including any ongoing erosion and sediment control measures arising from discharges. It is not possible to understand what those effects might be at this time due to the extended timeframe, and any further development would be informed by future investigations and ground conditions at that time.

8 Description of Works

8.1 Current Operations at Hunua Quarry

The purpose of the mineral extraction operations at Hunua is to extract rock from the ground and process it to produce building, construction and roading aggregates. The transformation of rock from the ground into aggregate products firstly requires the removal of any vegetation, then the stripping of overburden (soils and low-quality material) overlying the rock resource. The next step is to loosen and fragment the rock from the ground with the use of explosives and/or heavy machinery. The rock is then excavated by heavy machinery and either stockpiled or transported to the processing plant for further crushing and screening into various sizes and grades for sale.

Hunua Quarry operates as a vertically integrated aggregate facility comprising the following key components:

- **Symonds Hill Pit:** Active extraction areas producing greywacke aggregate.
- **Processing Plants:** Three-stage crushing and screening circuit feeding multiple product stockpiles via fixed and mobile plant.
- **Haul Roads and Internal Accessways:** Connecting extraction zones with the processing area, product load-out and OBDA areas.
- **Water Management Infrastructure:** Sediment retention ponds, surface water channels and water take bores.
- **Administrative and Maintenance Facilities:** Weighbridge, office buildings, workshops, and equipment service areas.
- **Power and Utilities:** 11 kV electricity supply, diesel fuel storage, and water pipelines.
- **Managed fill / cleanfill operations:** Existing consents allow the placement of 2 million m3 of overburden and 6 million m3 of managed fill in Hunua Pit to RL 170m. The managed fill being brought to the site is pre-approved and tested for acceptability prior to placement into the OBDA.

The quarry operates under a comprehensive environmental management framework and is supported by an extensive monitoring network for dust, water, and noise.

Mineral extraction activities are defined in the Auckland Unitary Plan as:

Activities carried out at a quarry and includes:

- *blasting;*
- *excavating minerals;*
- *processing minerals by crushing, screening, washing, or blending;*
- *storing, distributing and selling mineral products;*
- *accessory earthworks;*
- *removing and depositing overburden;*
- *treating stormwater and waste water;*
- *landscaping and rehabilitation of quarries;*
- *cleanfill and managed fills;*
- *recycling or reusing aggregate from demolition waste such as concrete, masonry, or asphalt;*
- *accessory activities and accessory buildings and structures such as laboratories; and*
- *workers accommodation.*
- *It excludes common marine and coastal area mineral extraction.*

8.2 Volume of Earthworks

The first initial stage (Stage 0 – current consented site) is identified in Figure 4 below. The full proposed quarry activities will be undertaken over 8 main stages.

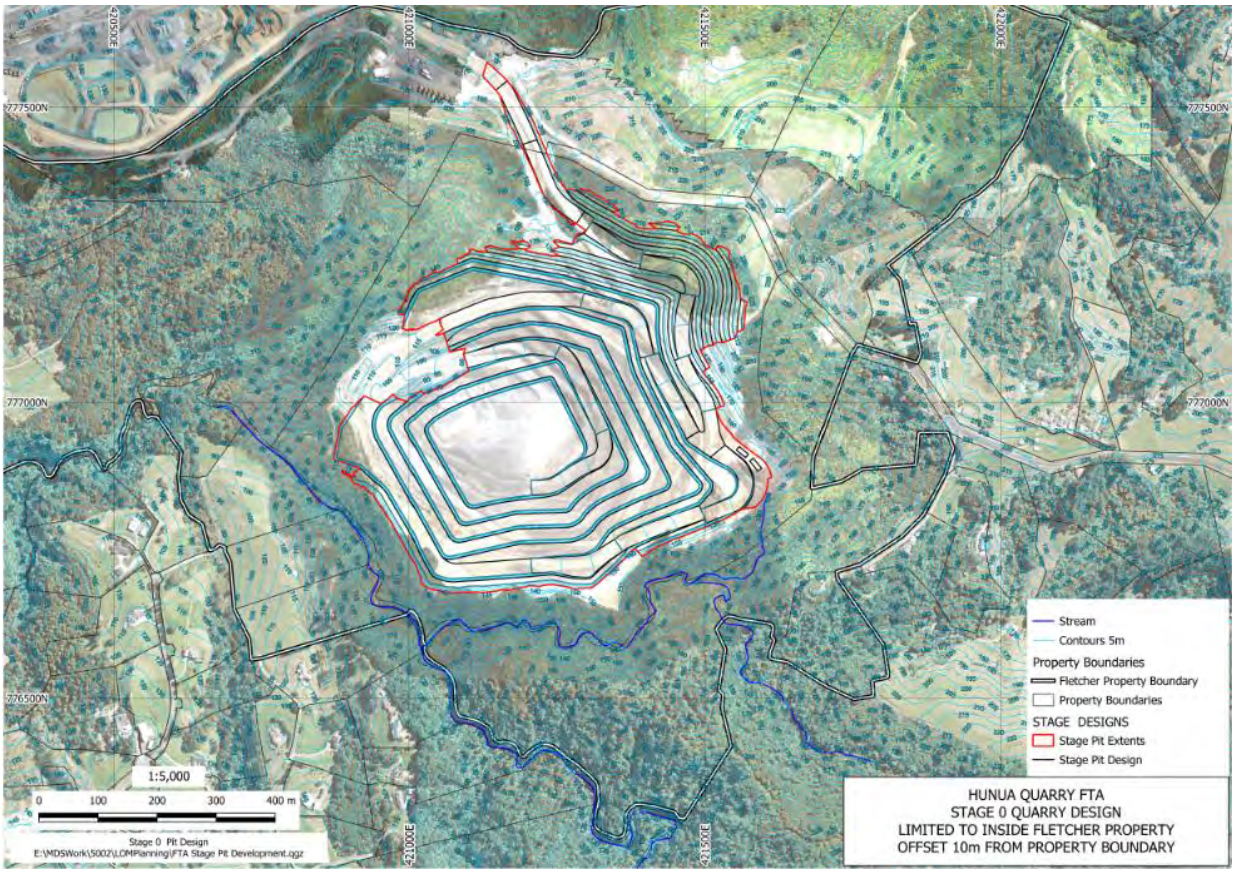

Figure 4: Stage 0 of Hunua Quarry Extension – current consented site

A large volume of material needs to be removed before the stream alignment works commence or any extraction can occur (Table 1). Most soil / overburden will be removed using excavators and transported to the OBDA area using rigid axle trucks. This is estimated to be between 3649 k bank cubic metres (BCM) and 4149 kBCM for the project.

Table 1: Summary of volumes (kBCM)[1]

Stage	Total volume of OBDA / Earthworks (kBCM)
1	1,732
2	171
3	332
4	530
5	0
6	17
7	5,169
8	15,447
Total	**23,398**

8.3 Enabling Works

There are existing sediment control devices already established within the quarry, and these will be utilised where possible or extended where required. An additional 2 x SRP's will be required. The first SRP will be installed during Stage 1 (SRP-1).

[1] 1 kBCM (bank cubic metre) is equal to 1m^3 in situ before excavation.

To allow for access to SRP-1 (see Appendix A), enabling works need to occur which involve the establishment of an access track and bridge across the Mangapū Stream tributary. SRP-1 will be constructed in a suitable location as indicated in the ESCP Drawings. The SRP has been designed to service a catchment of 3ha. The entire catchment of the stream diversion works is in excess of 5ha, and so careful consideration will need to be given to the catchment directed to the SRP at any one time which will involve progressive stabilisation and directing of this clean water off site.

8.4 Stages 1-8

The Symonds Hill Pit development will occur in eight indicative stages to allow continuous production while progressively implementing environmental mitigation and rehabilitation. However, to enable operational flexibility and the need to respond to market conditions, the staging and programme may not be followed sequentially. Table 2 below identifies each stage, an overview of the activities to be undertaken and whether these are part of the enabling works or 'business as usual' quarrying activity. The time required to achieve each stage is also set out, although this is approximate and no requirements or conditions are proposed to be based upon such timeframes. Earthwork volumes, vegetation clearance and offsetting/compensation requirements will be linked to the stages set out below. The conditions are also proposed to be based on the stages, with each consent (land use including vegetation clearance and the disposal overburden, water takes and discharges etc.) containing two sets of conditions: one comprehensive set of conditions that relate to enabling works (that will fall away once these works are complete) and one set of conditions that relate to quarrying.

Table 2: Staging and Indicative Life-of-Quarry Development Plan Overview

Stage	Activity	Nature of the works	Approximate duration (years)
1	Tributary realignment including the construction of a temporary bridge.	Enabling works	4
	Stripping campaign to the northwest (NW), -, occurs concurrently with the tributary realignment. Provided for under existing consents.	Extraction and processing	1-4
2	Stream diversion completed – the temporary bridge will be removed.	Enabling works	1
	NW cut down to 105RL. Provided for under existing consents.	Extraction and processing	
	Construct the western haul road.	Enabling works	
3	Incremental stripping campaigns: south from current pit crest towards stream diversion down to 120RL	Extraction and processing	1
4	Incremental stripping campaigns: southwest of the stream diversion and adjacent to the southern site boundary	Extraction and processing	43-73
5	Incremental stripping campaigns: southern boundary towards the current pit	Extraction and processing	
6	Incremental stripping campaigns: in an anticlockwise direction, extending the pit to the south and northwest and deepening the pit	Extraction and processing	

7	Realign the western haul road, so that it runs, for a short distance, along the southeast extent of the pit. This will enable the pit to extend to the northwest.	Enabling works	
	Incremental stripping campaigns: in an anticlockwise direction, extending the pit to the southwest and northwest and deepening the pit	Extraction and processing	
8	Incremental stripping campaigns: in an anticlockwise direction, extending the pit to the northwest and north.	Extraction and processing	

Mangapū Stream Tributary Realignment (Stage 1 – 2)

A new alignment of a tributary to Mangapū Stream will be established along the southern boundary to accommodate the pit expansion. The realignment will create a meandering, naturalised channel with riparian vegetation, in-stream habitat features, sediment control devices (where required) and separation from operational surface water controls. The new stream channel will be fully commissioned before any diversion of water occurs.

The Mangapū Stream tributary realignment offers a significant opportunity for ecological enhancement.

Key design outcomes include:

- Restoration of stream and riparian habitat lost through historic quarrying
- Improved water quality and sediment control.
- Integration of wetland plant species to enhance biodiversity
- Control of pest plants and animals over selected areas.
- Flood management will be incorporated into design.

Initially, it is proposed to install a 7m wide bridge to provide access to the works area. This will ensure that the tributary remains intact prior to the new tributary being constructed and fully commissioned. Vegetation clearance may be required and will commence once ecological restraints have been cleared. Approximately 5.5h of vegetation will be removed during the first season of works to enable machinery to access the tributary and works area. The bridge will be installed during April or May when water flows are low.

Once vegetation clearance has commenced, baseline and detailed topographical surveys can be undertaken to inform the design of the required earthworks. The 10 m wide access road on the western side of the future tributary alignment will be constructed, and sediment control infrastructure will be installed during the earthworks season (October-April). Runoff containing sediment will initially discharge to existing 150RL ponds. Once the clearance of vegetation has been completed, a new sediment pond will be constructed at the same location as the 150RL ponds and have the same discharge location. An additional SRP will also be constructed (see Appendix A).

The crest/starting position of the overburden stripping will be established, ensuring a minimum 10m offset from the neighbouring property boundary. The stripping of overburden will occur from the top of the slope above the access road, working down towards the existing quarry pit. The soil and overburden that is able to be free-dug (i.e. no drill and blast) will be removed first using a 100t excavator and 100t rigid axle trucks. A 10m high noise bund will be retained at the southern end of the cut to provide noise and dust mitigation. This will be lowered as the earthworks progress down the slope, with the bund being removed to enable the formation of the discharge point of the diversion. A total of approximately 900 BCM of overburden material will be removed to the Hunua OBDA.

The aggregate will then be extracted creating a series of benches as per standard quarrying practice: requiring drill and blast to then dig and cart the product to the processing facility. The batter faces will be designed to be 10m in height at 50^{o} with 7m benches above the diversion to the east and west. A total of approximately 420,000

BCM of rock will be removed which will be used as production feed and sold. The last bench of this stage will be at least 30m wide enabling sufficient space to create a meandering tributary with riparian planting and construct an access road to the west of the new tributary alignment. The 30-metre-wide bench will enable:

- A 1m offset from toe of eastern slope, and
- 19m wide high flow stream channel, and
- 1m wide low flow channel that meanders within the 19m wide high flow corridor, and
- 10m wide access road on western side of diversion corridor; and
- 470m of stream length @ 1:16.6 grade from inlet to outlet (not including meanders), and 570m including meanders.

The west facing bench will be covered in topsoil and planted or hydroseeded to improve visual amenity of the cut face and improve integration with backdrop of the outstanding natural landscape.

The tributary channel will be formed using a bulldozer. It will be approximately 500 m in length, and the bed will be 1m in width, having a 'u' shape and be meandering and boulders placed within it to create ripples to manage flow velocity and a more diverse habitat. In addition, waterfalls will be constructed to emulate existing morphological features of the existing stream, ensuring continuity of aesthetic and ecological functions. They are also needed to provide for, and facilitate, grade transitions and to achieve the required longitudinal stream profile as the proposed design outlines a reduction in the overall reach length.

The entire flow corridor including the channel will be lined with low permeability material and be of sufficient width to cope with a 1 in 100-year flood. To enable planting in the riparian margins/flow corridor, topsoil will need to be spread and stabilised with indigenous planting (similar to that being cleared) and boulders and rocks. There may be a need to step the channel down to cascade consistent with the reclaimed tributary. The boulders and rocks within the new channel and flow corridor will be reclaimed from the current streambed. Once the channel is complete, water from the existing tributary will be diverted to the new tributary.

The works will take approximately 4 years, with the tributary proposed to be commissioned in June 2031 (Figure 5).

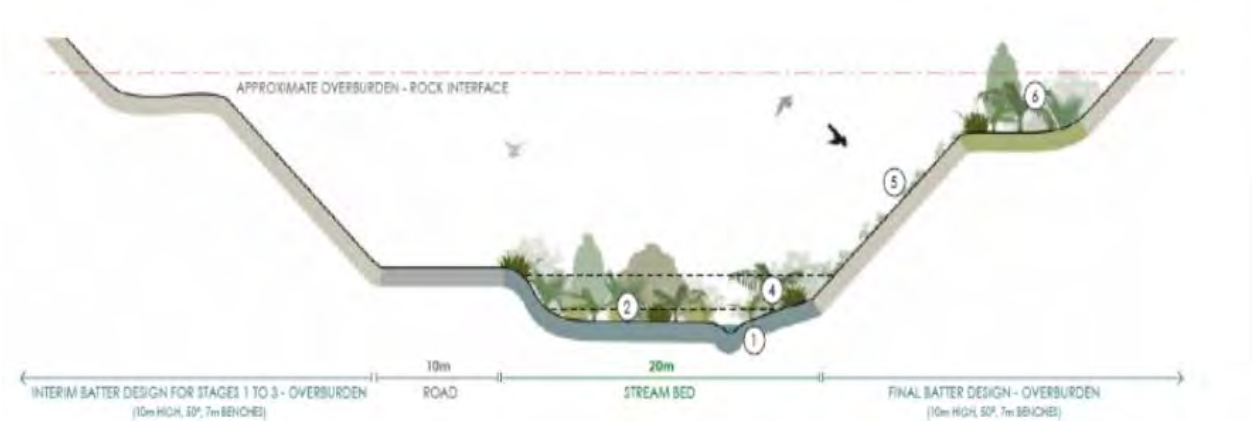

Figure 5: Mangapū Stream Realignment and Riparian Enhancement Concept at Stage 2

Construction of the western haul road (Stage 2)

It is proposed to construct a new 877m haul road from the pit to the processing plant during Stage 2, reducing diesel consumption due to its length and elevation.

Culverts will need to be constructed across one permanent stream and one intermittent stream, with pipe sizes up to 1,650mm ID to cope with a 100-year event. The pipes will have lengths up to 75m. The works will be undertaken during the period February to May (when stream flows are lowest). The installation of culverts and the diversion of the existing stream may be subject to the Freshwater Fisheries Regulations 1983, Part 6, Clauses 42

and 43 in relation to fish passage and such works will be subject to discussion with, and possibly, the approval, of the Director-General of Conservation (as required).

The haul road will require extensive earthworks including the creation of batter cuts, cut-to-waste, and cut-to-fill operations. The fill batter slopes will be approximately 1V:1:25h (378.7 degrees) and cut batter angles will be approximately 0.8v:1h (50 degrees). The haul road will have a minimum camber from the crown of 2% and a minimum vertical grade of 1:66, with table drains installed on the cut side. The total volume of earthworks will be approximately 87,723m^3 of cut and 14,881m^3 of fill. This will necessitate the installation of erosion and sediment controls including a new sediment pond at RL110, with additional flocculant treatment recommended.

Subsoil drains will be placed within the road and road runoff will be directed to a chemically treated collection point and sediment pond at RL110, with additional flocculant treatment being undertaken. The fill batter slopes (approx. 0.065ha) will be replanted and hydroseeding of the cut slopes will be undertaken, with progressive replanting where feasible.

The haul road will then be removed during Stage 7 and a new haul road constructed. The construction methodology will be similar to that set out above, but detailed design and assessment will be undertaken during the later stages of the Project. It is noted that the removal of the tributary is not assessed as part of this current application as the works are anticipated to occur beyond 35 years.

Stages 3- 4

Incremental stripping campaigns will occur during these stages, including south from current pit crest towards stream diversion down to 120RL and southwest of the stream diversion and adjacent to the southern site boundary. These campaigns will occur over a long time period (between 1 – 20 years).

Stages 5-8

Incremental stripping campaigns, towards the southern and northwest boundaries as well as pit deepening and filling.

Refer to Appendix A for detailed ESCP construction drawings for Stages 1 – 8.

8.5 Quarrying Process

The process of extracting aggregate resource involves using heavy machinery for the following processes:

Removing Existing Vegetation

Any existing vegetation within the extent of works will be removed using excavators and trucks. Note, the removal of vegetation, topsoil etc., will be progressive over the life of the quarrying operations as and when required.

Topsoil Stripping and Stockpiling

Topsoil and organic materials will be stripped, transported, and removed using excavators and trucks. The initial topsoil stripping will be used to form the erosion and sediment control clean water diversion bunds. The removal of material will be to the existing Over Burden Disposal Area (OBDA).

Removal of overburden

Overburden will be stripped using 100t excavators and transported by rigid dump trucks to the OBDA. Materials overlying the rock typically have little commercial value but have to be removed to facilitate extraction of the aggregate rock resource. The methods and equipment employed are similar to those used for soil/subsoil excavation.

The progressive development of the quarry, once the tributary is realigned, is expected to release 50-80 years of rock resource from the Symonds Hill Pit. It is intended that the overburden removed from the future expanded Symonds Hill Pit, will be placed progressively back into the Hunua Pit. From time-to-time overburden may be required for infrastructure and building projects and will be exported off site.

The on-site effects of overburden removal include effects on water and soil resources and air quality, all of which are addressed in the context of the consents and permits required from the Auckland Council. The management of these effects is more specifically described below.

Placement of Overburden

The overburden from Stages 1-7 (approximately Year 39 onwards) will be placed within the previously quarried Hunua Pit. Currently, the OBDA is consented to take 2 million m^3 of cleanfill, and 6 million m^3 of managed fill to a level of RL170.

Post Stage 7 (approximately Year 39), additional capacity for 18.45 million BCM of overburden will be required, therefore it is proposed to commence backfilling the Symonds Hill Pit. This will still enable on-going quarry operations during Stages 7 and 8 (Figure 6 and Figure 7), alongside rehabilitation activities (where practictable).

The Symonds Hill in-pit OBDA design will be based on the design criteria used for the Hunua OBDA. Refer below for Symonds Hill OBPA design.

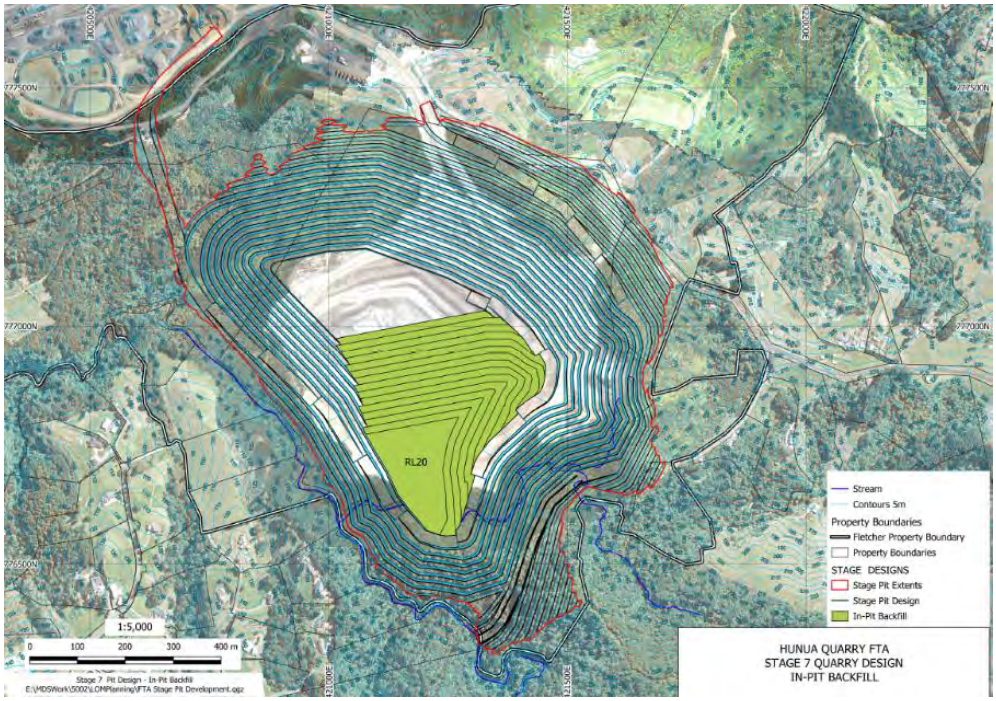

Figure 6: Stage 7 OBPA infill of Symonds Hill Pit

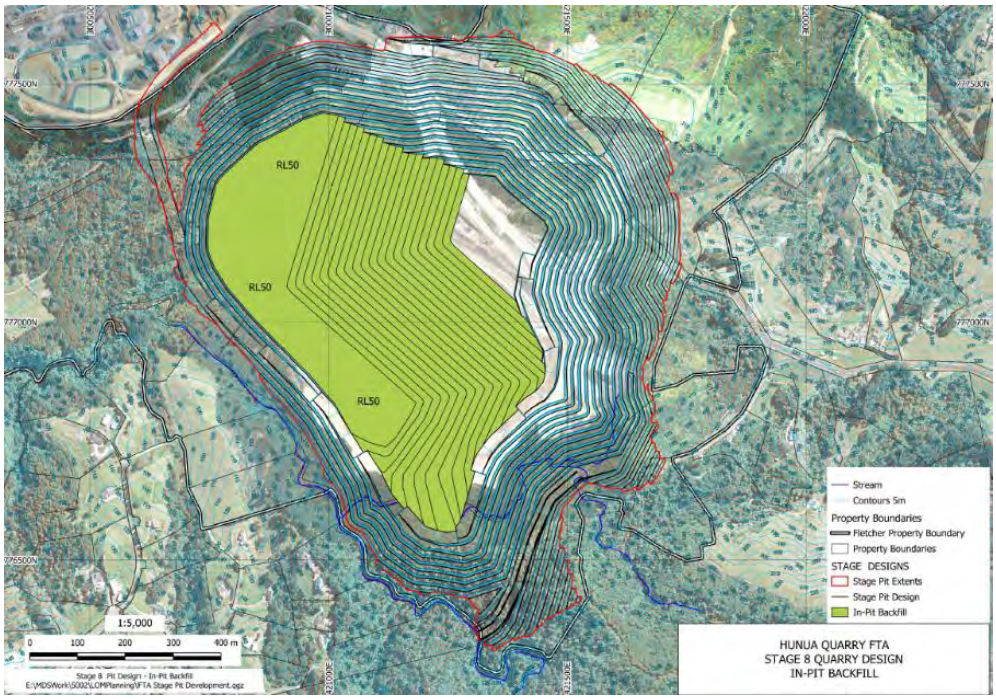

Figure 7: Stage 8 OBPA infill of Symonds Hill Pit

Processing

Rock is processed into aggregate products by crushing, screening, washing, blending and conveying machinery. The products are moved by trucks, loaders or conveyor to storage bins or stockpiles for processing.

While operationally it is desirable that the current fixed plant process all the rock from both the Symonds Hill Pit, from time to time mobile aggregate processing plant may be used to supplement, or substitute for, the fixed plant operation as it is now. The need to use mobile crushing equipment is either output related, for product/market reasons, or required because of major maintenance on the fixed plant. From an environmental effects perspective, all plant and site operations will continue to be subject to the same set of environmental controls.

The current plant is a modern aggregate processing plant capable of producing a full range of aggregate products. It is capable of washing semi-processed and finished aggregate products using a water control and treatment system which is also used to suppress dust. Usually this is a closed-circuit system with only makeup water added to compensate for water lost through evaporation or taken up by the aggregate products themselves. On occasion, after high intensity rainfall, process water may mix with stormwater in the water treatment system.

The plant will also incorporate a blending system which will allow for aggregates that would otherwise be considered low grade material to be modified by using either clean rock by-products or small amounts of additives such as cement, lime, fly-ash and steel mill and concrete manufacturing by-products to improve or upgrade the material properties. This system ensures that the resource at Hunua will be further optimised and waste minimised. For example, marginal materials enhanced this way are able to be used as engineered roading products.

In summary, the plant has been specifically designed to maximise the use of the Hunua rock resource while at the same time minimising the potential for adverse environmental effects. Winstone considers that the current crushing/screening rate limits in ARC consent 25026 of 1,000 tonnes/hour remains appropriate.

Fines Disposal

Process fines are very fine particles (silt, clay, ultra-fine sand) generated during aggregate washing and processing. They originate from rock breakdown during crushing and screening and are carried in water streams to sediment retention ponds (SRPs). As these fines remain suspended in water, they must be managed to prevent discharge into waterways.

There are a number of methods that can be used to manage process fines. Currently, fines are dug and carted from the SRP to a containment cell within the OBDA using an excavator and 100t trucks. This is undertaken about once a month, and the process takes two to three days. As the fines disposal cell is incorporated into the OBDA design, this process will continue for the foreseeable future.

However, in the future the following more efficient methods may be adopted:

1. Pumped fines disposal. The fines are pumped as slurry directly from the SRP to a containment area or treatment facility, reducing truck movements and improving efficiency.
2. Filter press dewatering. The process mechanically separates water from the fines, producing a dry, stackable 'filter cake.' This will reduce storage volume and water management requirements. It may also be feasible to sell the dewatered fines/filter cakes as low-grade fill or construction material.

All the methods will result in the management of fines to minimise impacts on water quality and freshwater values, including raising decants while removing fines from erosion and sediment control structures and only undertaking fines removal during low water retention in structures to prevent discharges during the fines removal process.

Discharges to water

It is proposed to manage runoff from the OBDA, haul roads and earthwork areas by discharging to sediment ponds. The maximum area of discharge to each sediment pond will be 5 hectares in accordance with GD05. All dewatering from the pit will also be discharged to settling ponds before discharge to stream network. On occasion, chemical flocculation may need to be undertaken.

The current water management system from the quarry pit involves a visual inspection of the water prior to pumping to RL110 SRP for treatment and discharge.

The proposed discharge monitoring and trigger characteristics are included in Section 13.

9 Principles and Processes of Erosion and Sediment Control

9.1 Principles

The key principles to be employed for an ESCP are to undertake land disturbing activities in a manner that reduces the potential for erosion of bare soils to occur (erosion control) and to employ treatment devices to treat sediment laden water prior to discharging runoff from the site (sediment controls). These principles have been incorporated into the ESCP. The 10 basic principles of erosion and sediment control taken from GD05 will be applied to each of the defined scenarios (as applicable) and outlined for completeness as follows;

- **Minimise disturbance:** only work areas required for construction to take place.
- **Stage construction:** carefully plan works to minimise the area of disturbance at any one time.
- **Protect steep slopes:** where steep slopes existing within the works area, ensure that these are protected as steep slopes are prone to erosion.
- **Protect watercourses:** Map all water bodies before works commence.
- **Stabilise exposed areas rapidly** by sowing new seed or mulch cover, or as appropriate to achieve stabilisation where possible.
- **Install perimeter controls:** divert clean water away from areas of disturbance and divert runoff from areas disturbed to sediment control devices.
- **Employ detention devices:** treat runoff by methods that allow sediment to settle out.
- **Use trained and experienced operators** and ensure site staff are aware of the requirements of the ESCP and the relevant resource consent conditions.
- **Make sure the ESCP evolves** as construction progresses and the nature of land disturbing activities change, the ESCP needs to be modified to reflect the changing conditions on the site.
- **Assess and adjust** inspect, monitor and maintain control measures.

9.2 Design

ESC devices for the enabling, and establishment works have been designed in accordance with the design principles of GD05 to ensure that the site is managed in a way that achieves the conditions of consent as a minimum. The ESCP has been designed to accommodate work operations being undertaken over the expected duration of the quarry. This will provide flexibility in the management of the Quarry to meet the possible fluctuation of the demand of aggregate. It is expected that any updated ESCPs will be prepared and submitted to Auckland Council for certification in advance of any changes being made on site.

A set of ESC drawings with sizing specific to the enabling works and staged stream channel diversions are provided in Appendix A for information. Actual staging and timing of the pit development will be determined by the overall quarry management and demand for aggregate. The controls and methodologies have been designed to meet the site requirements and to meet the design philosophy of GD05.

The ESC design and methodology for the establishment works is based around full compliance with GD05. Once the pit operations commence, upper catchment cleanwater will be directed around the pit while all site water will discharge to the pit floor to be integrated into the Quarry Pit water management system. GD05 provides for a

“best management practice” approach to ESC for land disturbing activities developed by Auckland Council for the Auckland Region.

Sizing and design information for the ESC measures are included in Appendix B.

As-builts and an audit programme ensure compliance with the design requirements and guidelines. Catchment areas (both clean and dirty) will adjust during the life of the quarry and regular audits, and as-built revisions will be undertaken.

9.3 ESCP Revision/Updates

It is anticipated that the ESCP will evolve over time, as erosion and sediment control methodologies develop alongside legislation and consent requirements. The ESCP will be a working document and will be updated regularly as required, with all changes submitted for certification to Auckland Council prior to works commencing.

Reasons for making changes to the ESCP will be documented. Any new/updated version of the ESCP documentation will be issued with an updated version number and dated. A copy of the current ESCP document and subsequent versions will be kept for the Project records. Superseded versions will be marked as obsolete.

Any relevant revisions to the ESCP will be submitted to the Auckland Council for review and certification at least 10 days before becoming operational.

10 General Erosion and Sediment Control Details

Generally, erosion and sediment controls for the development site will be simple and traditional. Works will be accessed from the existing quarry site, so no additional entrance points from outside the quarry area are required. Aside from the stream diversion works (see Section 10.13), as new works areas are reached, the following general methodology will be followed.

1. Set out the location of the specific sediment retention device, DEB or SRP.
2. Install a silt fence below this work area.
3. Construct the specific sediment retention device.
4. Install flocculation shed or similar for chemical treatment
5. As built sediment retention device to confirm compliance.
6. Install dirty water diversion bunds, formed from stripped topsoil/overburden to direct runoff to the specific sediment retention device.
7. Commence cut to fill and cut to waste earthworks within the catchment of the specific sediment retention device. Surplus material disposed of in the spoil disposal area(s).
8. As the batters are complete, respread topsoil and grass/hydroseed/plant as possible and practicable.
9. As the subgrade is completed and roadside drains formed complete these works to permanent design.
10. The SRPs, DEBs, silt fences and super silt fences are to remain until all surfaces within the contributing catchments are stabilised by grass (strike > 80%), aggregate or are deemed to be non-erodible material (e.g. Rock or polymer).

Stockpile areas will be managed within existing catchment areas for SRPs or DEBs and are subject to the stabilisation requirements for the Project. These measures are consistent with GD05.

10.1 Clean and Dirty Water Diversions

Clean water diversions (Figure 8) will be constructed to divert upper catchment clean water away from the area of works. This includes the initial cleanwater diversion bunds to divert cleanwater away from the establishment earthwork areas, temporary and permanent cleanwater stream diversion channels to divert the catchment stream flows firstly around the new proposed works, and then as the pit expands over time, temporary bunds and diversions will be constructed to ensure as far as practicable the objective of keeping cleanwater clean is achieved.

The cleanwater diversion bunds (for the earthworks) will likely be constructed using stripped topsoil and will be stabilised immediately following construction. This will likely include a perimeter bund around the extent of works and stage boundaries and will be progressively installed (and removed) as the quarry operations progress.

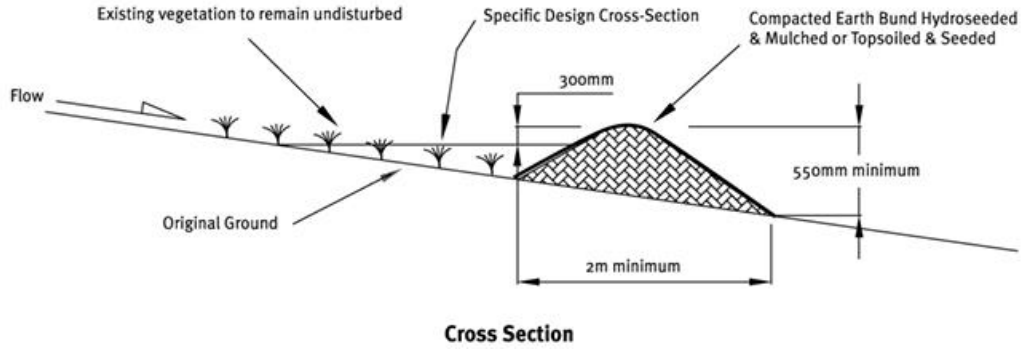

Figure 8: Cross section of a cleanwater diversion

The maximum contributing catchment area for cleanwater diversions during Stage 1 – 4 will be <10ha for all catchments. Calculations and detailed design are provided in Appendix B.

Suitable site material will be utilised to form dirty water diversion bunds (Figure 9) to divert sediment laden water from the site to the sediment treatment devices. Where required, bunds will be turfed on the cleanwater side to allow for immediate stabilisation. If turfing is not possible, the cleanwater side will be stabilised with haymulch, seed and fertiliser, geotextile or coconut matting. Dirty water diversions will be required as per the ESCP (Appendix A), usually for the establishment of works and for the haul road. The purpose of these diversions is to divert sediment laden water to the correct location for treatment prior to discharge.

The maximum contributing catchment area for the dirty water diversions will be <5ha for all SRP catchments. To comply with GD05 the calculated minimum perimeter bund height installed across the project would be a minimum of 550mm to provide conveyance of the 5% AEP storm event, plus 300mm freeboard.

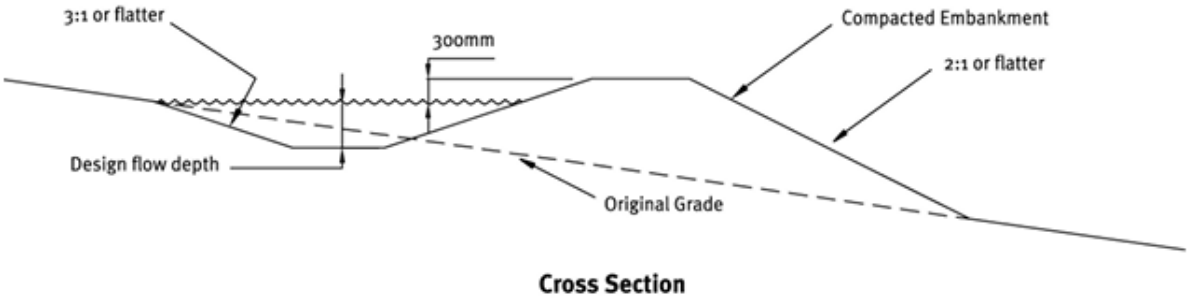

Figure 9: Cross section of a dirty water diversion (GD05)

10.2 Sediment Retention Ponds

Sediment retention ponds (SRPs) (Figure 10 and Figure 11)treat sediment laden runoff and reduce the volume of sediment leaving site, to protect downstream environments from excessive sedimentation, water quality degradation and impacts of increased flow. SRPs are suitable for catchments sized between 0.3 – 5 Ha. Floating decants are to discharge at 3L/s per Ha of catchment, and the SRP outlet structure shall have a decant pulley system to cease discharge when required, and a forebay with a minimum volume of 10% of the pond volume. The sizing criteria for any SRP on site is as follows:

- Size SRPs based on the contributing catchment area and slope length.
- On earthwork sites with slopes < 18% and < 200 m in length, design SRPs with a minimum volume of 2% of the contributing catchment area (200 m3 for each ha of contributing catchment).

- On earthwork sites with slopes > 18% or > 200 m in length, design SRPs with a minimum volume of 3% of the contributing catchment area (300 m3 for each ha of contributing catchment).
- The above calculations define the total storage volume, which is measured from the base of the pond to the top of the primary spillway.
- The slope angle is determined by the slope immediately (within 20 m) above the SRP, or by the average slope over the contributing catchment, whichever is greater. The slope angle should also be the greater of the pre- or post-construction slope.

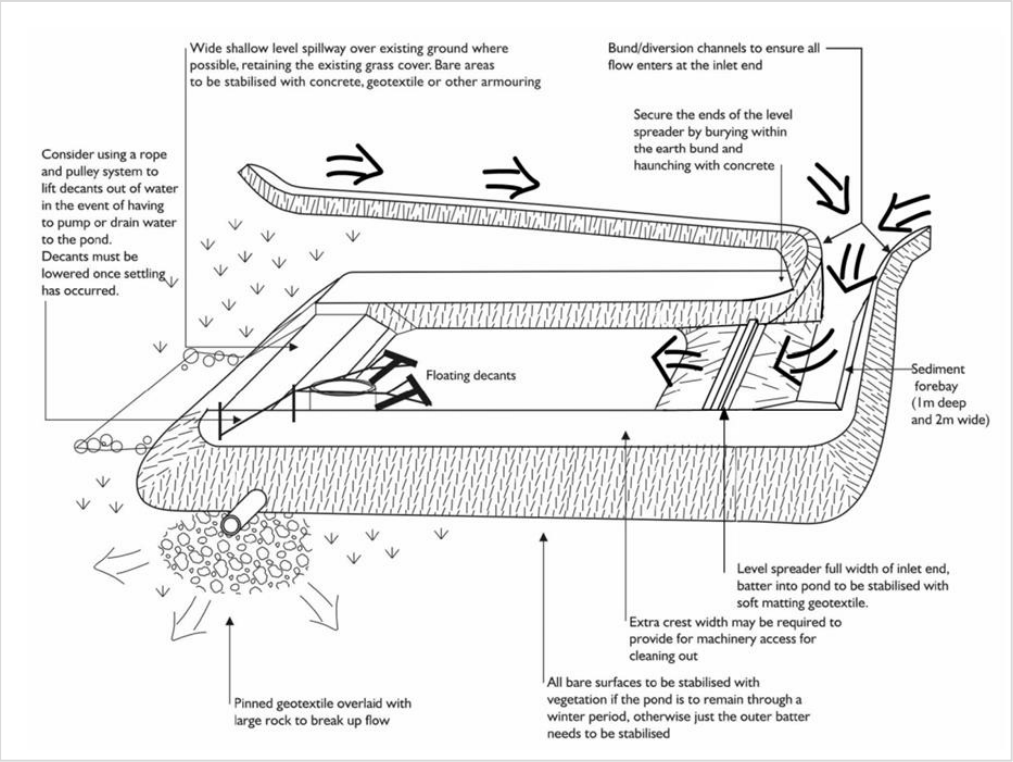

Figure 10: Schematic of a SRP

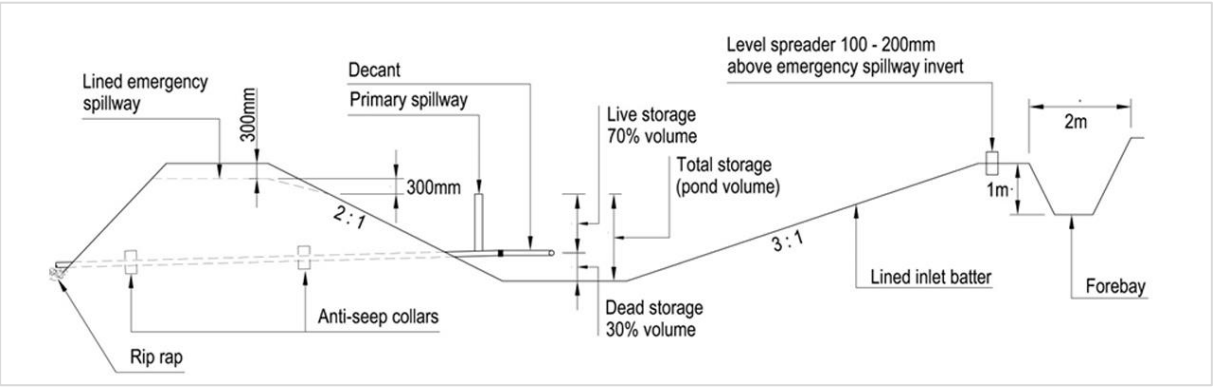

Figure 11: SRP Cross Section

All SRP's will be chemically treated. Detailed construction drawings and dimensions can be found in Appendix B

10.3 Decanting Earth Bunds

Several Decanting Earth Bunds (DEBs) will be constructed to manage runoff from the Stage 1 – 2 works for the stream diversion and western haul road.

All DEBs will discharge to native vegetation and will be chemically treated. All DEBs have been sized and designed in accordance with GD05 where possible. Where deviations from GD05 are required for DEB

construction, reasoning and additional controls have been detailed in Appendix A. Refer to Appendix B for specific design details.

10.4 Chemical Treatment

In accordance with best practice, all SRPs and DEBs to be used in the enabling works will be chemically treated to enhance sediment retention efficiency. A Chemical Treatment Management Plan (CTMP) will be prepared and submitted to Council for certification prior to works commencing. Chemically treated devices typically achieve 85-90%+ sediment removal efficiency.

As the benches are cut and over burden removed, the exposure of rock will reduce the sediment generating potential of the works and therefore improve the sediment efficiency of all devices. At the commencement and throughout the works, monitoring and bench testing of the SRP will be undertaken in accordance with the FMP. The bench testing will include testing and analysis of several chemical options and will include "organic flocculants" to determine the best water quality outcome.

10.5 Silt Fences

Silt fences will be used to treat site runoff from small areas that will not actively drain to a SRP or DEB and around specific isolated stream channel works. Silt fences will be installed below the footprint of the SRPs to capture any runoff generated during the construction of the ponds. Once the ponds are constructed the silt fences will be returned up either side of the emergency spillway to allow the spillway to function as designed. Figure 12 provides a schematic of silt fences that may be used on the project and Table 3 shows the design criteria.

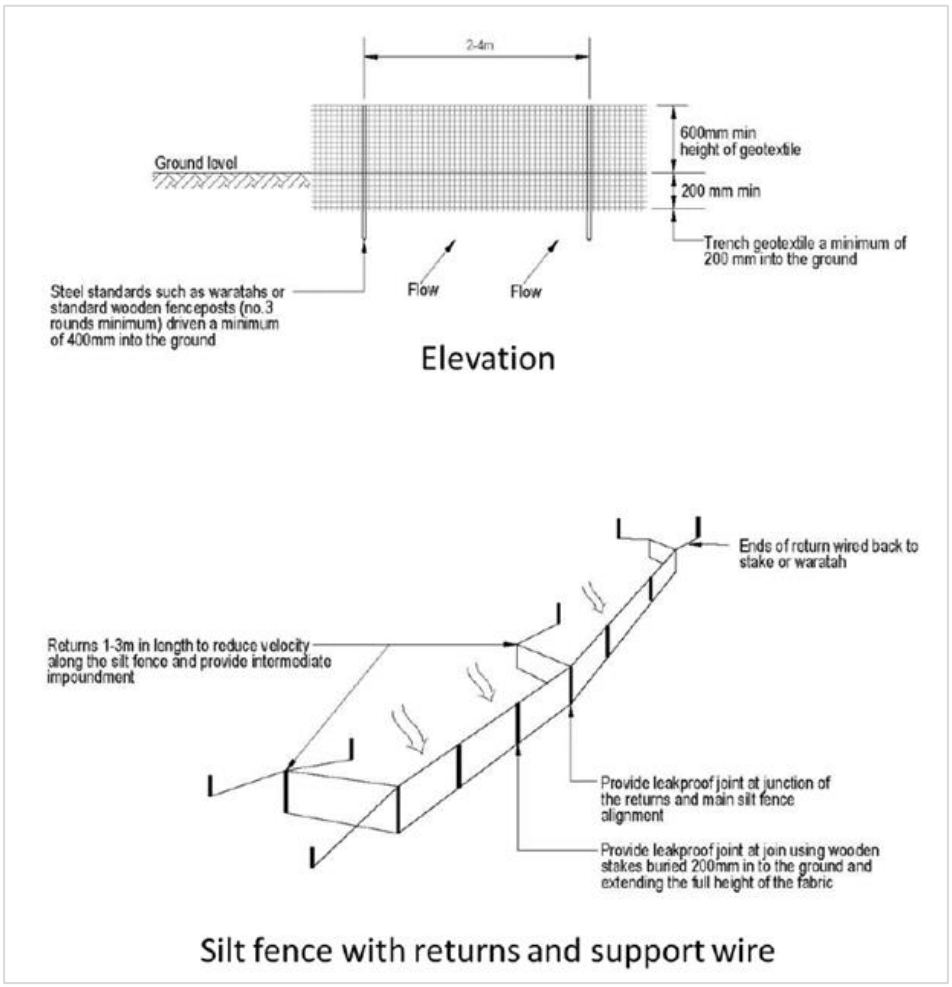

Figure 12: General silt fence schematic

Table 3: Silt fence design criteria

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

10.6 Access and Stabilised Entranceways

The main site entrance to the quarry is on Hunua Road. This has been fitted with a stabilised, formed entrance in accordance with GD05 and is already operational.

The purpose of these entranceway treatments is to prevent the exit point from site becoming a source of sediment generation and to reduce the tracking of sediment on to public roads.

The erosion and sediment control structures and requirements will be updated prior to any proposed changes to the Access and Stabilised Entranceways, and the ESCP updated accordingly.

10.7 As Builts

Prior to bulk earthworks commencing on any area, 'As Built Certification Statements', signed by an appropriately qualified and experienced person will need to be submitted to Auckland Council for certification to ensure that erosion and sediment controls have been constructed in general accordance with GD05.

Certified controls shall include sediment retention ponds[2], decanting earth bunds, silt fences and diversion channels/bunds. The 'As Built Certification Statement' will include all information as specified in the 'As Built Certification Sheets' (Appendix C) and supplied to the Auckland Council within 5 working days of the completion of the construction of those controls.

10.8 Dust control

Forward planning and management to minimise dust problems from earthworks activities provide the best options for control. If dust management is only addressed after it has become a problem on site, it is very difficult to bring under effective control until the site has been stabilised.

If dust is observed on site or predicted to be an issue, appropriate measures will be implemented as appropriate, in accordance with the Dust Management Plan/Air Quality Management Plan prepared as part of the substantive application.

10.9 Timing of earthworks

Normal quarry operations are possible all year round, however there are some activities which will be timed to take into account traditional earthwork season timeframes. Aggregate extraction activities occur throughout the year. This includes topsoil stripping, the removal of overburden and overburden disposal site remediation.

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[2] *Note: Photos must be taken of the anti-seep collar(s) for the as built information to ensure the SRP is not at risk of failure. The as built cannot be submitted unless there is evidence that these collars are appropriately installed.*

Once all necessary approvals have been obtained for the development, drainage and erosion and sediment controls will be completed first. Bulk earthworks and aggregate extraction will commence shortly afterwards. The first area to be established will be in the stream diversion works, as part of Stage 1.

Winter works

It is proposed to undertake earthworks and the removal of overburden during the winter months (May to October). This is already occurring on the site subject to approval from Auckland Council and stringent erosion and sediment controls, with no observed adverse impacts on the environment. Winter works will be carefully monitored especially during periods of wet weather. The ability to undertake such works during the winter months reflects the changing nature of weather patterns and that many extreme weather events increasingly occur outside May to October.

10.10 Minimise exposed areas

A range of best practice measures will be employed to maximise the area of land exposed to erosion at any one time. Vegetation clearance will be limited to those areas where soil disturbance will be undertaken, with as much existing ground cover being retained as possible. Staging of works may also be implemented, where practical, in order to stabilise areas where works have been completed.

10.11 Stabilisation and reinstatement

Exposed soil will be progressively stabilised when quarry works are completed to reduce erosion on these surfaces. Stabilisation will be in accordance with GD05 and the Quarry Management Plan objectives. All erosion and sediment controls will remain in-place until 80% vegetation reinstatement has been achieved.

A summary of stabilisation techniques which may be used on site:

- Geotextiles - An immediate form of stabilisation which involves the placement of geotextiles, mats, plastic covers, or erosion control blankets to stabilise disturbed soil areas and protect soils from erosion by wind or water. May be used as a permanent or temporary measure to control erosion.
- Hydroseeding/Hydro-hay - Will provide immediate stabilisation if applied with paper or wood pulp. Hydroseeding by itself will not provide the required amount of stabilisation to meet standards, however it will allow for very quick establishment of vegetation. Ideal for steep batters or slopes or runoff diversion channels/bunds when conditions allow for fast growth.
- Polymer - Will provide immediate stabilisation to areas which will not be disturbed for some time.

Application rates for hydroseeding and hay mulching is outlined below. Polymer application rates vary but will be confirmed with a suitably experienced contractor.

Certain faces of the quarry pits will not require formal stabilisation if they are determined to be predominantly rock faces where the above methods would not be applicable.

10.12 Watercourse protection

No machinery is to enter watercourses, except for authorised works in accordance with an approved resource consent.

All sediment laden water must be treated through a sediment treatment device before being discharged into any waterway. Diversion bunds or channels will be required to prevent sediment laden water from entering waterways.

10.13 Stream Works

Works in, or around, streams have potential to have a direct impact on watercourse habitat by habitat disturbance or destruction, and on watercourse ecology (such as through sediment and temperature-related effects). Care is therefore required for works in and around watercourses to minimise potential effects as much as possible.

Any sediment or material excavated from the bed of the stream must be stockpiled outside the 100-year flood plain area and managed with appropriate erosion and sediment control measures. No long-term stockpiling is proposed for the quarry extension, as all overburden will be taken to the existing OBDA. The existing OBDA is managed under a separate ESCP.

All areas of exposed earth, including the stream bed, must be stabilised appropriately with geotextile, rock or coconut matting at any time works are required to stop due to rainfall.

When the consent conditions are issued, a further iteration of the ESCP will be prepared to address specific requirements for stream works activities, including the Western Haul Road.

General Online Stream Diversion Methodology (structure installed within the existing stream)

There are two options to consider for online stream diversions – over-pumping or construction of a stream diversion channel to allow the water to by-pass the worksite.

Dam and Divert Methodology:

Damming a stream and pumping the flows around the worksite back to the stream considerably minimises disturbance relative to constructing a new diversion channel. With high flow streams, diversions are sometimes the only option; however, with most small streams, damming and pumping are less harmful to the environment and relatively simple to carry out.

The installation of a culvert (or bridge requiring in-stream works) using an online methodology will be undertaken in the following manner:

1. A dam is constructed across the stream with stabilised materials such as sandbags, sheet metal plate or other suitable construction materials. A pump is installed in the dam and sufficient hose length must be available to reach below the extent of in-stream works
2. The pump inlet should be placed in a drum with holes to minimise the possibility of sucking sediment from the bottom of the dam. Inclusion of a fish screen is recommended. The outlet should be directed to a stabilised area with an energy dissipater such as rip-rap boulders or similar.

A dam and pump methodology can only be used for works with a short duration or where the site can be stabilised at the end of each workday, so that flows can continue through the stream channel. Generally, it is not considered appropriate to implement a dam and pump methodology where the pump is required to be operating day and night for the duration of the operation (due to noise and pump reliability issues).

Sizing the pumped diversion for a given storm event depends on the duration of the stream diversion. As a minimum, the temporary pumping should be sized for a one-year peak discharge from the contributing catchment. These design parameters are based on the assumption that full channel 5% AEP (20 year) capacity is made available overnight or when storm events are predicted.

Temporary Stream Diversion:

These short-term watercourse diversions allow work to occur within the main watercourse channel. Size the diversion channel to allow for a 5% AEP rain event but consider the implications for secondary flow paths and upstream flood effects of having a larger event, up to 1% AEP.

1. The diversion channel should be excavated leaving a plug at each end so that the watercourse does not breach the diversion.

2. Stabilise the channel with, at a minimum, polythene and geotextile. This is dependent on the velocity of the water. Rip rap may be required to prevent scour and erosion.
3. Once the channel is stabilised, open the downstream plug to allow water to flow up the channel, keeping some water within the channel to reduce problems when the upstream plug is excavated. Then open the upstream plug, allowing water to flow into the channel.
4. A non-erodible dam should be placed immediately in the upstream end of the existing channel. A steel plate or earth bund (immediately stabilised) could be used.
5. A non-erodible downstream dam should then be installed to prevent backflow into the construction area. The structure and all channel works are then completed.
6. Once the culvert works are complete, the downstream dam should be removed first, allowing water to flood back into the original channel. The upstream dam is then removed, and both ends of the diversion channel are filled in with non-erodible material. Any sediment-laden water should be pumped to a sediment retention pond or dewatered. The remainder of the diversion channel should be filled in and stabilised.

Offline Stream Diversion methodology (structure installed adjacent to the existing stream)

The installation of a culvert (or bridge requiring in-stream works) using an offline methodology will be undertaken in the following manner:

1. Suitable access will be formed to provide access to the site.
2. Where the installation area is not already impounded by site perimeter controls, a silt fence will be installed between the culvert installation area and the stream.
3. The culvert(s) will be installed, to as close to the existing stream as practical without breaching the banks of the stream.
4. Any excavated material unsuitable for backfill will be removed from the work area for disposal in an existing controlled stockpile area. Material suitable for backfill will be appropriately stockpiled and protected from erosion and sediment discharge.
5. Any groundwater encountered during this operation will be pumped to a suitable sediment retention device such as a silt fence or SRP. If the water is clean and meets discharge consented limits, it can be pumped directly off-site following the dewatering/pumping protocol. A permit to pump form will be completed for any pumping activities.
6. The required channels to and from the end of the culverts to the stream will be excavated and stabilised (to final detail) to within approximately 0.5m of the stream.
7. In an ephemeral stream the final connections will simply be excavated and stabilised within 1 day.
8. During this operation the existing stream channel will be 'plugged' at each end with the outside face stabilised with geotextile.
9. In a perennial stream the final connections will be made under a short term (1 day) over pumping operation
10. Once complete suitable perimeter controls (typically silt fences) will be installed around the wing walls to control runoff from these isolated areas if required, or otherwise fully stabilised.
11. Stream flows will then be allowed to enter the culvert.

10.14 Over Pumping Operations

Over pumping operations may be required at certain stages of the work if required or a change in methodology is required. This is anticipated to be on a short term basis only (<24hrs).

The ESCP component of this report would need to be updated to reflect this change.

10.15 Dewatering

As the earthworks progress, a certain degree of dewatering may be required.

This dewatering will be undertaken in accordance with the following:

1. All excavation works are to be within the perimeter controls.
2. Any works required outside of the perimeter controls will need to be assessed in accordance with the requirements of this ESCP and the Consent Conditions to determine if a revision of the ESCP is required to accommodate those works prior to implementation.
3. Water which is to be removed from an excavation is to be pumped to the nearest SRP or DEB.
4. When the water reaches the required discharge standards then the stored flows will be discharged.

Any batch dosing of the device is to be undertaken in accordance with the Chemical Treatment Management Plan.

11 Estimated Sediment Yield (Stages 1 -8)

An estimate of sediment yield for the works that are to be treated via GD05 devices has been developed using the Universal Soil Loss Equation (USLE). The table of results of these estimates are also discussed in in Section 15.

In summary:

- The USLE estimates are based on conservative assumptions.
    - The open areas are taken as maximums. It is likely that they can be staged down to smaller areas at any given time.
    - The length-slope ratio is based on assumed slope lengths that exceed the likely cut bench spacing, and do not take account of the low gradients of the benches.
    - The assumed soil does not take account of the exposure of less erodible regolith and rock that will occur as the cuts progress.
- The existing upstream catchment load (including the site) is estimated to be 400ha.
- The 5.9ha open during Stage 1 (Stream Diversion Stage) of the project is estimated to result in up to 51.5 tonnes of sediment, representing a 2.5% increase in the load derived from the existing catchment.
- For Stage 2, the (up to) 3ha earthworks area is estimated to generate 26.9 tonnes per year, representing a 1.31% increase in the load derived from the existing catchment each year.
- For Stage 3, the (up to) 4.5ha earthworks area is estimated to generate 49.5 tonnes per year, representing a 2.42% increase in the load derived from the existing catchment each year.
- For Stage 4, the (up to) 5.2ha earthworks area is estimated to generate 118.1 tonnes per year, representing a 5.77% increase in the load derived from the existing catchment each year.
- For Stage 5-6, there is no increase in catchment size for new areas opened
- For Stage 7 and 8, the (up to) 41ha earthworks area is estimated to generate 950 -1000 tonnes per year, representing a 50% increase in the load derived from the existing catchment each year. However, these Stages of the site will be divided up into smaller campaigns and therefore a much smaller sediment yield should be expected.
- During each stage there are portions of the site which are completed and then diverted to the quarry pit. The treatment stage here is currently visual inspection of the water to be pumped to SRP RL110 prior to discharge.
- The quarry expansion will be established in a staged and progressive manner as overburden is produced. The total area of the expansion is approximately 60ha.
- SRPs and DEBs will be installed to treat runoff from the construction of the stripped areas. The SRP's and DEBs discharge to bush via stabilised overland flow paths or pipes to areas outside the quarry expansion.

12 Statutory Considerations

12.1 National Policy Statement for Freshwater Management

The National Policy Statement for Freshwater Management 2020 (NPSFM) contains an objective and 15 policies relating to the management of water quality and quantity, and any activities that may impact on those attributes, within the concept of Te Mana o te Wai, being:

the fundamental importance of water and recognises that protecting the health of freshwater protects the health and well-being of the wider environment. It protects the mauri of the wai. Te Mana o te Wai is about restoring and preserving the balance between the water, the wider environment, and the community.

Objective 2.1(1) states:

1. *The objective of this National Policy Statement is to ensure that natural and physical resources are managed in a way that prioritises:*
    a. *first, the health and well-being of water bodies and freshwater ecosystems*
    b. *second, the health needs of people (such as drinking water)*
    c. *third, the ability of people and communities to provide for their social, economic, and cultural well-being, now and in the future.*

These provisions have been taken into account in the preparation of this report. The adoption of the measures detailed in the ESCP are anticipated to manage and mitigate sediment loading downstream to achieve a level of water quality management that I consider will be consistent with the objectives and policy direction of the NPSFM and in accordance with Te Mana o te Wai.

12.2 Auckland Unitary Plan: Operative in Part

Chapter B7 (Natural Resources) of the Regional Policy Statement is relevant. B7.3 seek to ensure the enhancement of degraded freshwater systems, freshwater system loss is minimised, and that any adverse effects are avoided, remedied, or mitigated. B7.4 seeks to maintain water quality in freshwater bodies and coastal waters which have good water quality, and to enhance the water quality in degraded systems.

Chapter E3 (Lakes, rivers, streams, and wetlands) of the AUP: OP provides regional plan provisions that are of most relevance to this proposal. Those provisions are Objectives E3.2 (1) to (5) and (7) and Policies E3.3(2), (3), (7) and (8). These objectives and policies seek to ensure that activities in, on, under or over the bed of a lake, river, stream, and wetland are managed to minimise adverse effects on the lake, river, stream, or wetland.

Chapter E11 (Land Disturbance – Regional) of the AUP: OP provides the regional plan provisions directly relevant to earthworks. Those provisions are Objectives E11.2 (1)-(3) and Policies E11.3 (1)-(7).

Rule E11.8.2(1) provides the assessment criteria for consideration of the regional earthworks activities.

These are:

a) *whether applicable standards are complied with;*
b) *the proximity of the earthworks to any water body and the extent to which erosion and sediment controls and the proposed construction methodology will adequately avoid or minimise adverse effects on: E11 Land disturbance – Regional Auckland Unitary Plan Operative in part 19*
    i. *water quality including of the coastal marine area;*
    ii. *ecological health including of the coastal marine area;*
    iii. *riparian margins;*
    iv. *the mauri of water; and*
    v. *the quality of taiāpure or mahinga mātaitai.*
c) *the extent to which the earthworks minimises soil compaction, other than where it benefits geotechnical or structural performance;*

d) *the proximity of the earthworks to areas of significant ecological value and the extent the design, location and execution of the works provide for the maintenance and protection of these areas;*
e) *whether monitoring the volume and concentration of sediment that may be discharged by the activity is appropriate within the scale of the proposed land disturbance; and*
f) *whether the extent or impacts of adverse effects from the land disturbance can be mitigated by managing the duration, season or staging of such works.*
g) *the extent to which appropriate methods are used to prevent the spread of total control pest plants or unwanted organisms (as listed under the Biosecurity Act 1993), such as kauri dieback disease.*

The provisions outlined in the Regional Policy Statement and the Auckland Unitary Plan have been carefully considered in preparing this assessment. The measures proposed for the erosion and sediment control approaches and the construction methodologies are anticipated to appropriately address the objectives and policies of Chapters B7, E3, and E11, and to meet the assessment criteria of Rule E11.8.2(1). Collectively, the controls proposed are expected to minimise adverse effects on freshwater systems, maintain or enhance water quality, safeguard ecological and cultural values, and ensure that land disturbance activities are undertaken in a manner consistent with the policy direction for the protection and enhancement of Auckland's natural resources.

13 Maintenance and Monitoring

The operational effectiveness and efficiency of all erosion and sediment control measures must be maintained throughout the duration of, and each stage of, earthworks/quarrying activity, or until the site is permanently stabilised against erosion. Maintenance activities and site checks to be undertaken by Hunua Quarry staff (under direction of site management) are summarised in Table 4**Error! Reference source not found.**. All maintenance inspections and remedial actions should be documented and available upon request to Auckland Council. A suggested maintenance record template and inspection record is included in Appendix D.

A record will be maintained of the date and time of inspection undertaken, any maintenance requirements identified and of maintenance undertaken to all erosion and sediment control structures.

Table 4: Recommended maintenance activities and checks

Control Type		Frequency
Weather forecast	Check Metservice New Zealand for rainfall forecasts	At least weekly
Diversion bunds and channels	Ensure they are in the correct place (clean water diverting flows away from the work areas and sediment-laden flows directed to sediment treatment devices)	Weekly
	Inspect for signs of scouring or collapse and repair	Weekly
	Remove any materials that may have accumulated	As required
	Take particular care to protect against damage from earthmoving operations and reinstate the diversion if damaged.	As required
	Look for low spots, areas of water ponding, formation of tunnel gullies, sediment deposition and debris blockage	Weekly
Sediment Retention Pond/Decanting Earth Bund	Inspect the SRP and clean out if excess material has accumulated	Weekly
	Check the embankment for signs of erosion. Stabilise appropriately.	Weekly
	Check the inlet structure	Weekly
	Check the outlet structure and pipe (i.e. signs of seeping, blockages)	Weekly
Monitoring of sediment discharge	Check whether the erosion and sediment devices are operating as designed	During rainfall events
	Inspect areas of earthworks and identify whether additional erosion and sediment control measures are necessary	During rainfall events
	Determine whether excessive sediment is discharging to roadways, land, or watercourses	During rainfall events

Stabilising areas	Identify areas that require stabilisation	As works progress (minimum of once a week)

Any accumulated sediment deposited in the diversion channels where there is a risk of overtopping due to a lack of freeboard will be removed and disposed of to a secure area to ensure it does not discharge to the receiving environment.

Any sediment or fines removed from erosion and sediment control structures will be placed within the existing OBDA structures in a manner that meets the structural and geotechnical requirements associated with the OBDA.

13.1 SRP and DEB maintenance

Maintenance of the erosion and sediment control measures should seek to ensure that the accumulated sediment be removed from sediment retention devices prior to reaching 20% live storage capacity. The SRP or DEB must have at least 80% treatment capacity at all times. Sediment removed from treatment devices should be placed within the OBDA or stable ground where it cannot re-enter the device or be washed into any watercourse.

The SRP sump or any sumps around the site must be cleaned out regularly and after every large storm event to allow them to be effective during and immediately after future rain events

13.2 Monitoring and Triggers

Given the nature of the works proposed within the quarry, it is intended to undertake the following monitoring for water quality:

- Significant rainfall events will instigate monitoring and inspection to check the condition and continued effectiveness of the sediment control measures. As an initial trigger, a 'Trigger Event' of greater than 25mm in a 24-hour period or 15mm in a 1-hour period will instigate this process.

Other triggers to instigate monitoring includes:

- Spillage/accident reports that cause a discharge of sediment or contaminants to the aquatic environment;
- Obvious degradation of the receiving environment immediately downstream of an active work site such as accumulation of sediment, conspicuous oil/grease, scums/foams, floatable matter, fish kills, discolouration of water or significantly increased growth of nuisance algae;
- Verified exceedance of >20% increase in TSS measured at a downstream location, when compared to upstream

Following a rainfall trigger event, a documented visual inspection of all receiving waterways, SRPs and DEBs shall be carried out as soon as practicable. To monitor construction water discharges from SRPs & DEBs, pH, turbidity (NTU), and clarity shall be measured using calibrated field probes. The accuracy of field probes shall be measured by collecting grab samples from all of the SRPs and DEBs on site that are discharging.

For ESC device performance, the following management thresholds shall be applied:

- pH between 6.5 – 8.5 as measured at the outlet;
- 80% reduction in turbidity between inflow and outflow of discharging SRPs & DEBs; **OR**
- 100mm of clarity as measured at the outlet.

In-house calibration of turbidity meters and pH probes will be done as per manufacturers specifications.

It is also recommended that the water management system within the quarry pit incorporates a turbidity sensor and threshold (for example, <100 NTU) prior to pumping to SRP RL110 for treatment and discharge. The system should be designed, installed, and managed with extra capacity availability that can accommodate the extra campaign areas once they come online and subsequently report to the quarry pit. This will also be effective at the management of the infill areas of the quarry pit, as indicated in Figure 6 and Figure 7.

14 Proposed Consent Conditions

In order to manage erosion and sediment control on the site, the following conditions are proposed:

General

1. A minimum of 30 days prior to works commencing, an Erosion and Sediment Control Plan (ESCP) must be submitted to the Auckland Council for written certification. The ESCP must contain, but is not limited to calculations to confirm compliance with best practice erosion and sediment control for quarrying and associated activities including:

    a. Detailed plans showing the location of sediment control measures, on-site catchment boundaries, and sources of runoff;
    b. Confirmation that the erosion and sediment control devices have been sized appropriately in accordance with the Auckland Council Guideline Document GD05: Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region (2016) (GD05).
    c. Drawings and specifications of designated sediment control measures;
    d. Details of any stockpiling locations within the catchment and the erosion and sediment control measures to minimise construction-phase discharges from the stockpiles;
    e. overburden removal and disposal operations planned for the following 12 months; and
    f. areas of expected quarry operations for the following 12 months.

Site Meeting

2. A minimum of 15 working days prior to works commencing under this consent, the consent holder must hold a meeting that:

    a. is located on the subject site;
    b. includes Auckland Council compliance monitoring representatives; and
    c. includes representation from the Quarry Manager.

    The meeting must discuss the erosion and sediment control measures and the earthworks methodologies, and must ensure all relevant parties are aware of, and familiar with, the necessary conditions of this consent. The following information must be made available at the pre-start meeting:

    d. Timeframes for key stages of the works authorised under this consent;
    e. Name and contact details for key contractors and supervising engineers;
    f. Resource consent conditions;
    g. The Erosion and Sediment Control Plan and,
    h. The procedures and/or methodologies for completing the monitoring procedures as outlined in condition 9.

Erosion and Sediment Control Device requirements

3. The Consent Holder shall design, construct and maintain all erosion and sediment control measures in general accordance with *Auckland Council Guideline Document GD05: Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region (2016) (GD05)*.

    Advice Note

Any modifications or deviations to the above shall be subject to certification through the recertification process for the ESCP.

4. Re-vegetation and / or stabilisation of all disturbed areas (where practicable) is to be completed in general accordance with the measures set out in the *Auckland Council Guideline Document GD05: Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region (2016)* (GD05).

5. Within ten (10) working days following construction, implementation and completion of each specific erosion and sediment control device as detailed in the ESCP (i.e. sediment retention ponds, and clean and dirty water diversion bunds), a suitably qualified and experienced person must provide written certification to the Council that the erosion and sediment control measures have been constructed and completed in accordance with the approved ESCP and GD05

   Advice Note:

   Suitable documentation for certification of erosion and sediment control devices, can be obtained in Appendix C of Auckland Council Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region, June 2016, including any amendments to this document (GD05): Erosion and Sediment Control construction quality checklists.

6. Earthworks must be managed to avoid deposition of earth, mud, dirt or other debris on any public road or footpath resulting from earthworks activity on the subject site. In the event that such deposition does occur, it must immediately be removed. Roads or footpaths must not be washed down with water without appropriate erosion and sediment control measures in place to prevent contamination of the stormwater drainage system, watercourses or receiving waters.

   Advice Note
   In no circumstances should the washing of deposited materials into drains be advised or otherwise condoned. It is recommended that you discuss any potential measures with the Council's monitoring officer who may be able to provide further guidance on the most appropriate approach to take. Alternatively, please refer to Auckland Council Guideline Document 005, Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region, June 2016, including any amendments to this document (GD05).

Chemical Treatment

7. Within 30-days of consent being granted, a Chemical Treatment Management Plan (ChTMP) must be prepared and submitted to the Council for written certification. If an existing plan is being implemented, it must be updated to reflect the earthworks associated with this consent. The ChTMP must meet the following requirements:

   a. Specific design details of a chemical treatment system based on a rainfall activated methodology for the site's sediment retention ponds, and any other approved impoundment system;
   b. Monitoring, maintenance (including post storm) and contingency programme (including a record sheet);
   c. Details of optimum dosage (including assumptions);
   d. Results of initial chemical treatment trial;
   e. A spill contingency plan; and
   f. Details of the person or bodies that will hold responsibility for long term operation and maintenance of the chemical treatment system and the organisational structure which will support this system.

Advice Note

In the event that minor amendments to the ChTMP are required, any such amendments must be limited to the scope of this consent. Any amendments which affect the performance of the ChTMP may require an application to be made in accordance with section 127 of the RMA. Any minor amendments should be provided to the Council prior to implementation to confirm that they are within the scope of this consent.

8. The sediment retention ponds, and any other approved impoundment devices utilised as part of the earthworks, must be chemically treated in accordance with the certified Chemical Treatment Management Plan (ChTMP), throughout the duration of earthworks.

Maintenance of Sediment and Erosion Control

9. The operational effectiveness and efficiency of all erosion and sediment control measures specifically required by the approved Erosion and Sediment Control Plan, must be maintained throughout the duration of earthworks activity, or until the site is permanently stabilised against erosion. A record of any maintenance work must be kept and be supplied to the Council on request. Maintenance will be undertaken in accordance with the *Auckland Council Guideline Document GD05: Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region (2016)* (GD05).

Monitoring of Erosion and Sediment Controls

10. Monitoring undertaken during the construction period shall include the items listed below in (i) to (iii) following a rainfall trigger event of 25mm in a 24 hour period and 15mm in a 1 hour period:

    i. Visual inspections of all SRPs and DEB's;
    ii. Visual inspection of all receiving waterways; and
    iii. Manual inlet and outlet sampling from SRPs as detailed in condition 10.

11. The following sampling programme, consisting of the collection of 1 litre grab samples of water for the analyses of total suspended solids, turbidity and pH, collected at the following points, must be carried out following a rainfall trigger as per Condition 10. Samples must be collected as soon as practicable after the 25mm or more rainfall event having occurred at the following locations:

    a. 10m upstream of the most upstream quarry discharge point, into the Mangapū Stream, including clean water diversions (or as agreed with Auckland Council).
    b. 30m downstream of the most downstream quarry discharge point, into the Mangapū Stream, including clean water diversions (or as agreed with Auckland Council).
    c. All SRPs and DEBs at the inlet (prior to chemical treatment) and outlet points.

    All water samples must be analysed for total suspended solids (TSS) and nephelometric turbidity units (NTU), within one week of collection.

    If analysis of instream samples indicates that discharges from the quarry have increased the TSS (or NTU equivalent) as measured from point **a)** to point **b)**, by 20% or more, quarry operations must be modified and/or water quality control measures implemented. Details of any modifications to quarry operations and/or water quality control measures, must be included in an evaluation report(s) and must be submitted to the Council at quarterly intervals.

    If analysis of SRP or DEB samples indicates that discharges from any device have exceeded parameters detailed in **d) – f)**, the cause of the exceedance must be determined and remedied. Details of any modifications to quarry operations and/or ESC measures, must be included in an evaluation report(s) and must be submitted to the Council on request.

d. pH between 6.5 – 8.5 as measured at the outlet;

e. 80% reduction in turbidity between inflow and outflow of discharging SRPs & DEBs; **OR**

f. 100mm of clarity as measured at the outlet.

The sampling programme must be carried out throughout the duration that this consent is exercised.

Advice Note:

Once a statistically reliable relationship between TSS and NTU has been established, measurements of NTU only may be approved by Council, at the request of the consent holder.

Annual Erosion and Sediment Control Plan

12. On 30 April every year, the Consent Holder must submit an annual Erosion and Sediment Control Plan to Council for certification. The Plan must contain, but is not limited to:
    a. Areas to be worked over the next 12 months;
    b. Plans for earthworks, including overburden stripping and dumping, over the next 12 months with specific reference to any works proposed for the period between 30th April and 1st October;
    c. Areas of vegetation removed, and areas planted over the previous 12 months;
    d. Details of stockpiling activities;
    e. Design calculations for diversion drains to be constructed in the next 12 months;
    f. Details of maintenance activities undertaken in the previous 12 months, and maintenance activities proposed over the next 12 months;
    g. Details of any problems in respect of water management on the site during the previous 12 months, and proposals for addressing such problems;
    h. An Erosion and Sediment Control Plan, including calculations to confirm general compliance with GD05, including sediment pond volume requirements calculated based on predictions of exposed earthworks for quarrying and overburden stripping and dumping for the next 12 months; and
    i. Results of the previous 12 months of sampling and water monitoring, including summarised rainfall data and an assessment of the sampling results.

Seasonal Restriction

13. Earthworks on site, other than rock extraction, must not be undertaken between 01 May and 30 September in any year, without the submission of a 'Request for winter works' for approval by the Council. All requests must be renewed prior to the approval expiring and works must not occur until written approval has been received from the Council. All winter works will be re-assessed monthly or as required to ensure that adverse effects are not occurring in the receiving environment and approval may be revoked by Council upon written notice to the consent holder.

Advice of Completion or Abandonment of earthworks

14. Immediately upon completion or abandonment of earthworks on the subject site, all areas of bare earth associated with the works must be permanently stabilised against erosion (where practicable).

Advice Note:
Stabilisation measures may include:

a. The use of mulching or natural fibre matting.
b. Top-soiling, grassing and mulching of otherwise bare areas of earth.
c. Aggregate, rock or vegetative cover that has obtained a density of more than 80% of a normal pasture sward.

The on-going monitoring of these measures is the responsibility of the consent holder. It is recommended that you discuss any potential measures with the Council's monitoring officer who will guide you on the most appropriate approach to take. Alternatively, please refer to Auckland Council, Auckland Council Guidance Document 005, Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region, June 2016, Incorporating Amendment 3 (GD05).

15 Assessment of Effects

The discharge of sediment laden runoff from disturbed land to aquatic environments has the potential to result in adverse effects on associated flora and fauna through reduced water quality conditions and smothering of habitats. The measures summarised above and described in this report are designed to reduce sediment losses from disturbed areas during construction.

The Hunua Quarry development has the potential to cause sedimentation and water quality changes from vegetation clearance, earthworks and construction related discharges. The erosion and sedimentation controls proposed during construction, are designed to protect the downstream freshwater receiving environments and therefore, also provide protection to the ultimate marine receiving environment.

Erosion and sediment controls for the quarry development are outlined in this report and will involve the interception and treatment of sediment-laden runoff from the various construction areas. The erosion and sediment control measures proposed will be designed to minimise (to the extent practicable, and in accordance with GD05) the extent of soil erosion and manage any resultant sediment yield. Erosion control will be the highest priority in the design of the erosion and sediment control measures as it prevents sediment generation in the first instance.

For this proposal, all stages will use traditional earthworks practices consistent with GD05 erosion and sediment control (ESC) requirements. Some elements within these stages will require adaptive approaches, particularly the initial access into the stream diversion works and the western haul road, where access may involve a cut and cover methodology. These establishment activities are limited in both area and duration relative to the overall life of the quarry. Once the main quarry pit is established and fall is directed into it, reliance on SRPs and DEBs for sediment treatment will reduce, with water instead being managed through the controlled quarry pit water system.

Assessing sediment yield for a project of this scale inevitably involves uncertainty and relies on multiple assumptions. Any change to those assumptions can significantly influence the predicted yields. Sediment yield estimates indicate that the enabling works may increase sediment yield at the downstream extent of the site by approximately 2.5% to 5.77% during Stages 1–4. These estimates are intentionally conservative; in practice, site characteristics, staging, and reductions in open areas are likely to result in lower actual yields. It is also important to recognise that USLE outputs are not direct predictions of sediment loads. Instead, they provide a comparative tool and help refine ESC plans to minimise sediment generation as far as practicable.

The ESC strategy focuses on minimising exposed areas at any one time, applying best practice control measures, and progressively stabilising completed areas to reduce contributing catchment sizes. The proposed ESC methodology represents the best practicable option for this project. It incorporates best practice controls, staged establishment, quarrying processes, and progressive stabilisation. This approach aligns with industry leading practices that have successfully minimised sediment discharges and downstream effects on numerous projects across the Auckland region.

The proposed approach to ESC as described in this report, and the assessment of potential effects therein, is provided by myself as technical expert. I am satisfied that the proposed ESC management will effectively minimise potential sediment effects, due to:

- Comprehensive on-site monitoring to successfully implement effective erosion and sediment controls that respond to the project constraints and continuously improve the management approach
- Implementation of erosion and sediment control measures during construction, including structural (physical) and non-structural (site management and staging of the works) measures to meet the GD05 requirement

- Introduction of construction techniques to reduce ecological effects. For example, the bridge structure (Stage 1) instead of a culvert will reduce the risk of sediment discharge.

On that basis, the potential discharge of treated sediment laden water during the earthworks, streamworks and subsequent quarrying has taken account of the relevant assessment criteria and would in my opinion, on a technical basis, be consistent with relevant policies. Overall, within the scope of my assessment, the proposal is consistent with the relevant provisions of the AUP:OP.

I conclude that provided best practice erosion and sediment controls are in place during land disturbing activities as described above, any adverse effects on receiving environments can be appropriately mitigated. Some sediment is likely to be discharged from sediment devices in areas of works during rainfall events, but this will generally occur when the streams are under higher flows and receiving sediment from other sources in the catchment. Given the natural conditions that exist, and assuming best practice erosion and sediment control as described in GD05, the effects of construction discharges on receiving environments should be no more than minor.

Accordingly, the proposed ESC measures for both establishment and quarrying activities, along with the predicted sediment discharges, are expected to meet statutory requirements and support the intended outcomes for water quality and downstream environments.

16 Incident Management and Reporting

Incident response in relation to an unauthorised sediment discharge shall be undertaken. In relation to erosion and sediment control, an incident is defined as:

- Discharges from non-stabilised areas that are not treated by erosion and sediment control measures as required by the ESCP;
- Failure of any erosion and sediment control measures;
- Failure of any temporary stream diversion; and/or
- Any other incident, which either directly or indirectly causes, or is likely to cause, adverse ecological effects in any waterbodies, that is not authorised by a resource consent.

Incidents will primarily be identified by site observations by quarry staff and as a result of specific environmental and erosion and sediment control inspections undertaken by an appropriate Winstone representative. An incident may also be required as a result of the monitoring undertaken, through complaints, or stakeholder feedback.

An internal incident report will be prepared (within 5 working days), and include the following details:

- Description and location of incident;
- Description of the weather conditions before/during the incident;
- Description of work being carried out at the time of the incident and how the incident occurred;
- Immediate corrective actions taken to rectify the situation and mitigation measures to be taken to minimise the adverse effects on the environment;
- Root causes of the incident; and
- Environmental controls in place at the time of the incident.
- The incident will be reported in the internal incident reporting software, RADAR

16.1 Corrective Actions

As soon as practicable after an incident, the following recommendations should be made:

- Determine the immediate actions to be taken to ensure compliance with the relevant management plan(s), as soon as possible
- Corrective actions to address root causes shall be assigned and actioned as soon as practicable, taking into account health and safety.
- If required, liaise with Auckland Council to establish what remediation or rehabilitation is required and whether this is practicable to implement.

Additional monitoring may be required as a result of an incident, and changes may be required to the certified ESCP. Any such changes will be made in accordance with the conditions of consent(s).

17 Decommissioning

All SRPs, DEBs, silt fences and super silt fences are to remain until all surfaces within the contributing catchments are stabilised by grass (strike > 80%), aggregate or other appropriate stabilisation measure.

Once the above stabilisation criteria have been met, the decommissioning of controls will meet the following standards:

- Prior to backfilling of any devices, the silt fence or super silt fences that were utilised during the installation devices will be reinstated if required (particularly over the spillways), note this requirement will be subject to the duration of the backfilling.
- Any accumulated sediment is to be removed as part of this decommissioning and will be disposed of in one of the site spoil disposal areas.
- The exposed areas resulting from sediment retention pond or decanting earth bund decommissioning will be rapidly stabilised in accordance with the final landscaping for the area. Where this final landscaping requires grassing, additional stabilisation in the form of hay mulch may be appropriate.
- Any recyclable materials as the result of silt fence or super silt fence removal, waratahs, wire, tensioners, waratah caps etc will be retained and reused as practical.
- The geotextile from the silt fences or super silt fences is not (typically) suitable for reuse so will be removed from site as waste.
- As with the silt fence material, geotextile used for site stabilisation will be recycled if practical, where this is not practical it will be removed from site as waste.
- Throughout the duration of the project, the ability to salvage and recycle silt fence and geotextile will continue to be investigated. Off-site recycling opportunities will also be investigated.

Notice of the decommissioning must be provided to the Council at least two working days prior to the removal of any erosion and sediment control works specifically required as a condition of resource consent or by this document.

A template for decommissioning any erosion and sediment control device is included in Appendix E.

Appendix A – ESCP and Construction Methodology

The earthworks construction activities will follow a conventional approach. This will involve removal of vegetation within the areas to be worked; drainage activities; stripping of topsoil to stockpile; cutting and filling operations; aggregate extraction, spreading and; reinstatement of the finished surface with topsoil and grass or other stabilised surface where appropriate. Once vegetation has been removed, it may be beneficial to resurvey the area to confirm contour lines and appropriateness of ESC device locations.

The general construction methodology will be as follows:

Table 5: Construction Methodology

Stage	Description	ESC Control
See Drawing: ESCP-HQ-01 - 02	<u>Stream diversion work commences.</u> The first stage of the stream diversion work is to achieve access to the unnamed tributary into the Mangapū Stream. This will be completed with a combination of controls, including cut and cover, pumping and a cut-in methodology to allow for the containment of sediment laden water. Total area is 0.3 -0.6ha. Overburden to be taken to the OBDA (volumes TBC). 1. Mobilise to the site and have all appropriate materials available to achieve cut and cover (all unstabilised material must be covered prior to rainfall) and pumping operations. Commence works with a minimum 3-day fine weather window 2. Excavators to work gradually from the existing site, cutting into the material to form a bund at the extent of works at the end of each day. Minimum bund height must be 1.5m. This bund will prevent sediment discharge and allow the water to be pumped back to the exiting SRP RL150 for treatment. Pump(s) to be set up on float switches. 3. Once access to the tributary is complete, the track must be stabilised with aggregate and maintained for the duration of works. The cut embankment must be stabilised. 4. Crossing detail commences (bridge). If works are required in the stream, this will be completed by undertaking an online in-stream methodology involving an over pumping operation during low flow stream conditions. Number of pumps will be confirmed closed to the time of establishment. 5. Super Silt Fences to be set up in front of the abutment to prevent any material entering the stream. Once access is achieved across the stream, the same process will start on the other side (SSF establishment) 6. SRP-01 installed. This SRP will accommodate a maximum 3ha catchment area at any one time. As the stream diversion works progress, the benches within the cut must be stabilised progressively and then allowed to discharge offsite to keep the catchment to 3ha. This will involve removing sections of the cleanwater bunds on either side of the cut (CW-1 and CW-2). Stabilisation requirements may not mean all areas are hydroseeded, if the substrate is non-erodible. Remediation works on the SE benches will take place progressively, which will involve topsoil placement and plantings. 7. As the stream diversion progresses towards Mangapū Stream, there will be several points in time where the invert of the diversion changes and fall will not be able to be achieved back to SRP01. There will be two main methodologies to control sediment laden water from this point on:	Cut and cover methodology Pumping to existing controls SSF's SRP RL150, SRP-01 For pumping operations, a Permit to Pump system will be established. This will detail size and number of pumps required, duration, checks and maintenance. All areas that become unstabilised as part of the crossing detail works must be stabilised prior to rainfall. Silt fences to be installed around SRP01 during construction and decommissioning.

	- Works will be controlled by a bund (2m min height) at the end of the cut to accommodate some water storage and this will be pumped back to SRP01 for treatment and discharge. Pumps to be set up on float switches and a record of maintenance/testing carried out. This will continue until a DEB (and outlet) can be established within the cut. - A SRP (SRP02) will be constructed within the cut (SW side) to accommodate a portion of the catchment which cannot fall back SRP01. This will also be used for dewatering. 8. Once the stream diversion is ready to be livened, all areas must be sufficiently stabilised and protected from scouring. The livening process will take some time, and the final staging and livening date will be communicated to Auckland Council. 9. SRP01 may be decommissioned once all areas are stabilised or an approved cut and cover methodology is approved for small areas remaining.	
ESCP-HQ-03	This stage involves the expansion of the existing quarry pit into the northern corner of the property, towards the exiting access track. Expansion area = <6ha. 1. Extension of the SRP RL110 device to accommodate additional catchment (max catchment 5ha at any one time). Installation of diversion bunds around the site where stripping will occur. 2. Vegetation and topsoil stripping will commence in the identified expansion area 3. Once extraction commences, falls will change within the catchment and eventually the entire area will fall towards the quarry pit instead of the SRP. This will occur in a staged manner, with a maximum area of 5ha discharging towards SRP110 at any one time.	Diversion Bunds SRP RL 110
ESCP-HQ-04-05	Establishment of the Western Haul Road will commence. This involves areas of cut and fill in steep catchments, 2 x culvert with suitable fill sourced from the site and externally. Total area = approx. 2.8ha. Overburden to be disposed of in the existing OBDA. 1. Site establishment to commence, starting at Point E, the interface with the existing haul roads and the new extension. 2. To access Culvert 1, the cut needs to commence, which will be directed back to a sump and lamella[3] set up. Approximate location is indicated on the drawings. As the cut embankments are completed, these need to be stabilised or determined to be rock with limited potential for erosion. 3. Establishment of a series of DEB's and SSF's will be constructed along the track alignment. DEB-01 will be installed within the track alignment. Due to space constraints, this DEB's catchment is greater than 0.3ha (0.5ha) however as the haul road is constructed it will be sheeted with aggregate and is therefore expected to have low sediment yield. This specific DEB will be installed with a forebay, and a geotextile lined level inlet. All DEBs will be chemically treated. In this instance, the use of the DEB as the treatment device is considered appropriate. 4. DEB02 shall be installed as the cut progresses. The same requirements apply for this DEB as DEB01 due to oversized catchment (0.4ha) and limited space availability. 5. SSF's will be constructed for the fill areas which are steep and therefore must have 2m returns every 15m. Once fill areas are completed, they should be stabilised immediately. 6. A portion of the haul road will have some fall back to SRP RL110 which will be utilised where possible.	DEB01, DEB02 SSF's SRP RL110 Culvert installation to follow guidance in Section 10.13.

[3] A Lamella Clarifier is a type of sedimentation tank that uses a series of inclined plates to separate solid particles from liquid. These plates, also known as lamella plates, are arranged at an angle to increase the effective settling area of the tank.

	Usually, construction may only commence once devices are as built. In this case, some level of construction is required in order to get the 2 x DEB's in place. Sediment controls for the installation of these DEBs will occur on site but is likely to be under a cut and cover methodology, with unstabilised areas covered prior to rainfall. If required, the construction sequencing of the Western Haul Road may be reversed, and may start at Point A. The location of each DEB in the drawings is indicative only and will be determined on site, due to the most appropriate discharge locations (and staging requirements).	
ESCP-HQ-04-06	Expansion into the stream diversion area will occur progressively and follow the typical new 'campaign' methodology traditionally used at quarry sites: 1. Establishment of a new SRP (SRP RL100), with a catchment capacity of 3ha 2. No more than 3ha of stripped area can discharge to the SRP RL100 at any one time. 3. Once extraction of rock commences, the fall of the area will change towards the quarry pit. 4. Pumping may be required for areas which cannot achieve fall to either the quarry pit or SRP, initially. These areas must be bunded sufficiently (2m) with pumps on float switches. 5. The stream diversion is live by this stage. SRP RL100 must discharge off site via a stabilised flow path or piped system.	SRP RL100
ESCP-HQ-04-07	This stage will occur in sub-stages, with a maximum catchment area of 5ha, to be directed to SRP RL100. The main objective of this stage is to merge the western stream diversion embankment into the main quarry pit: 1. Vegetation clearance and topsoil stripping 2. Extraction of rock to allow fall back into the quarry pit 3. Disestablishment of the western stream diversion embankment will require an internal bund to be constructed to prevent sediment laden water discharging into the diversion. 4. Ensure old stream channel is sufficiently blocked to prevent sediment discharge.	SRP RL100
ESCP-HQ-04-08	Continuation of Stage 4 extent in terms of open area. No additional areas proposed.	
ESCP-HQ-04-09-10	Expansion of the site towards the east and west of the quarry footprint. This area totals 21ha and 20ha. A replacement for the Western Haul Road will also be constructed, tying into the new western side of the quarry. As these areas lie outside of the 35-year time frame these areas will be addressed at a later stage with minimum best practise standards applied. At a minimum, cleanwater diversions have been shown, along with existing SRP's. Drawings provided for indicative purposes.	

During construction works, all effort will be made to stabilise parts of the site as areas are topsoiled and completed. Erosion and sediment controls will remain in place until a satisfactory level or reinstatement has been achieved, at which time the temporary controls will be selectively removed.

Western Haul Road

The Western Haul Road will be constructed during Stage 2 of the quarry expansion. This is another significant area of works which involves cut and fill areas. This area (2.9ha) will not fall towards the internal quarry pit in the short term so additional ESC devices will need to be constructed, consisting of DEBs, SRPs and SSFs where appropriate. See Table 5 for detailed construction methodology.

The Western Haul Road eventually will be incorporated into the main quarry footprint during Stages 7 – 8 and is replaced by an additional haul road further west.

Two new culverts are required to convey steep natural catchments beneath a haul-road formation. Because the natural bed width is approximately 1.0 m, the internal bed width inside any culvert must be at least 1.3 m. This requirement governs culvert sizing, not hydraulic capacity.

Two compliant design options are recommended:

Option A — Embedded circular concrete culvert (minimum internal Ø 1.65 m) embedded ≥25% (≥0.41 m) to form ≥1.30 m natural bed width; bevelled headwall inlet and rip-rap outlet apron.

Option B — Box culvert or open-bottom arch (clear bed width ≥1.50 m preferred), preserving natural streambed and simplifying fish passage and geomorphic continuity.

The recommended approach is that Culvert 2 (larger catchment) adopt Option B; Culvert 1 (smaller) either Option A or Option B for consistency. Both align with Auckland Council performance expectations for culvert installation and checks.

Catchments: C1 = 1.90 ha (slope ≈ 26.7%), C2 = 10.12 ha (slope ≈ 22.1%)

ESC NOTES

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ALL EROSION AND SEDIMENT CONTROLS ARE TO BE INSTALLED AND MAINTAINED AS A MINIMUM STANDARD IN ACCORDANCE WITH GD05.

CUT OFF DIVERSIONS ARE TO BE INSTALLED PRE-RAINFALL AT THE END OF THE WORKING DAY TO DIVERT SEDIMENT LADEN FLOWS TO THE CORRECT TREATMENT DEVICE

LOCATION OF CONTROLS SHOWN ARE INDICATIVE AND ARE TO BE CONFIRMED ON SITE

ALL CONTROLS DESIGNED TO A MINIMUM 5% AEP UNLESS OTHERWISE STATED

ESC MEASURES

- SSF — SUPER SILT FENCE
- SF — SILT FENCE
- CW — CLEAN WATER DIVERSION
- DW — DIRTY WATER DIVERSION
- DECANTING EARTH BUND (DEB)
- SEDIMENT RETENTION POND (SRP)
- SRP CATCHMENT AREA
- DEB CATCHMENT AREA
- SUPER SILT FENCE CATCHMENT AREA
- CUT OFF BUND/CHANNEL

STABILISED ACCESS TRACK

INITALL ACCESS REQUIRED DOWN TO UNNAMED TRIBUTARY.

COMPELTED UNDER CUT & COVER METHODOLOGY (0.3 - 0.4HA) WHERE REQUIRED, WITH PUMPING TO SRP RL150

OVERLAND FLOW PATH

SRP01
3HA CATCHMENT AREA
900M3 MIN VOLUME
CHEMICAL TREATMENT REQUIRED
OUTLET TO UNNAMED TRIBUTARY

BRIDGE STRUCTURE OVER TRIBUTARY TBC

INDICATIVE SRP AREA (3HA). THIS WILL CHANGE AS WORKS PROGRESS WITHIN THE SITE. BENCHES SHALL BE STABILISED AS THEY ARE COMPELTED TO DISCHRGE AWAY FROM THE SRP TO MINIMISE CATCHMENT

CW-1

CW-2

UNNAMED TRIBUTARY TO MANGAPU STREAM

MANGAPU STREAM

MAIN STREAM DIVERSION EXTENT - TOTAL AREA 5.2HA

ONCE THE HINGE POINT IS REACHED IN THE CUT, FALL BACK TO SRP01 CANNOT BE ACHIEVED.

2M HIGH BUND TO BE MAINTAINED AT THE END OF THE CUT WITH SUFFICIENT PUMPS TO PUMP BACK TO SRP01 FOR THE DURATION OF WORKS.

3HA CATCHMENT TO BE MAINTAINED.

0 100 200 m

WINSTONE AGGREGATES

MPD ENVIRONMENTAL

REV	DESCRIPTION	CAD	CHK	DATE	APPROVED	DATE
A	ESCP for review					

DESIGNED
DRAWN
DESIGN CHECKED
DRAWING CHECKED

DRAWING STATUS
PROJECT PHASE

THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION PURPOSES UNLESS APPROVED

CLIENT WINSTONE AGGREGATES
PROJECT HUNUA QUARRY EXPANSION

TITLE
ESCP - STREAM DIVERSION WORKS

DRAWING NO: ESCP-HQ-01
REV: A

ESC NOTES

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- SRP CATCHMENT AREA
- DEB CATCHMENT AREA
- SUPER SILT FENCE CATCHMENT AREA
- CUT OFF BUND/CHANNEL

STABILISED ACCESS TRACK

INITALL ACCESS REQUIRED DOWN TO UNNAMED TRIBUTARY.

COMPELTED UNDER CUT & COVER METHODOLOGY (0.3 - 0.4HA), WHERE REQUIRED, WITH PUMPING TO SRP RL150

OVERLAND FLOW PATH

SRP01
3HA CATCHMENT AREA
900M3 MIN VOLUME
CHEMICAL TREATMENT REQUIRED
OUTLET TO UNNAMED TRIBUTARY

CATCHEMENT REDUCES TO 2.7HA ONCE STABILISATION TAKES PLACE

BRIDGE STRUCTURE OVER TRIBUTARY TBC

INDICATIVE SRP AREA (3HA). THIS WILL CHANGE AS WORKS PROGRESS WITHIN THE SITE. BENCHES SHALL BE STABILISED AS THEY ARE COMPELTED TO DISCHRGE AWAY FROM THE SRP TO MINIMISE CATCHMENT

CW-1

CW-2

UNNAMED TRIBUTARY TO MANGAPU STREAM

MAIN STREAM DIVERSION - STABILISED AREA (2HA)

MANGAPU STREAM

SRP02
0.7HA CATCHMENT AREA
210M3 MIN VOLUME
CHEMICAL TREATMENT REQUIRED

ONCE THE HINGE POINT IS REACHED IN THE CUT, FALL BACK TO SRP01 CANNOT BE ACHIEVED.

2M HIGH BUND TO BE MAINTAINED AT THE END OF THE CUT WITH SUFFICIENT PUMPS TO PUMP BACK TO SRP01 FOR THE DURATION OF WORKS.

3HA CATCHMENT TO BE MAINTAINED.

0 100 200 m

WINSTONE AGGREGATES

MPD ENVIRONMENTAL

REV	DESCRIPTION	CAD	CHK	DATE	APPROVED	DATE
A	ESCP for review					

DESIGNED
DRAWN
DESIGN CHECKED
DRAWING CHECKED

DRAWING STATUS
PROJECT PHASE

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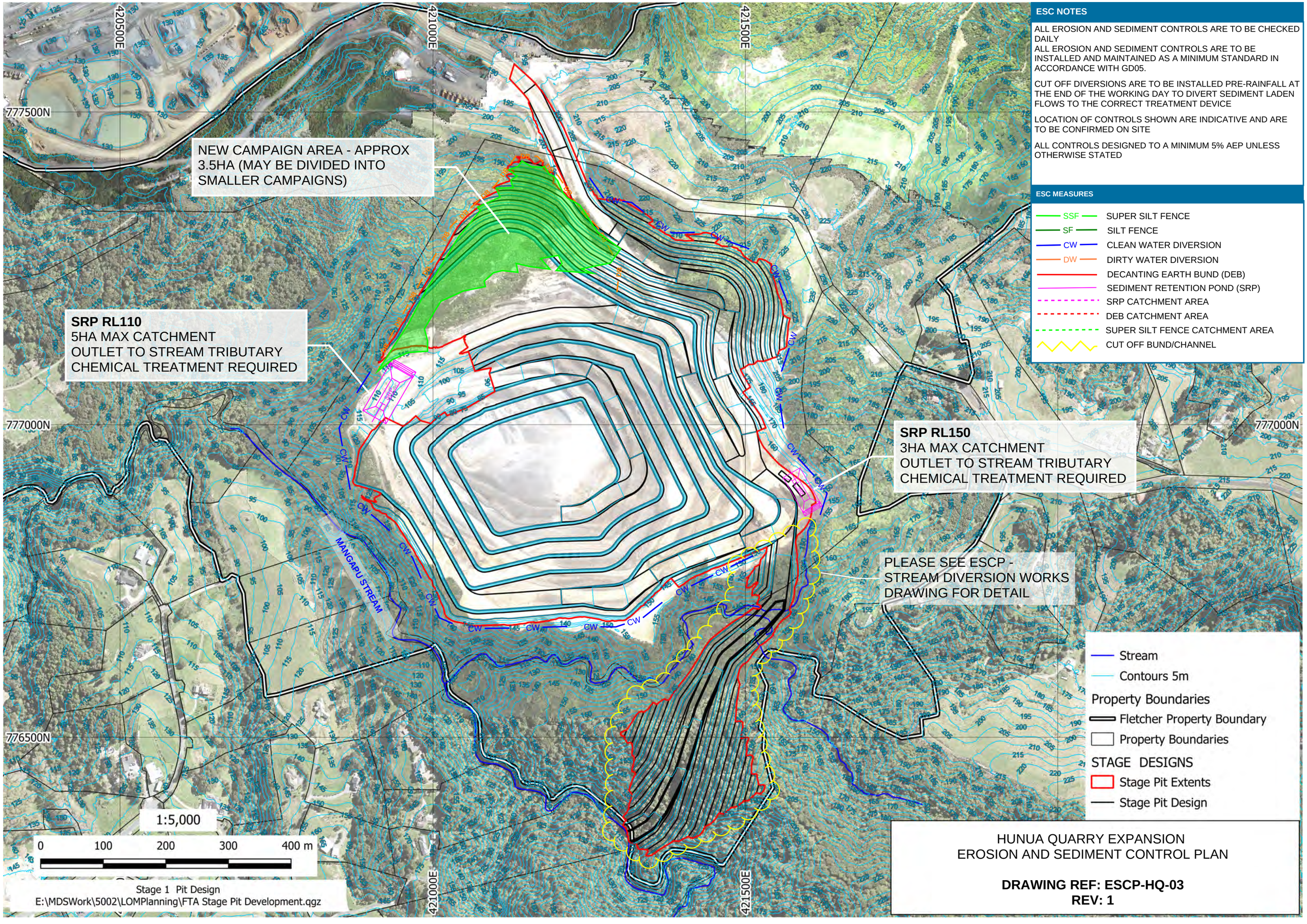
CLIENT WINSTONE AGGREGATES
PROJECT HUNUA QUARRY EXPANSION

TITLE
ESCP - STREAM DIVERSION WORKS

DRAWING NO: ESCP-HQ-02
REV: A


420500E
421000E
421500E
777500N
777000N
776500N
NEW CAMPAIGN AREA - APPROX 3.5HA (MAY BE DIVIDED INTO SMALLER CAMPAIGNS)
SRP RL110
5HA MAX CATCHMENT
OUTLET TO STREAM TRIBUTARY
CHEMICAL TREATMENT REQUIRED
SRP RL150
3HA MAX CATCHMENT
OUTLET TO STREAM TRIBUTARY
CHEMICAL TREATMENT REQUIRED
PLEASE SEE ESCP - STREAM DIVERSION WORKS DRAWING FOR DETAIL
MANGAPU STREAM
CW
DW
SSF
SF
DEB
SRP
1:5,000
0 100 200 300 400 m
Stage 1 Pit Design
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ESC NOTES
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CUT OFF DIVERSIONS ARE TO BE INSTALLED PRE-RAINFALL AT THE END OF THE WORKING DAY TO DIVERT SEDIMENT LADEN FLOWS TO THE CORRECT TREATMENT DEVICE
LOCATION OF CONTROLS SHOWN ARE INDICATIVE AND ARE TO BE CONFIRMED ON SITE
ALL CONTROLS DESIGNED TO A MINIMUM 5% AEP UNLESS OTHERWISE STATED
ESC MEASURES
SSF SUPER SILT FENCE
SF SILT FENCE
CW CLEAN WATER DIVERSION
DW DIRTY WATER DIVERSION
DECANTING EARTH BUND (DEB)
SEDIMENT RETENTION POND (SRP)
SRP CATCHMENT AREA
DEB CATCHMENT AREA
SUPER SILT FENCE CATCHMENT AREA
CUT OFF BUND/CHANNEL
Stream
Contours 5m
Property Boundaries
Fletcher Property Boundary
Property Boundaries
STAGE DESIGNS
Stage Pit Extents
Stage Pit Design
HUNUA QUARRY EXPANSION
EROSION AND SEDIMENT CONTROL PLAN
DRAWING REF: ESCP-HQ-03
REV: 1

ESC NOTES

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- DEB CATCHMENT AREA
- SUPER SILT FENCE CATCHMENT AREA
- CUT OFF BUND/CHANNEL

WESTERN QUARRY HAUL ROAD
(2.89HA)

(SEE DRAWING ESCP-HQ-05)

SRP RL110
5HA MAX CATCHMENT
OUTLET TO STREAM TRIBUTARY
CHEMICAL TREATMENT REQUIRED

SRP RL150
3HA MAX CATCHMENT
OUTLET TO STREAM TRIBUTARY
CHEMICAL TREATMENT REQUIRED

MANGAPU STREAM

420500E
421000E
421500E
777500N
777000N
776500N

- Stream
- Contours 5m

Property Boundaries
- Fletcher Property Boundary
- Property Boundaries

STAGE DESIGNS
- Stage Pit Extents
- Stage Pit Design

1:5,000

0 100 200 300 400 m

Stage 2 Pit Design
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HUNUA QUARRY EXPANSION
EROSION AND SEDIMENT CONTROL PLAN

DRAWING REF: ESCP-HQ-04
REV: 1

ESC NOTES

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CUT OFF DIVERSIONS ARE TO BE INSTALLED PRE-RAINFALL AT THE END OF THE WORKING DAY TO DIVERT SEDIMENT LADEN FLOWS TO THE CORRECT TREATMENT DEVICE

LOCATION OF CONTROLS SHOWN ARE INDICATIVE AND ARE TO BE CONFIRMED ON SITE

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- SRP CATCHMENT AREA
- DEB CATCHMENT AREA
- SUPER SILT FENCE CATCHMENT AREA
- CUT OFF BUND/CHANNEL
- CUT
- FILL

STAGE 1

CONTROLLED BY LAMELLA AND PROGRESSIVE STABILISATION

CULVERT 1
SEE STREAM WORKS METHODOLOGY FOR INSTALLATION AND LIVENING OPTIONS

APPROXIMATE LOCATION OF SUMP (MIN 25m3 CAPACITY) AND LAMELLA

CHEMICAL TREATMENT REQUIRED.

DEB02(MAX CATCHMENT 0.4HA)
CHEMICAL TREATMENT REQUIRED.
ADDITIONAL CONTROLS REQUIRED - SEE CONSTRUCTION METHODOLOGY.

FILL TO BE CONTROLLED WITH A SSF. STABILISATION MUST BE PRIORITISED IN THIS AREA - AS SOON AS FILL IS COMPELTED IT NEEDS TO BE STABILISED.

RETURNS ON SSF EVERY 15M DUE TO STEEP CATCHMENT.

DEB01(MAX CATCHMENT 0.5HA)
DEB TO BE INSTALLED IMMEDIATELY AFTER CULVERT 1 COMPLETION.
CHEMICAL TREATMENT REQUIRED.

ADDITIONAL CONTROLS REQUIRED - SEE CONSTRUCTION METHODOLOGY.

CULVERT 2
SEE STREAM WORKS METHODOLOGY FOR INSTALLATION AND LIVENING OPTIONS

THIS CATCHMENT TO FALL BACK TO SRP RL110

- Stream
- Contours 5m

Property Boundaries
- Fletcher Property Boundary
- Property Boundaries

STAGE DESIGNS
- Stage Pit Extents
- Stage Pit Design

1:1,500
0 10 20 30 40 50 60 70 80 90 100 m

West Haul Road - Aerial
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EROSION AND SEDIMENT CONTROL PLAN - WESTERN HAUL ROAD

DRAWING NUMBER: **ESCP-HQ-05**
REV: 1

ESC NOTES

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ESC MEASURES

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- CW — CLEAN WATER DIVERSION
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- SEDIMENT RETENTION POND (SRP)
- SRP CATCHMENT AREA
- DEB CATCHMENT AREA
- SUPER SILT FENCE CATCHMENT AREA
- CUT OFF BUND/CHANNEL

SRP RL110
HA MAX CATCHMENT
OUTLET TO STREAM TRIBUTARY
CHEMICAL TREATMENT REQUIRED

SRP RL150
3HA MAX CATCHMENT
OUTLET TO STREAM TRIBUTARY
CHEMICAL TREATMENT REQUIRED

SRP RL100
5HA MAX CATCHMENT
OUTLET TO STREAM TRIBUTARY
CHEMICAL TREATMENT REQUIRED

NEW CAMPAIGN AREA - APPROX
4.5HA (MAY BE DIVIDED INTO
SMALLER CAMPAIGNS)

MANGAPU STREAM

420500E 421000E 421500E

777500N 777000N 776500N

- Stream
- Contours 5m

Property Boundaries
- Fletcher Property Boundary
- Property Boundaries

STAGE DESIGNS
- Stage Pit Extents
- Stage Pit Design

1:5,000

0 100 200 300 400 m

Stage 3 Pit Design
E:\MDSWork\5002\LOMPlanning\FTA Stage Pit Development.qgz

HUNUA QUARRY EXPANSION
EROSION AND SEDIMENT CONTROL PLAN

DRAWING REF: ESCP-HQ-06
REV: 1

ESC NOTES

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CUT OFF DIVERSIONS ARE TO BE INSTALLED PRE-RAINFALL AT THE END OF THE WORKING DAY TO DIVERT SEDIMENT LADEN FLOWS TO THE CORRECT TREATMENT DEVICE

LOCATION OF CONTROLS SHOWN ARE INDICATIVE AND ARE TO BE CONFIRMED ON SITE

ALL CONTROLS DESIGNED TO A MINIMUM 5% AEP UNLESS OTHERWISE STATED

ESC MEASURES

- SSF — SUPER SILT FENCE
- SF — SILT FENCE
- CW — CLEAN WATER DIVERSION
- DW — DIRTY WATER DIVERSION
- DECANTING EARTH BUND (DEB)
- SEDIMENT RETENTION POND (SRP)
- SRP CATCHMENT AREA
- DEB CATCHMENT AREA
- SUPER SILT FENCE CATCHMENT AREA
- CUT OFF BUND/CHANNEL

SRP RL110
HA MAX CATCHMENT
OUTLET TO STREAM TRIBUTARY
CHEMICAL TREATMENT REQUIRED

SRP RL150
3HA MAX CATCHMENT
OUTLET TO STREAM TRIBUTARY
CHEMICAL TREATMENT REQUIRED

SRP RL100
5HA MAX CATCHMENT
OUTLET TO STREAM TRIBUTARY
CHEMICAL TREATMENT REQUIRED

NEW CAMPAIGN AREA - APPROX 5HA (MAY BE DIVIDED INTO SMALLER CAMPAIGNS)

CLEAN WATER DIVERSION TO BE MAINTAINED BETWEEN LIVENED STREAM DIVERSION

- Stream
- Contours 5m

Property Boundaries
- Fletcher Property Boundary
- Property Boundaries

STAGE DESIGNS
- Stage Pit Extents
- Stage Pit Design

1:5,000

0 100 200 300 400 m

Stage 4 Pit Design
E:\MDSWork\5002\LOMPlanning\FTA Stage Pit Development.qgz

HUNUA QUARRY EXPANSION
EROSION AND SEDIMENT CONTROL PLAN

DRAWING REF: ESCP-HQ-07
REV: 1

ESC NOTES

ALL EROSION AND SEDIMENT CONTROLS ARE TO BE CHECKED DAILY

ALL EROSION AND SEDIMENT CONTROLS ARE TO BE INSTALLED AND MAINTAINED AS A MINIMUM STANDARD IN ACCORDANCE WITH ENVIRONMENT CANTERBURY'S EROSION AND SEDIMENT CONTROL TOOLBOX GUIDELINES

CUT OFF DIVERSIONS ARE TO BE INSTALLED PRE-RAINFALL AT THE END OF THE WORKING DAY TO DIVERT SEDIMENT LADEN FLOWS TO THE CORRECT TREATMENT DEVICE

LOCATION OF CONTROLS SHOWN ARE INDICATIVE AND ARE TO BE CONFIRMED ON SITE

ALL CONTROLS DESIGNED TO A MINIMUM 5% AEP UNLESS OTHERWISE STATED

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- SEDIMENT RETENTION POND (SRP)
- SRP CATCHMENT AREA
- DEB CATCHMENT AREA
- SUPER SILT FENCE CATCHMENT AREA
- CUT OFF BUND/CHANNEL

SRP RL110
HA MAX CATCHMENT
OUTLET TO STREAM TRIBUTARY
CHEMICAL TREATMENT REQUIRED

SRP RL150
3HA MAX CATCHMENT
OUTLET TO STREAM TRIBUTARY
CHEMICAL TREATMENT REQUIRED

SRP RL100
5HA MAX CATCHMENT
OUTLET TO STREAM TRIBUTARY
CHEMICAL TREATMENT REQUIRED

420500E
421000E
421500E
777500N
777000N
776500N

- Stream
- Contours 5m

Property Boundaries
- Fletcher Property Boundary
- Property Boundaries

STAGE DESIGNS
- Stage Pit Extents
- Stage Pit Design

1:5,000

0 100 200 300 400 m

Stage 6 Pit Design
E:\MDSWork\5002\LOMPlanning\FTA Stage Pit Development.qgz

HUNUA QUARRY EXPANSION
EROSION AND SEDIMENT CONTROL PLAN

DRAWING REF: ESCP-HQ-08
REV: 1

ESC NOTES

ALL EROSION AND SEDIMENT CONTROLS ARE TO BE CHECKED DAILY

ALL EROSION AND SEDIMENT CONTROLS ARE TO BE INSTALLED AND MAINTAINED AS A MINIMUM STANDARD IN ACCORDANCE WITH ENVIRONMENT CANTERBURY'S EROSION AND SEDIMENT CONTROL TOOLBOX GUIDELINES

CUT OFF DIVERSIONS ARE TO BE INSTALLED PRE-RAINFALL AT THE END OF THE WORKING DAY TO DIVERT SEDIMENT LADEN FLOWS TO THE CORRECT TREATMENT DEVICE

LOCATION OF CONTROLS SHOWN ARE INDICATIVE AND ARE TO BE CONFIRMED ON SITE

ALL CONTROLS DESIGNED TO A MINIMUM 5% AEP UNLESS OTHERWISE STATED

ESC MEASURES

- SSF — SUPER SILT FENCE
- SF — SILT FENCE
- CW — CLEAN WATER DIVERSION
- DW — DIRTY WATER DIVERSION
- DECANTING EARTH BUND (DEB)
- SEDIMENT RETENTION POND (SRP)
- SRP CATCHMENT AREA
- DEB CATCHMENT AREA
- SUPER SILT FENCE CATCHMENT AREA
- CUT OFF BUND/CHANNEL

NEW CAMPAIGN AREAS - APPROX 11.5HA AND 9.5HA (WILL BE DIVIDED INTO SMALLER CAMPAIGNS)

SRP RL110
HA MAX CATCHMENT
OUTLET TO STREAM TRIBUTARY
CHEMICAL TREATMENT REQUIRED

SRP RL100
5HA MAX CATCHMENT
OUTLET TO STREAM TRIBUTARY
CHEMICAL TREATMENT REQUIRED

SRP RL150
3HA MAX CATCHMENT
OUTLET TO STREAM TRIBUTARY
CHEMICAL TREATMENT REQUIRED

420500E 421000E 421500E
777500N 777000N 776500N

- Stream
- Contours 5m

Property Boundaries
- Fletcher Property Boundary
- Property Boundaries

STAGE DESIGNS
- Stage Pit Extents
- Stage Pit Design

1:5,000

0 100 200 300 400 m

Stage 7 Pit Design
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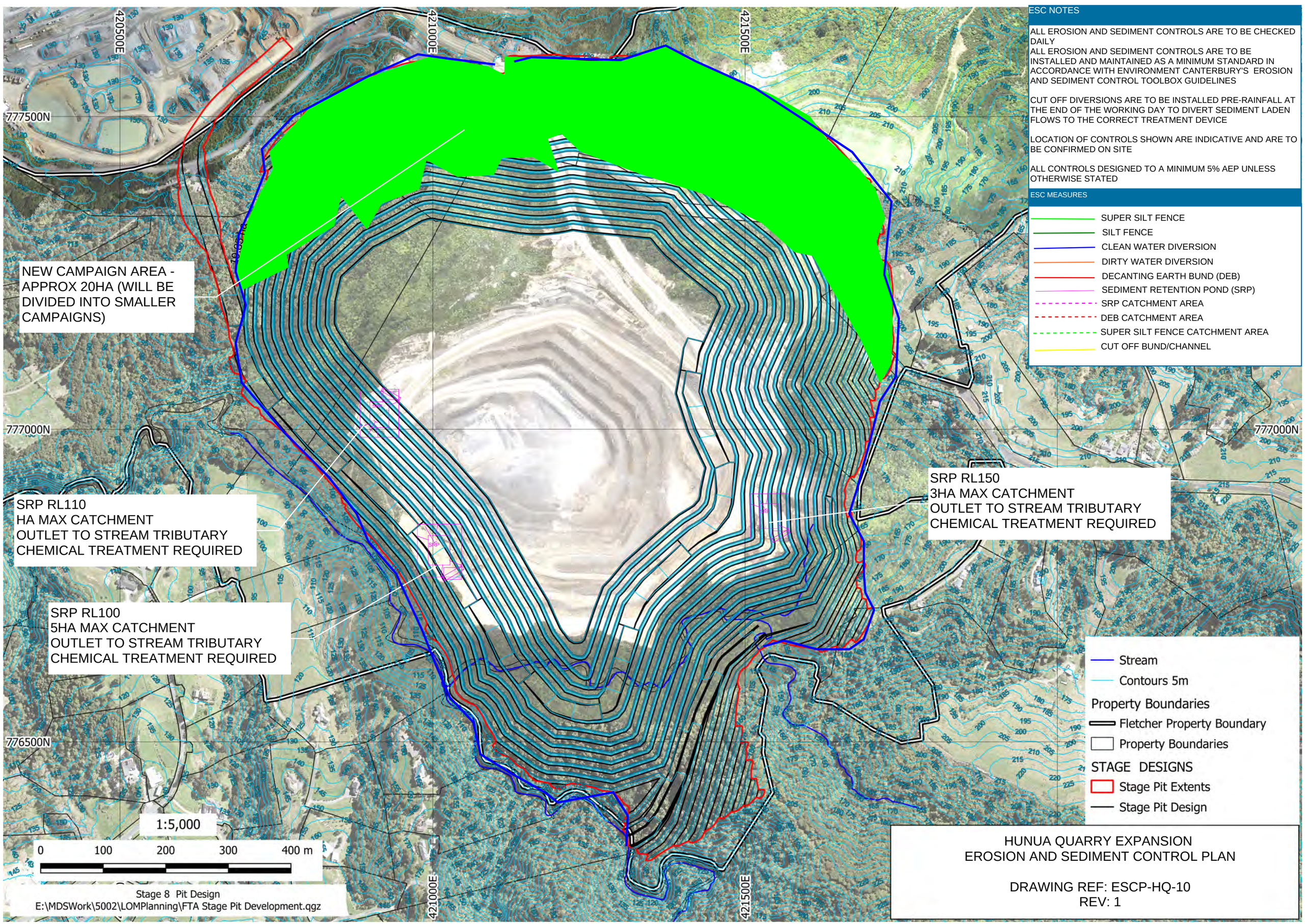
HUNUA QUARRY EXPANSION
EROSION AND SEDIMENT CONTROL PLAN

DRAWING REF: ESCP-HQ-09
REV: 1


420500E
421000E
421500E
777500N
777000N
776500N
NEW CAMPAIGN AREA - APPROX 20HA (WILL BE DIVIDED INTO SMALLER CAMPAIGNS)
SRP RL110
HA MAX CATCHMENT
OUTLET TO STREAM TRIBUTARY
CHEMICAL TREATMENT REQUIRED
SRP RL100
5HA MAX CATCHMENT
OUTLET TO STREAM TRIBUTARY
CHEMICAL TREATMENT REQUIRED
SRP RL150
3HA MAX CATCHMENT
OUTLET TO STREAM TRIBUTARY
CHEMICAL TREATMENT REQUIRED
SRP
1:5,000
0 100 200 300 400 m
Stage 8 Pit Design
E:\MDSWork\5002\LOMPlanning\FTA Stage Pit Development.qgz
ESC NOTES
ALL EROSION AND SEDIMENT CONTROLS ARE TO BE CHECKED DAILY
ALL EROSION AND SEDIMENT CONTROLS ARE TO BE INSTALLED AND MAINTAINED AS A MINIMUM STANDARD IN ACCORDANCE WITH ENVIRONMENT CANTERBURY'S EROSION AND SEDIMENT CONTROL TOOLBOX GUIDELINES
CUT OFF DIVERSIONS ARE TO BE INSTALLED PRE-RAINFALL AT THE END OF THE WORKING DAY TO DIVERT SEDIMENT LADEN FLOWS TO THE CORRECT TREATMENT DEVICE
LOCATION OF CONTROLS SHOWN ARE INDICATIVE AND ARE TO BE CONFIRMED ON SITE
ALL CONTROLS DESIGNED TO A MINIMUM 5% AEP UNLESS OTHERWISE STATED
ESC MEASURES
SUPER SILT FENCE
SILT FENCE
CLEAN WATER DIVERSION
DIRTY WATER DIVERSION
DECANTING EARTH BUND (DEB)
SEDIMENT RETENTION POND (SRP)
SRP CATCHMENT AREA
DEB CATCHMENT AREA
SUPER SILT FENCE CATCHMENT AREA
CUT OFF BUND/CHANNEL
Stream
Contours 5m
Property Boundaries
Fletcher Property Boundary
Property Boundaries
STAGE DESIGNS
Stage Pit Extents
Stage Pit Design
HUNUA QUARRY EXPANSION
EROSION AND SEDIMENT CONTROL PLAN
DRAWING REF: ESCP-HQ-10
REV: 1

Appendix B – ESC Design

The following information includes further details of key construction aspects of the proposed enabling works and bulk earthworks. All controls will be designed, installed, and maintained in accordance with best practice. This includes being in general accordance with the Auckland Council GD05 Guidelines.

Minimum Design Standards

Peak flows are based on HIRDS data from NIWA (Earth Science New Zealand) for the site location over 10-minute intensities. At the time of writing, no provision has been made for climate change due to the temporary and adaptive nature and duration of the works. The expansion will be carried out over a long time period, and it may require updated design standards during the life of the project which take into account climate change. For the purposes of this ESCP, focus has been placed on the first 35 years of construction.

It is recommended that any variations for climate change should be considered during a 10-year review of these calculations.

The coefficients used in the ESCP are based on the NZIE (New Zealand Institute of Engineers) Coefficient Chart (1980). This is the chart provided in MPI's Standardisation of design flows for coastal catchments in NZ by Craig Martell. This allows for extreme events, soil and slope type. Adjustment due to ground slope can also be made, up to a factor of +0.10 which can be done for steep areas of the site (20% or steeper).

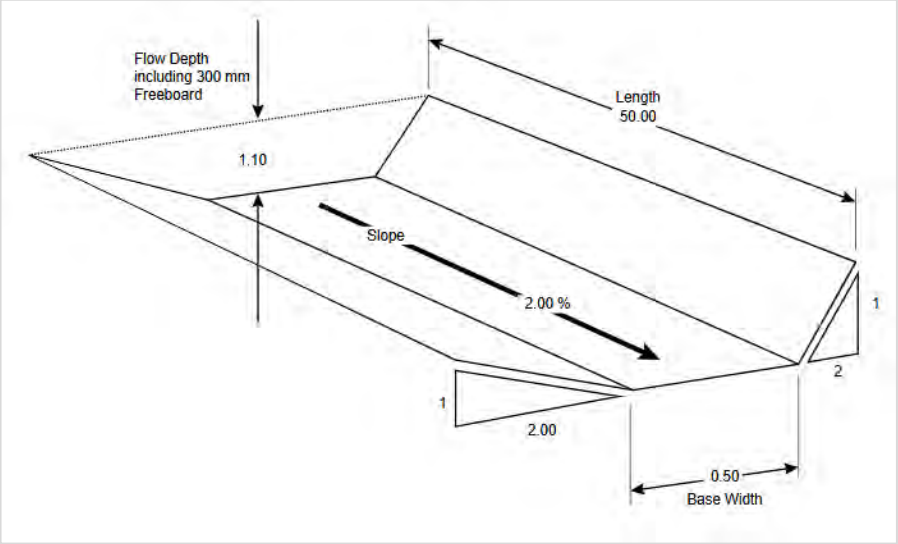
A minimum flow depth of 300mm has been used, or in some cases 350mm to achieve a minimum bund height. Final measurements and stabilisation requirements will be captured in the as built process.

Diversions

Cleanwater Diversions (All)

Peak Flow = 3.03m^3/s
Maximum Catchment Area 10ha
Weighted CN = 74
Rainfall (I) – 230mm/24hr (ARI 20)

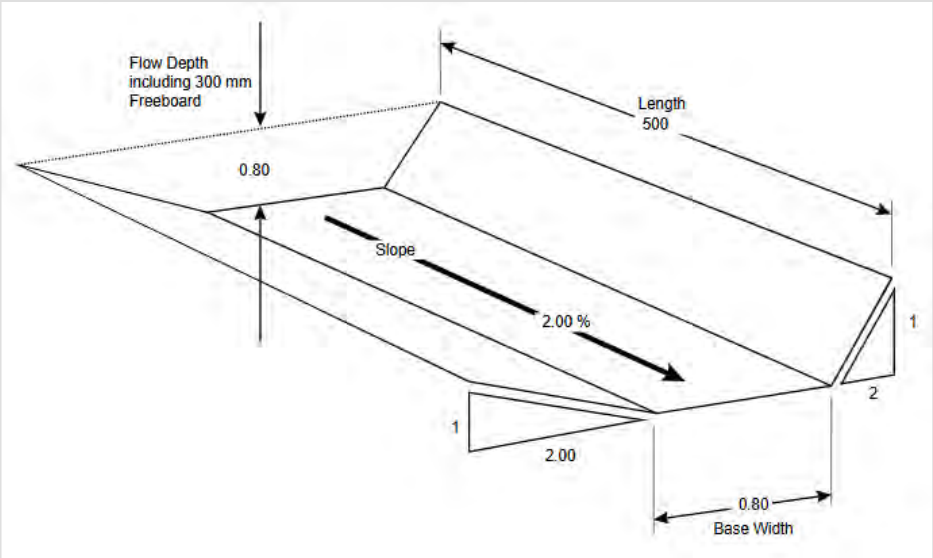
Bund Dimensions
Minimum height 1100mm (including 300mm freeboard)
Channel slope 2% (Flattest)
Base width – 0.5m



Dirty Water Diversion Bunds (All)

Peak Flow = 1.842m^3/s
Maximum Catchment Area = 5ha
ARI 20 = 24 hr rainfall 230mm
Slope 2%
Length = 500m

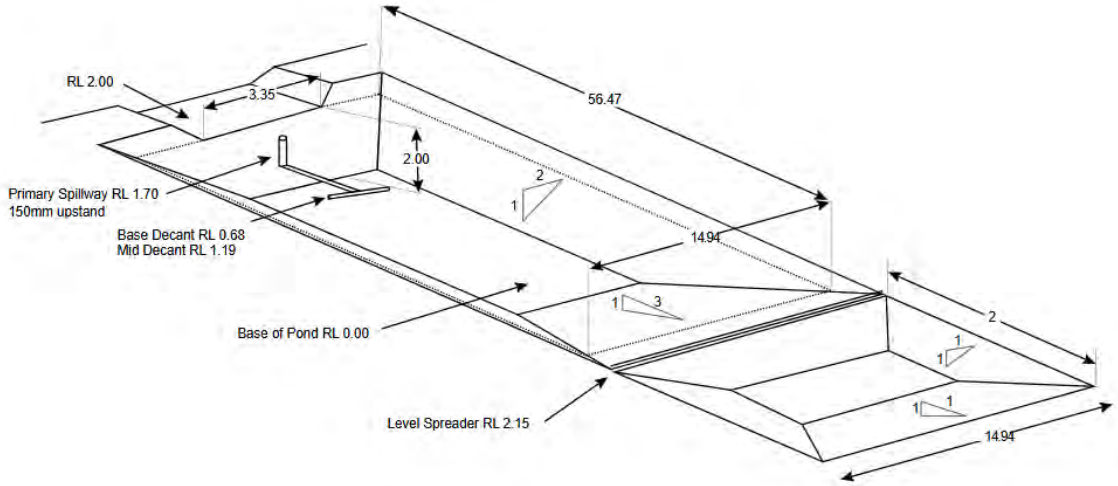
Trapezoidal Channel
Base Width = 0.8m
Flow Depth = 0.8m (including 300mm freeboard)
Mannings (n) (Bare Earth - Rough) = 0.03
Channel Flow Velocity (m/s) = 2.1m/s
Channel Capacity (m3/s) = 1.886m^3/s



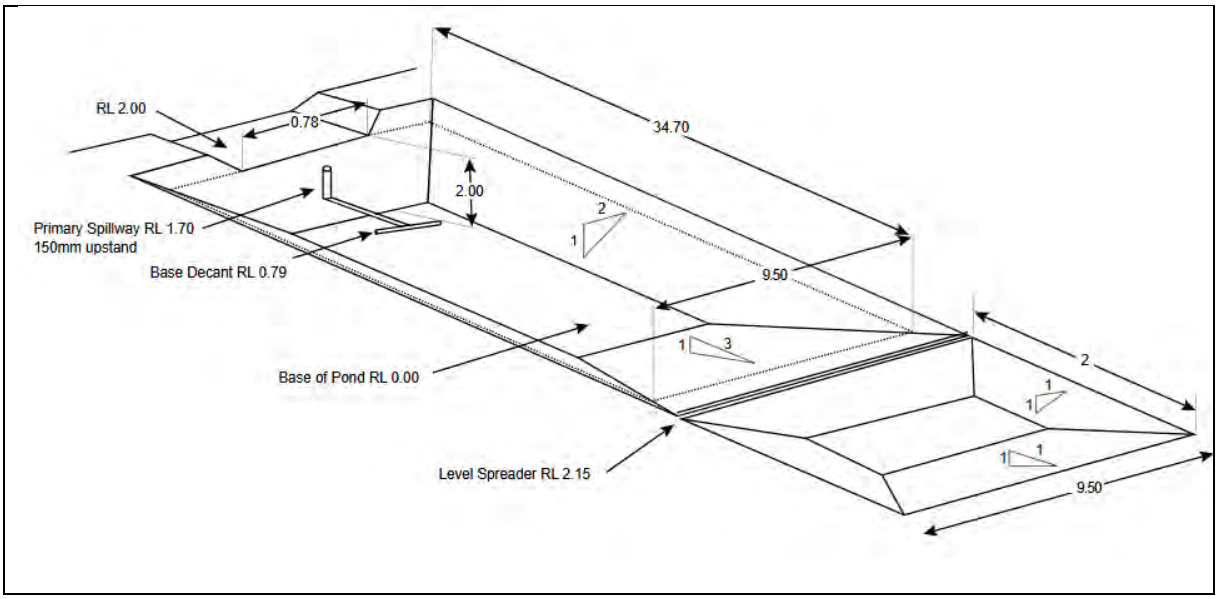
Sediment Retention Devices[4]		
SRP01 and SRP RL150		
Storage Volume Criteria	3	%
Contributing Catchment	3	ha
Minimum Storage Volume	900	m^3
Dead Storage	270	m^3
Live storage	630	m^3
Length at Emergency Spillway Level	56.47	m
Width at Emergency Spillway Level	14.94	m
Emergency Spillway base width (300mm deep)	3.35	m
Primary Spillway diameter	150	mm
Number of decants	2	
Number of holes per decant	200	
Minimum outlet pipe diameter	150	mm
RL Emergency Spillway	2	m
RL Primary Spillway	1.7	m
RL Level Spreader (min)	2.15	m
RL Base Decant	0.68	m
RL Middle Decant	1.19	m
Length at Base	46.47	m

[4] A RL of 0m for the base of each SRP and DEB has been used for simplicity

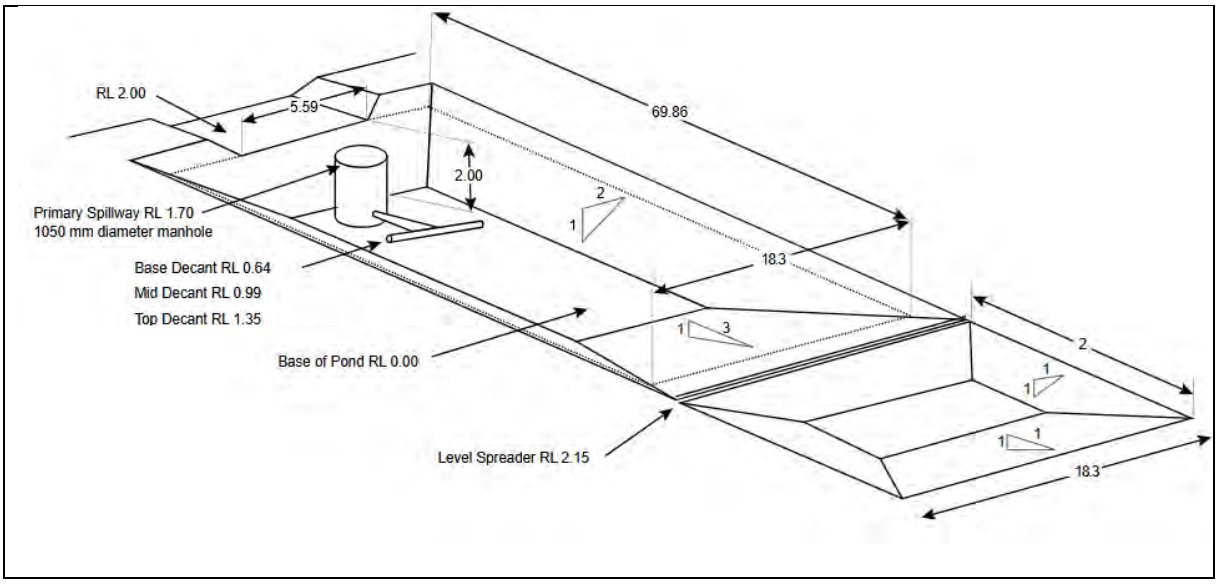
Width at Base	6.94	m
Forebay		
Depth (min. depth)	1	m
Width (full width of pond)	14.94	m
Length (min. length)	2	m



SRP 02		
Storage Volume Criteria	3	%
Contributing Catchment	0.7	ha
Minimum Storage Volume	210	m^3
Dead Storage	63	m^3
Live storage	147	m^3
Length at Emergency Spillway Level	34.7	m
Width at Emergency Spillway Level	9.5	m
Emergency Spillway base width (300mm deep)	0.78	m
Primary Spillway diameter	150	mm
Number of decants	1	
Number of holes per decant	93	
Minimum outlet pipe diameter	150	mm
RL Emergency Spillway	2	m
RL Primary Spillway	1.7	m
RL Level Spreader (min)	2.15	m
RL Base Decant	0.79	m
RL Middle Decant		m
RL Top Decant		
Length at Base	24.7	m
Width at Base	1.5	m
Forebay		
Depth (min. depth)	1	m
Width (full width of pond)	9.5	m
Length (min. length)	2	m



SRP RL110 and SRP RL100		
Storage Volume Criteria	3	%
Contributing Catchment	5	ha
Minimum Storage Volume	1500	m^3
Dead Storage	450	m^3
Live storage	1050	m^3
Length at Emergency Spillway Level	69.86	m
Width at Emergency Spillway Level	18.29	m
Emergency Spillway base width (300mm deep)	5.59	m
Primary Spillway diameter	1050	mm
Number of decants	3	
Number of holes per decant	222	
Minimum outlet pipe diameter	300	mm
RL Emergency Spillway	2	m
RL Primary Spillway	1.7	m
RL Level Spreader (min)	2.15	m
RL Base Decant	0.64	m
RL Middle Decant	0.99	m
RL Top Decant	1.35	
Length at Base	59.86	m
Width at Base	10.29	m
Forebay		
Depth (min. depth)	1	m
Width (full width of pond)	18.29	m
Length (min. length)	2	m



DEB01		
Storage Volume Criteria	3	%
Contributing Catchment	0.5	ha
Minimum Storage Volume	150	m^3
Dead Storage	45	m^3
Live storage	105	m^3
Length at Emergency Spillway Level	33.2	m
Width at Emergency Spillway Level	7	m
Emergency Spillway base width (300mm deep)	0.9	m
Primary Spillway diameter	150	mm
Number of decants	1	
Number of holes per decant	67	
Minimum outlet pipe diameter	150	mm
RL Emergency Spillway	1.2	m
RL Primary Spillway	0.9	m
RL Base Decant	0.32	m
Length at Base	28.4	m
Width at Base	4.6	m

DEB02		
Storage Volume Criteria	3	%
Contributing Catchment	0.4	ha
Minimum Storage Volume	120	m^3
Dead Storage	36	m^3
Live storage	84	m^3
Length at Emergency Spillway Level	30.15	m
Width at Emergency Spillway Level	6.4	m
Emergency Spillway base width (300mm deep)	0.9	m
Primary Spillway diameter	150	mm
Number of decants	1	
Number of holes per decant	53	
Minimum outlet pipe diameter	150	mm
RL Emergency Spillway	1.2	m

RL Primary Spillway	0.9	m
RL Base Decant	0.32	m
Length at Base	25.35	m
Width at Base	4	m

Appendix C – As Built Certification Sheets

As Built Certification Sheet: Sediment Retention Pond

This certification sheet confirms the as-built information of control(s) identified.

Comments			
SRP Name			
Contributing catchment area (Ha)**:**			
Storage & Dimensions			
Dead Storage:	**Volume** (m^3)**:**	**Depth** (m)**:**	
Live Storage:	**Volume** (m^3)**:**	**Depth** (m)**:**	
Dimensions Set at Base:	**Length** (m)**:**	**Width** (m)**:**	
Dimensions at Primary Spillway:	**Length** (m)**:**	**Width** (m)**:**	
Dimensions at Embankment Height:	**Length** (m)**:**	**Width** (m)**:**	
Embankment Compaction:			
Forebay Dimensions			
Forebay Storage (m^3)			
Inlet Batter Ratio:	3 : 1	**Compliant**: ☐ Yes ☐ No	
Level Spreader Level:	☐ Yes	☐ No	
Level Spreader Whole Width:	☐ Yes	☐ No	
Level Spreader Haunched:	☐ Yes	☐ No	
Discharge & Spillway			
Dimensions of Emergency Spillway:	**Length** (m)**:**	**Width** (m)**:**	
Emergency Spillway Stabilisation:			
100-Year Event Spillway Capacity:	☐ Yes	☐ No	
Pipe Diameter (mm)**:**	**Primary Spillway**:	**Outlet**:	
Discharge Point Stabilization:			
Anti-Seep Collars Installed:	☐ Yes	☐ No	
Pond Length to Width Ratio:		**Compliant**: ☐ Yes ☐ No	
Freeboard: Primary & Emergency:			
Number of Floating Decants:		**Discharge Rate** (L/s)**:**	
Decants can raise above Primary:	☐ Yes	☐ No	
End caps installed on decant:	☐ Yes	☐ No	
Weighted manhole riser:	☐ Yes	☐ No	
Chemical Treatment			
Floc Box Installed & Dosing:	☐ Yes	☐ No	
Floc Hose >5m above Inlet	☐ Yes	☐ No	
Council-Approved Variations to this Device			

I confirm that the as-built information on this certification sheet is accurate, and the device identified here has been constructed in accordance with the ESCP for this area and in line with GD05 Guidelines or in accordance with any variations accepted by Auckland Council:

Name:		**Position:**	
Signature:		**Date:**	

Name:		**Position:**	
Signature:		**Date:**	

Attach ESCP drawing, surveyed drawing (if relevant) and images of the device below.

Appendix D – Example Inspection Sheets

Environmental Site Inspection

This inspection sheet is designed to be used for regular inspection of all ESC devices and after rainfall trigger events (25mm/24hrs and/or 15mm/1hr). Inspections after rainfall trigger events must occur within 24hrs. Where it is identified that any ESC measure has become ineffective and maintenance is required, the Environmental Manager or Site Manager for Hunua Quarry must be notified to contact Auckland Council on 09 301 0101 or email monitoring@aucklandcouncil.govt.nz.

Site Information			
Date:		**Time:**	
Work Area:			
Inspection By:			
Works at the Time of Inspection:			

Erosion and Sediment Controls
Critical Risks Identified
Actions Discussed or Raised

As per ESCP, check off controls as you inspect them:			
Control	**Compliant**	**Non-Compliant**	**N/A**
Stabilised Entryway	☐	☐	☐
Clean water diversions	☐	☐	☐
Dirty water diversions	☐	☐	☐
Silt fences	☐	☐	☐
Super silt fences	☐	☐	☐
Sumps	☐	☐	☐
Stabilisation requirements	☐	☐	☐
Actions Required (All non-compliant devices require an action point below)			

SRP Check			
Check off controls as you inspect them:			
SRP Name:			
Clarity *>100mm at outlet*	☐	☐	☐
Walls *Batters not damaged. No evidence of shortcutting*	☐	☐	☐
Forebay *<Muck out required?*	☐	☐	☐
Level Spreader *Not damaged, no debris*	☐	☐	☐
Pond body *<Muck out required?*	☐	☐	☐

Spillway *Not damaged or blocked*	☐	☐	☐
Outlet *Stabilised, not damaged*	☐	☐	☐
Floc box *Levels good, holes clear, hose 3-5m from inlet*	☐	☐	☐
Silt fences *Not damaged*	☐	☐	☐
CW & DW *Drains/bunds not damaged, no sediment*	☐	☐	☐
Actions needed - *If any aspect of pond is not satisfied, see last page for remedials*			

Comments and Photos

Remedials & Troubleshooting

Pond clarity

If the decant is not discharging and there is 100mm+ clarity, then no action required.
Is the SRP discharging sediment-laden water with a clarity of less than 100mm?
If yes, and is safe to do so, undertake immediate remedial actions including (but not limited to):
Raising the T-bars
Install additional downstream ESCs to protect nearby water courses.
Repairing any damaged or eroded areas
Check the floc box

Pond Walls

Are the pond batters free from damage or erosion?
If 'NO' then engineer assistance may be required to check the integrity and stability of the pond.
Possible fix is to poly, geotextile line the batter
Do not overload the pond with high water levels (i.e. lower decant, dewater pond if clarity 100mm+.

SRP Forebay

Is the forebay or drop out pit less than 50% full? If 'NO', organise a clean out

Level Spreader

Is the level spreader stabilised and free from erosion or damage? If not then clean debris off spreader, re-pin/replace poly/geo if required

SRP Main Body

Check markings on decant riser - is there less than 20% of accumulated sediment within the pond? If no, organise a clean out

Emergency Spillway

Is the emergency spillway stabilised and free from erosion or damage? If not then clean debris off spreader, re-pin/replace poly/geo if required

SRP Outlet

Is the SRP discharge point stabilised and free from erosion or damage? If not, consider rock lining or replace poly, geo

Floc Box

Check the floc box floc level (top up if low). Check and clear high, low flow hole in header tank as required. Ensure the floc hose is positioned 5m from the inlet channel AND dispatching floc on geo.

Silt Fences

Is the fencing around the SRP intact and free from any damage? Are any Silt Fences damaged, needing repair? Repair or replace sections required.

Dirty Water Bunds & Channels

Are the dirty water bunds/diversion channels entering the SRP free from damage or accumulated sediment? If no, organise a clean out

Think safety first when working near a body of water!

Appendix E – Decommissioning Form

Decommissioning Form: ESC Device

This decommissioning form confirms the details required to decommission/disestablish erosion and sediment control(s). No ESC devices shall be removed or decommissioned from site before that location is appropriately stabilised, and Auckland Council must be informed no less than 2 working days prior to removal. Removal of devices must be approved by the Environmental Manager or equivalent.

Device Details	
Work Area	
Name of Device *(as per ESCP)*	
Size of Catchment *(Ha)*	
Reason for Removal	

ESCP Drawing
Approved ESCP Drawing:

Stabilisation of Catchment			
Type of stabilisation			
80% stabilisation met?	☐ Yes	☐ No	☐ N/A
Will the device be replaced?	☐ Yes	☐ No	☐ N/A

Stabilisation of Catchment		
Environmental Manager: I have confirmed on site that the control can be removed in accordance with GD05.		
Name:	**Date:**	**Signature:**

Statement of Approval

I am satisfied that:

- **The control needs to be removed, and**
- **There is adequate stabilisation of the catchment or the replacement control has been designed as per best practice, and**
- **Consultation with Auckland Council has taken place.**

Therefore, I give authority for the above control to be removed by the person named above.

Name/Position:	**Company:**	**Signature:**	**Date:**

Appendix F – Experience and Qualifications (Megan Dredge)

MEGAN DREDGE

Director and Principal Environmental Consultant

BSc (Tech), CEnvP

14 YEARS OF EXPERIENCE

LOCATION

Hamilton, Auckland, New Plymouth & Christchurch

TECHNICAL SKILLS

Erosion & Sediment Control

Stormwater Management

Environmental Planning, Permitting & Compliance

Environmental sampling

Risk Management

Pre-Hospital Emergency Care

Incident Management (Civil Defence)

MANAGEMENT SKILLS

Project Management

Environmental Management Systems (EMS)

Team Management

ACCREDITATIONS

Certified Environmental Practitioner (CEnvP 1709) - General Practice

PROFESSIONAL ASSOCIATIONS

PROFILE

Megan is a versatile and dedicated environmental specialist with a strong passion for protecting and enhancing our natural environments, while also providing for the needs and expectations of her clients. With a solid foundation in the construction industry, Megan brings proven expertise in environmental management, erosion and sediment control (ESC), ecology, environmental monitoring, consent management, and regulatory compliance. Megan is a Certified Environmental Professional - General Practice (#1704).

In recognition of Megan's leadership and work on the Mount Messenger Alliance project, she was honoured to receive IECA Australasia's Award for Environmental Excellence in October 2024, followed by winning the IECA Global Award for Environmental Excellence in 2025 in the US. Megan was also nominated for the IECA Emerging Leader Award (Global) for 2025. Megan was also invited to take part in the ESC Community of Practice for Auckland Council on the redevelopment of GD05.

EDUCATION

Bachelor of Science and Technology, Resource and Environmental Planning (REP	2011
Graduate Certificate in Economics	2011

PROFESSIONAL EXPERIENCE

- **Mt Cass Windfarm, Amberly, Canterbury, New Zealand (2025 – 2026): Erosion and Sediment Control (ESC) Consultant**

  Project: Mt Cass Wind Farm is a 94.6 MW onshore wind project being developed on the Mt Cass range near Waipara in North Canterbury, designed to generate over 300 GWh of electricity annually. It will be the first wind farm in the Canterbury region and is now owned and being delivered by Yinson Renewables, with completion expected in 2028. The project includes 22 turbines.

  Responsibilities: Providing full erosion and sediment control management to the Project. Site specific erosion and sediment control plan design, implementation and management including flocculation management plans and advice, as built certification and monitoring of devices.

- **Mt Messenger Bypass Project, New Plymouth, Taranaki, New Zealand (2022 – 2026): Erosion and Sediment Control (ESC) Team Lead and Technical Lead**

  Project: The Mt Messenger Bypass is a new resilient 6 km route that will bypass the current steep, narrow, and winding section of State Highway 3 (SH3) at Mt Messenger in North Taranaki. This project is being built in a greenfield operation with steep clay slopes. Erosion and sediment is a key risk for the project, along with the abundant Kiwi, lizards, and bats in the project footprint.

  Responsibilities: Lead a 2 person team and directed a supervisor. Providing full erosion and sediment control management to the Project. Site specific erosion and sediment control plan design, implementation and management including flocculation management plans and advice, as built certification and monitoring of devices. Consent compliance monitoring relating to ESC consents. Relationship interface management between the Alliance and local government. Maintained a 99% compliance score with Taranaki Regional Council for the Project.

- **Quarry ESC Support and Management (2021-2026)**

MEGAN DREDGE

Director and Principal Environmental Consultant

BSc (Tech), CEnvP

International Erosion Control Association (IECA) – Full Member

Projects: Multiple quarries across the North Island

Responsibilities: Provide erosion and sediment control advice and support for reconsenting, fast track consenting, erosion and sediment control plan updates and new operational areas.

- **Turitea Wind Farm, Palmerston North, Manawatū-Whanganui, New Zealand (2021-2022): Environmental Advisor/Environmental Consultant**

  Project: Turitea Wind Farm is New Zealand's largest wind farm, a 222 MW project located in the Tararua Ranges near Palmerston North and owned and operated by Mercury Energy. It consists of 60 Vestas V112 turbines.

  Responsibilities: Managed the environmental controls and ensured compliance the Project EMS. This included the financial management of the environmental goods and services. Developed and initiated risk management strategies on the project in a collaborative in both a top-down and bottom-up approach. Designed the projects erosion and sediment control plans and centred the installation of the ESC measures.

- **Natural Habitats, Hamilton, Waikato, New Zealand (2020-2021): Environmental and Project Manager**

  Responsibilities: Managed the logistics of project delivery on multiple landscape projects. Facilitated project programming for multiple projects including reporting on project deliverables and financial achievements. Provided leadership and project management when implementing project operations.

- **City Ege Alliance, Hamilton, Waikato, New Zealand (2018-2020): Environmental/Northern Zone Engineer**

  Project: The Hamilton section of the Waikato Expressway is a 22-kilometre four-lane highway running from Ngāruawāhia to the Tamahere interchange, completing the final link in the 102-kilometre expressway network. It is the largest roading project in Waikato's history and was opened in July 2022, designed to improve safety, reduce congestion, and streamline travel between Auckland and the wider Waikato region.

  Responsibilities: Drove the risk assessment process for the project when assessing risk to the environment. Provided onsite monitoring and insured compliance with a Construction Environmental Management Plan and all relevant regulatory requirements. Developed and implemented site erosion and sediment control plans. Managed sub-contractors completing ecological assessments.

PROFESSIONAL HISTORY

MPD Environmental Limited	2021 - Present
Downer NZ	2021 - 2022
Natural Habitats	2020 - 2021
Fletcher Construction	2016 – 2020
Mighty River Power (Mercury)	2010-2012

AWARDS

IECA Global Award for Environmental Excellence
To the Te Ara o Te Ata: Legacy Project Mouth Messenger Alliance where I contributed to as a Sr Erosion Sediment Control Advisor and IECA Member. 2025

IECA Australasia Award for Environmental Excellence *Te Ara o Te Ata (Mt Messenger Bypass) Project*	2024
IECA Australasia Award for Innovation or Education to the Erosion and Sediment Control Industry *Highly Commended for the innovative approach to a Decanting Earth Bund design, which I contributed to the design and building of.*	2024
IECA Australasia Award for Environmental Excellence *Turitea Wind Farm Project*	2022