SOUTHERNSKIES ENVIRONMENTAL

Chemical Treatment Management Plan

Southern Seawall Project

Wellington International Airport Limited

October 2025

Document Control

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Table of Contents

Appendices

1 Introduction

1.1 Purpose and Scope

The purpose of this Chemical Treatment Management Plan (**CTMP**) is to set out the methodology for determining the effectiveness and dosing rates for chemical treatment to enhance the sediment retention efficiency of sediment retention ponds (**SRPs**), decanting earth bunds (**DEBs**) and other water impoundment devices such as treatment tanks that will be used throughout the Project.

The CTMP shall be implemented for the duration of the construction of the Project. It will support the overall erosion and sediment control (**ESC**) principles and methods described in the Erosion and Sediment Control Plan (**ESCP**) and will inform the development of site-specific erosion and sediment control plans (**SSESCPs**).

1.2 Implementation and Operation

Table 1 details the roles and responsibilities that will apply to the implementation and management of the chemical treatment systems across the Project.

Table 1 CTMP - roles and responsibilities

Name	Role	Contact details	Responsibility
To be provided			

2 Methodology

In accordance with the Erosion and Sediment Control Guide for Land Disturbing Activities in the Wellington Region (The Guidelines), it is proposed to chemically dose the SRPs, DEBs and impoundment containers in accordance with this CTMP to maximise sediment retention.

Soil sampling and bench testing (laboratory testing of chemical responses), and the management of the chemical treatment systems will be undertaken in accordance with Appendix F1 and Section F2.0 of The Guidelines.

Ongoing sampling will also be required as the earthworks progress. In this regard protocols have been established and are set out in Section 5.

Any sampling and bench testing of sub-soils (below topsoil) that is necessary will be taken from the contributing catchment of sediment controls devices to determine the optimum chemical response and dosing rate, balanced within an acceptable pH range.

Ongoing sampling will also be required as the earthworks progress.

Bench tests of soil samples will be undertaken using:

1. Poly Aluminium Chloride (PAC).
2. Superfloc. Superfloc is a blend of PAC and PolyDADMAC.

The recommended chemical and dose rate will be that which achieves the best settlement rate within the acceptable pH range of 5.5 to 8.5 and will not change the baseline pH beyond +/-1.

3 Implementation

A draft SSESCP has been prepared for each works area. Those SSESCPs identify and provide the sizing calculations and drawings for all ESC measures to be implemented in the corresponding area. Once a SSESCP has been finalised and certified by Greater Wellington Regional Council (GWRC), the ESC measures will be constructed in that works area.

Confirmation of the recommended chemical, dose rates, and chemical delivery system will be submitted to the Council with the as-built certification of the devices and Appendix 1.A of this CTMP will be updated with the recommended dose rates for that SSESCP area.

4 Flocculation System

4.1 Rainfall Activated Dosing System

The rainfall activated dosing system (as shown in Figure 2 and Figure 3) has been developed specifically for earthworks sites. The system uses a rainfall catchment tray to capture rainfall with the size of the tray being determined by the required chemical dose and the land catchment size.

Rainwater caught by the catchment tray is piped into a header tank, and then into a displacement tank which floats in a larger tank containing the flocculant filled to the level of an outlet pipe leading to the sediment laden diversion about 10m upstream of the inlet of the sediment control device. The greater the rate of rainwater flow into the displacement tank the greater the flow of flocculant into the sediment laden runoff channel. The header tank is designed to provide for no dosing during the initial rainfall of up to 12mm of rain under dry conditions to reflect the lag time between the onset of rainfall and the arrival of runoff at the device. The dual outlet of the header tank outlet also attenuates chemical flow during the initial stages of a storm and after rain has ceased at the end of a storm.

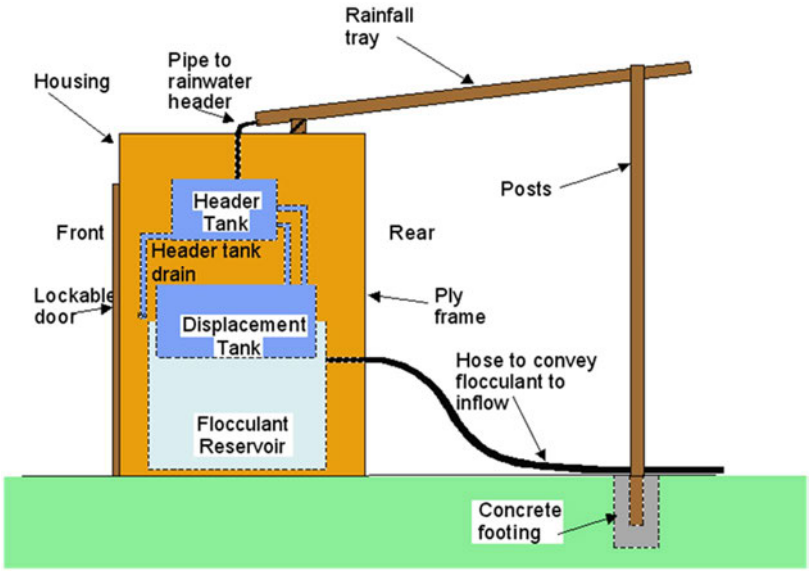


Figure 1 Traditional floc shed schematic.

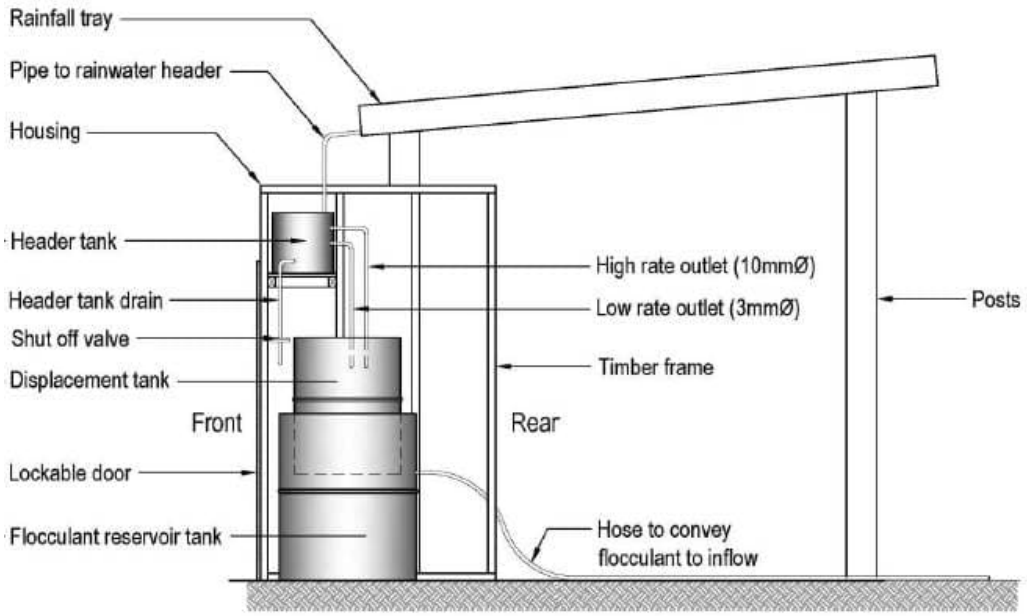


Figure 2 Components of the floc shed.

A mini Floc Shed (Figure 4) or Floc Box (Figure 5) are well suited for DEBs with catchment areas less than 3,000m^2 and are set up in a similar way to the traditional floc shed outlined above.

Figure 3 : Mini floc shed

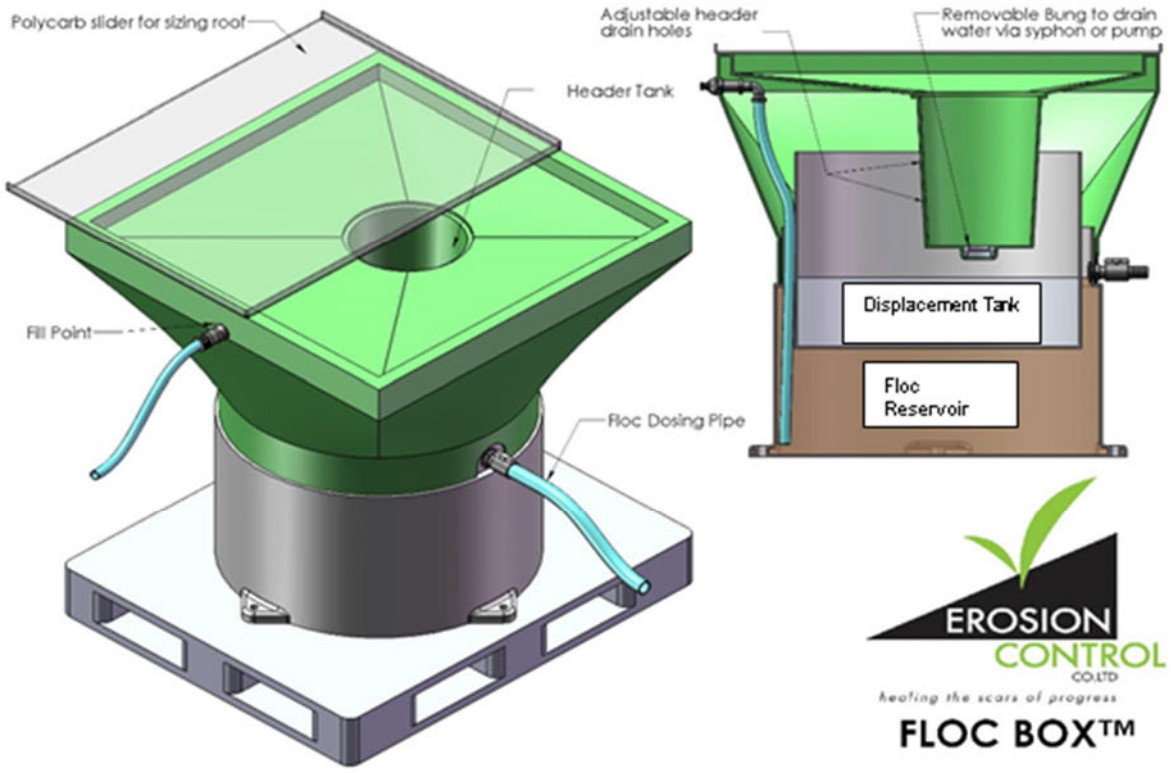


Figure 4 Floc box

4.1.1 Area of rainwater catchment tray required for rainfall activated system

The area of the rainwater catchment tray (Figure 6) is determined by the dose required, and the area of the earthwork catchment draining to the sediment control device.

The rainwater catchment tray size is determined by the total land catchment area draining to the sediment control device including both the 'open' area and stable areas. If the catchment area is changed, then the catchment tray size should also be changed in proportion. Reduction of the tray size is easily achieved by placing a piece of plywood on top of the upstand over the lower end of the tray, thereby allowing the rain which falls on the plywood to run to waste. Floc boxes include a sliding lid that adjusts the catchment tray size in a similar way.

The required tray size will be calculated and submitted with the as-built certifications associated with each SSESCP and included in Appendix 1 of this CTMP.

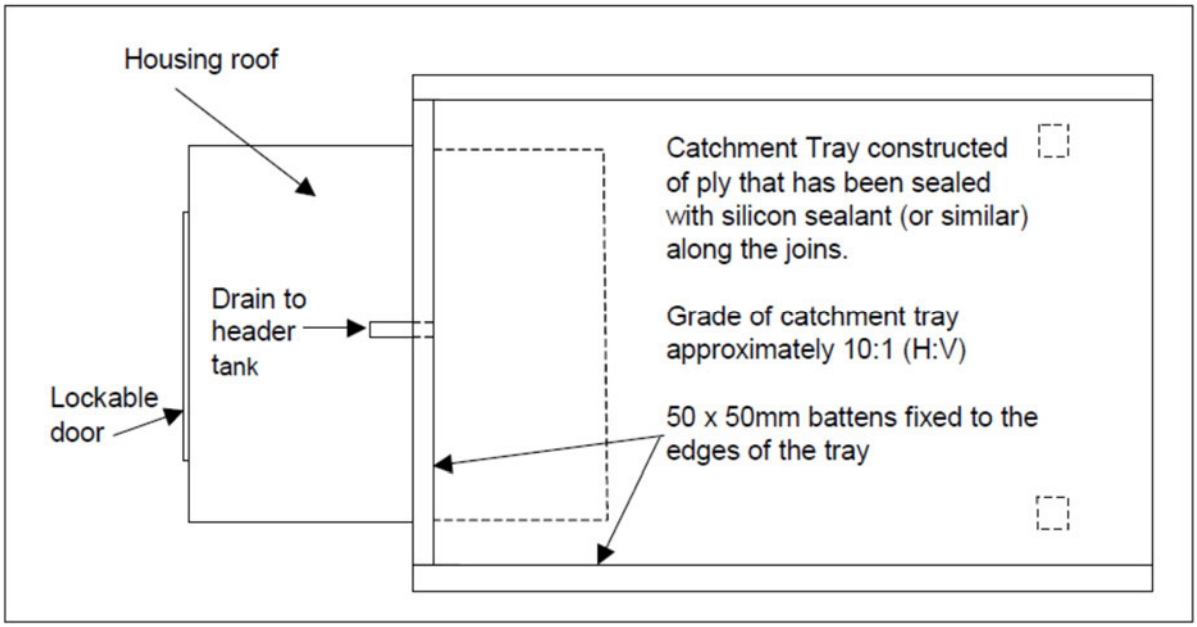


Figure 5 Roof tray design.

4.1.2 Header Tank Outlet Spacing

Rainfall from the catchment tray is drained into a header tank which has two outlets offset vertically. This provides a storage capacity that avoids dosing during initial rainfall following a dry period and to attenuate dosing at the beginning and end of a rainstorm event.

The volume between the drain (lowest) header tank outlet and the first dosing outlet is equal to the volume of 12mm of rain on the catchment tray and the volume between the first and second dosing outlets is the same.

The required header tank outlet spacing details will be calculated and submitted with the as-built certifications associated with each SSESCPs and included in Appendix A to this CTMP.

Header Tank Management in summer months will be as per the Guidelines, which requires:

- After 3 days without rain – reduce volume by 50%.
- After 6 days without rain – empty completely.

4.1.3 Sediment Laden Runoff Channel and Dosing Point

The chosen chemical needs to be added to the sediment laden runoff channel to provide mixing with the sediment laden runoff before it reaches the area of ponded water in the forebay or the sediment control device itself.

All sediment laden runoff from the catchment should be combined into a single channel if possible before it reaches the chemical dosing point. To maximise mixing, the dosing point should be located at least 10 metres prior to the point where the runoff reaches the inlet of the device (in the case of a SRP, the inlet of the forebay).

The dosing point should be at a location where the chemical will fall into the sediment laden flow during periods of low flow. The end of the dosing tube should be only a few centimetres

above the diversion channel to ensure that the chemical falls into the sediment laden runoff and is not blown away during periods of strong wind.

4.2 Flow Activated Dosing Systems

The flow activated dosing system (Goodrich EDD or similar) should be set up by the supplier to achieve the recommended dose rate.

Like rainfall activated systems, the dosing point should be upstream of the sediment retention device to ensure full mixing of chemical within the inflow before it reaches the sediment retention device.

4.3 Batch Dose Treatment

Batch dosing is largely undertaken as a reactive measure to treat impounded runoff that has not been treated to the correct standard. Batch dosing is achieved by adding liquid reagent to the surface of impounded runoff to increase the rate of settlement to achieve the required standard of discharge.

Batch dosing may be undertaken as a contingency measure in devices that have been treated by a rainfall activated system.

The criterion to establish the need for batch dosing is the clarity of the sediment laden runoff. Clarity will be measured by either of the following two techniques:

- Black disc
  - A 50-80mm diameter disc is attached to a 1m long stick with a centimetre scale starting as the disc is lowered vertically into the water to be tested until it disappears, and then is raised until it just reappears. The depth of reappearance is recorded as the clarity of the water.
- Clarity Tube
  - A clarity tube containing a magnetic back disc will be filled with water from the device. The tube will be laid horizontal and the disc will be moved down the tube until it disappears, when viewed from the end of the tube and the distance is recorded. The disc is then moved back until it reappears, and the distance is recorded.
  - Readings should be taken in diffuse sunlight or shade. If it is impossible to avoid bright sunlight, work with the tube perpendicular to the sun's plane.
  - Readings will not be taken in very low light conditions (insufficient for colour perception).

Water with a clarity of 100mm or greater is considered to be acceptable for discharge. Water with a depth of clarity of less than 60mm should be batch dosed. If the sediment laden runoff has clarity between 60-100mm after rainfall has ceased, it should be left for 48 hours to settle. If the clarity has not reached 100mm after 48 hours, or if sediment laden runoff has to be discharged within 48 hours because the pond is full, the sediment laden runoff should be batch treated.

The batch dose rate will be based on the specific bench testing for that area and calculated against the volume of the device to be treated. The batch dose rates will be provided in Appendix A of this CTMP.

4.3.1 Application Procedure for Batch Dosing

The chemical dose should be applied evenly over the surface of the sediment control device as quickly as practicable. It is best to apply the dose in one application, rather than going over the surface of the water two or more times.

The total dose may be applied in one of two ways.

a) Spray:
   The chemical can be applied to the surface of the pond using a sprayer that produces large drops.
b) Bucket:
   Place no more than 1 litre of chemical in a 10-litre bucket and throw the chemical onto the ponded surface of water so that the chemical divides into drops before hitting the surface.

Settlement generally requires 1-2 hours.

4.3.2 Timing

As impounded water often develops marked temperature gradients during the day, which can inhibit mixing of the chemical that is added to the surface of the impounded water and the settlement of coagulated solids, batch treatment should be carried out in the early morning to optimise mixing of the chemical with the sediment laden runoff and the subsequent settlement of coagulated solids.

5 Determination of Dose Rate

Bench testing will be undertaken to determine the preferred chemical treatment system and optimum dose for suspended solids removal. The bench testing will also consider the effects on pH of the treated water for the sediment retention devices.

Bench testing will be undertaken as an ongoing and continual process throughout the life of the Project (refer to Section 3 of this CTMP "Implementation"). Ongoing monitoring of the site's sediment retention devices will also be undertaken as outlined in Appendix 1.B and this CTMP. If the monitoring highlights any deficiencies further bench testing will be undertaken. All bench testing results will be recorded in the Bench Testing Result Sheets in Appendix A to this CTMP.

6 Monitoring and Maintenance Requirements

6.1 Routine Management and Maintenance

Instructions for routine management and maintenance of the chemical treatment system are provided in Appendix B to this CTMP. A copy of this table will be kept onsite and will be available for review.

All monitoring records and maintenance checks and actions will be recorded on the monthly record sheet provided in Appendix C to this CTMP. The systems will be checked after each rainfall event, and during dry periods the systems will be checked weekly.

It is also noted that chemical treatment increases the sediment removal efficiency of the sediment controls. The sediment controls will need to be regularly desilted to ensure that the maximum volume is re-established after rain events.

6.2 Contingency Management

Contingencies could include poor performance of the treatment system, or effects of other influences on sediment laden runoff quality, such as reduced pH, that might make the use of chemicals inappropriate.

If the treated water in the sediment control device is consistently very clear it could indicate overdosing, and the possibility of lowered pH which can present a risk to receiving waters as a result of elevated free aluminium concentration in the discharge. If the treated water is consistently clear the pH of the water in the sediment control device will be tested.

Contingencies such as poor treatment performance or consistently very clear treated water should be dealt with as part of the day to day environmental management of the site. Refer to the ESCMP for additional monitoring and maintenance procedures that are to be implemented across the Project.

A treatment chemical spill contingency procedure is provided in Section 6.6 below.

6.3 Record Keeping and Reporting

A copy of the maintenance record for the chemical treatment system will be kept on site (Appendix C to this CTMP).

A copy of the maintenance record for the chemical treatment system will be provided to GWRC on request.

6.4 Procedure for Chemical Transportation

PAC and Superfloc will be delivered to the site by commercial carriers in accordance with current Hazardous Substances and New Organisms Act 1996, and Ministry of Transport, Transporting Dangerous Goods Safety, An Industry Guide[1]. These chemicals can be requested from the supplier generally in 20 litre containers, 200 litre drums and/or 1,000 litre Intermediate bulk containers (IBCs). PAC and Superfloc all weigh about 250kg and are most easily moved within the site in a loader bucket. Transport around the site will be via suitable vehicles or machinery and containers will be sealed and secured such that the containers cannot topple over.

[1] For further information, refer to Hazardous Substances and New Organisms Act 1996 (reprinted 2017), and https://www.transport.govt.nz/assets/Import/Documents/ca67c03328/Transporting20Dangerous20Goods.pdf

6.5 Storage of Chemicals on Site

Bulk PAC and Superfloc supplies will be held in secure storage. 200L polyethylene drums or IBCs of PAC and Superfloc will be held beside each chemical treatment shed / floc box, on level ground and secured so that the container cannot topple over. Those drums will be under the overall security and control of the site as a secure workplace. Drums of chemical will always be stored on end with the screw caps uppermost. Topping up of flocculant chemical will be made weekly as part of the regular inspection regime.

6.6 Chemical Spill Contingency Procedure

If there is a spill of PAC or Superfloc onto the ground it should be immediately contained using earth bunds to prevent it entering water. The spilt chemical should be recovered if possible and placed in polyethylene containers. If the spilt chemical cannot be recovered, it should be mixed with a volume of soil equal to at least ten times the volume of spilt chemical. This will effectively neutralize the chemical. The soil with which the chemical has been mixed should be buried in the ground a minimum of 0.5 metres below the surface or removed from site.

If there is a spill of chemical into ponded water, discharge from the pond to natural water should be prevented.

If there is any spill into flowing water:

1. The Council should be advised immediately.
2. The volume of the spill should be recorded.
3. If possible, the water and spilt chemical should be pumped into a bund or sediment control device until all the spilt chemical has been removed from the watercourse.
4. If the chemical cannot be removed from the watercourse any downstream users should be identified and advised.

6.7 Chain of Responsibility for Monitoring and Maintenance

The Environmental Manager will have overall responsibility for chemical treatment systems.

The Environmental Manager will check the effect of PAC and Superfloc dosing on the pH of the treated water once the device has filled for the first time and monitor pH and overall performance throughout the duration of works at least weekly and post rainfall triggers, as outlined in the Erosion and Sediment Control Monitoring Plan (**ESCMP**).

6.8 Training of Person Responsible for Maintenance and Monitoring

If a person with experience in the monitoring and maintenance of the chemical treatment system is not available, the Environmental Manager will train a person nominated by the Project team to carry out the routine monitoring and maintenance of the chemical treatment system, and to keep the required records. This person's contact details will be provided to Council.

6.9 Procedure Modification

It is expected that as the Project progresses, performance checks of the chemical treatment systems may be required due to changing soil types etc. This will be undertaken following additional sampling and testing and approval from the Environmental Manager.

Appendix A – Bench Testing Results Sheets

1 Introduction

Soil samples were taken from the contributing catchments of (insert description of devices and catchment).

These two chemicals were tested: (delete any chemical that was not tested)

1. **Poly Aluminium Chloride (PAC)**
2. **Superfloc**

Superfloc is a blend of PAC and PolyDADMAC.

Bench test flocculation trials were undertaken to determine soil reactivity to chemical treatment in accordance with the Erosion and Sediment Control Guide for Land Disturbing Activities in the Wellington Region.

2 Bench Test Trials

2.1 Results of PAC Bench Test

Initially, bench tests using PAC. The results of the bench tests are as follows.

Sample 1, Catchment 1 Initial pH = Initial Turbidity =

Aluminium Dose (mg/L)	Clarity (mm) after 5mins	Clarity (mm) after 30mins	Clarity (mm) after 60mins	Final pH after 60mins	Final Turbidity after 60mins
0					
2					
4					
6					
8					
10					

Sample 2, Catchment 1 Initial pH = Initial Turbidity =

Aluminium Dose (mg/L)	Clarity (mm) after 5mins	Clarity (mm) after 30mins	Clarity (mm) after 60mins	Final pH after 60mins	Final Turbidity after 60mins
0					
2					
4					
6					
8					
10					

2.2 Results of Superfloc Bench Tests

Bench tests were also undertaken using Superfloc. The results of the bench tests are as follows.

Sample 1, Catchment 1 Initial pH = Initial Turbidity =

Aluminium Dose (mg/L)	Clarity (mm) after 5mins	Clarity (mm) after 30mins	Clarity (mm) after 60mins	Final pH after 60mins	Final Turbidity after 60mins
0					
1.6					
3.2					
4.8					
6.4					

Sample 2, Catchment 1 Initial pH = Initial Turbidity =

Aluminium Dose (mg/L)	Clarity (mm) after 5mins	Clarity (mm) after 30mins	Clarity (mm) after 60mins	Final pH after 60mins	Final Turbidity after 60mins
0					
1.6					
3.2					
4.8					
6.4					

3 Discussion

Insert discussion and conclusion based on the bench testing results.

Include recommendation / chemical to be used and dose rate

3.1 Batch Dose Rate

Insert batch dose rate and requirements

3.2 Rainfall Activated Dosing System Details

Floc Shed Tray Size

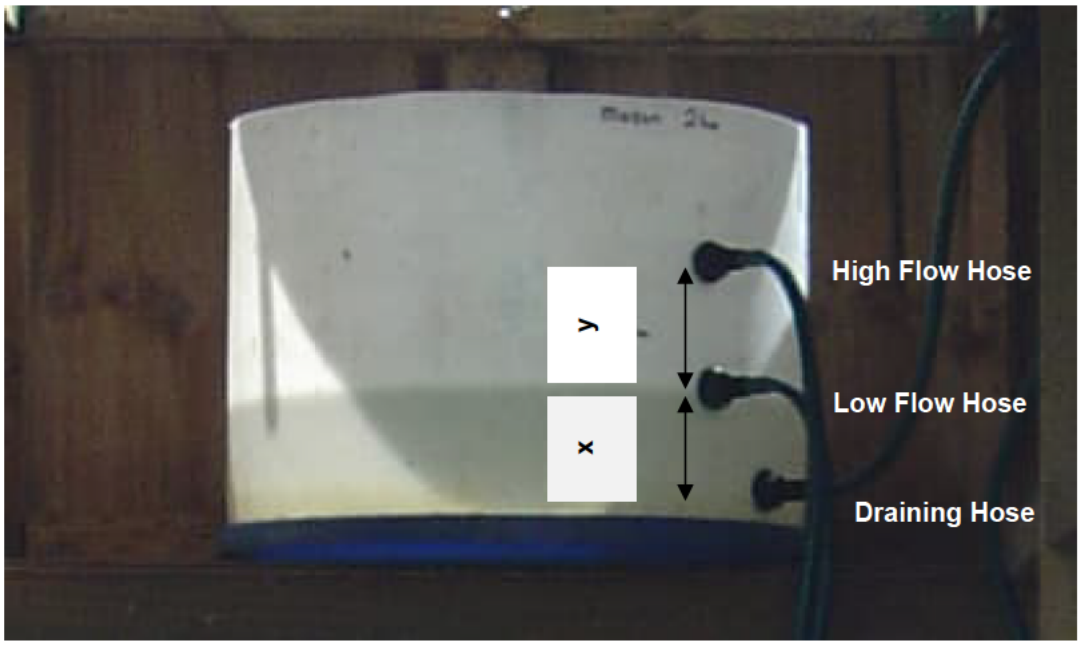
Based on the bench test results on [insert date of testing] the required tray size is XXX square metres per hectare of exposed land catchment draining to the sediment control device. This is the area inside the upstand around the edge of the tray.

Sediment Retention Device	Catchment area (ha)	Tray Size (m^2)
XX	X	X
XX	X	X

Header Tank Outlet Spacing

The distance between the drain and first dosing outlet, and between the two dosing outlets, for a standard header tank made from a 200-litre drum with an internal diameter of 55 cm would be:

Sediment Retention Device	Catchment Area (ha)	Distance (x) (cm)	Distance (y) (cm)
XX	XX	X	X
XX	XX	X	X



Appendix B - Instructions for Maintenance of Rainfall Activated Treatment Systems

Reducing the Header Tank Water Volume

The header tank is used to avoid dosing during the initial stages of rainfall when site conditions are dry, and no runoff is to be expected.

The volume in the header tank is lowered using the lowest of the three outlet tubes.

- After 3 days without rain - reduce volume to 50%.
- After 6 days without rain - reduce volume to empty (level at lowest outlet).

Refilling the Chemical Reservoir

The chemical reservoir tank should be refilled when the white displacement tank is half full, or sooner if heavy rain is predicted. This is done by first emptying the white tank (baling with a bucket is efficient), and then refilling the black reservoir tank until the PAC or Superfloc level is at the lower edge of the outlet.

Observation of Water Quality in Sediment Control Device

The pond water quality will be observed at least weekly, and the clarity determined using a black disc and recorded on the monitoring sheet. pH shall be recorded once the pond has filled up to ensure that chemical dosing does not have an unacceptable effect.

Periodic System Checks

Check that the rainfall catchment tray is not leaking – especially along the lower edge of the tray. This should be done after rainfall has ceased.

Check the lower hose with the small tube outlet, from the header tank to the displacement tank, is not blocked.

Monitoring Records

A separate sheet is provided for monitoring records for each month (see Appendix C to this CTMP). The information to be recorded is as follows:

Visual check - Check the tray for leaks, the plumbing, and the hoses from the header tank. Record ‘ok’ or if maintenance is required write ‘M’ and note requirement in Notes column.

How full is the header tank (%)? This is the volume between the lowest and middle outlets. After rain this should be either 100% after 12mm or more rain, or between 0-100% after less than 12mm rain. In summer: 50% when lowered after 3 dry days; 0% when emptied after 6 dry days.

Depth in Displacement Tank (%) - Measure depth of water in cm. Reduces to 0 when emptied.

Chemical volume added - Record the PAC or Superfloc volume added. 1 drum = 200L, 9cm in the 200L drum = 20L. The volume can also be calculated from change in water level in displacement tank where 1cm change = 4 litres of chemical.

Water Clarity - Record using black disc near device outlet. (Refer above).

Appendix C – Chemical Treatment Monitoring and Maintenance Record

Site:

Sediment Control Device Name: Month: Maintenance Person:

Date	Visual Check	% Header Tank Full	Water depth in Displacement Tank (cm)	Chemical Volume Added	Water Clarity (cm)	pH	Notes on maintenance required or additional information	Rainfall (mm)	Initial
01									
02									
03									
04									
05									
06									
07									
08									
09									
10									
11									
12									
13									
14									
15									
16									
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25									
26									
27									
28									
29									
30									
31									

SOUTHERNSKIES ENVIRONMENTAL

Site Specific Erosion and Sediment Control Plan MGC Yard

Southern Seawall Project

Wellington International Airport Limited

October 2025

Document Control

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Contents

1. INTRODUCTION

This Site-Specific Erosion and Sediment Control Plan (**SSESCP**) relates to the activities associated with the establishment of the Miramar Golf Course Construction Yard ("**MGC Yard**"). The location of the yard is shown in Figure 1 and the features are shown in Figure 2.

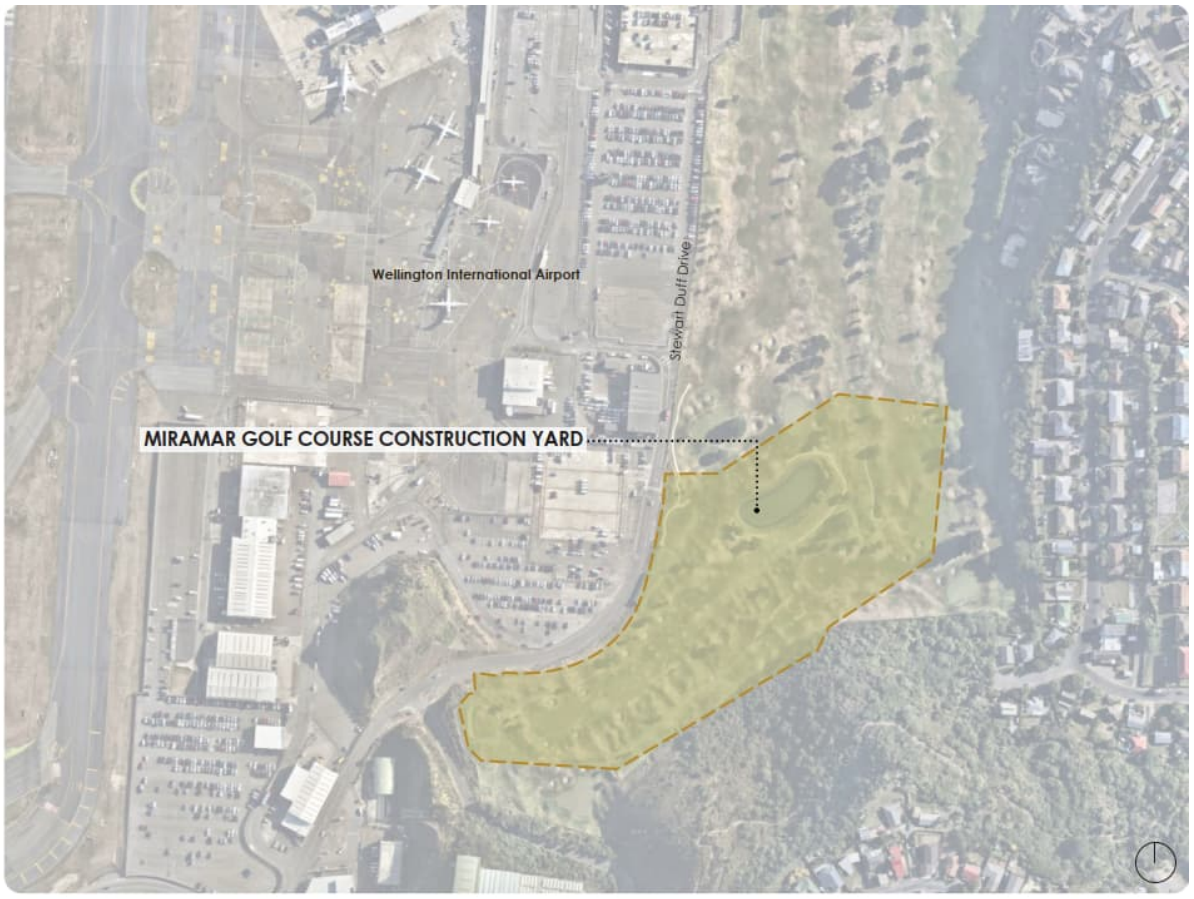


Figure 1: Location of MGC Yard

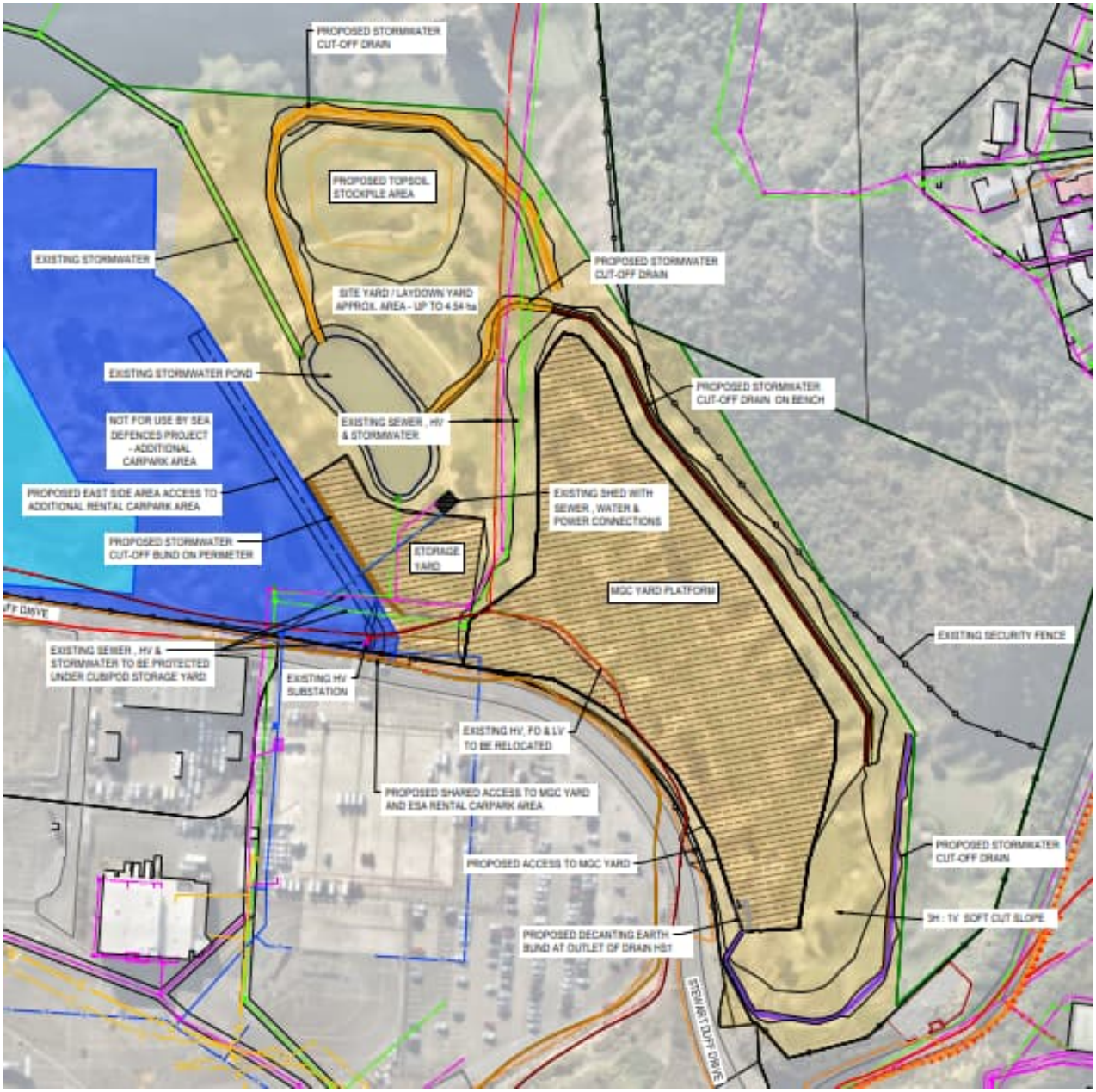


Figure 2: Features of MGC Yard

This SSESCP provides design erosion and sediment control (**ESC**) measures indicating how the site will manage runoff during these construction activities.

This SSESCP has been prepared in accordance with the principles of the Greater Wellington Regional Council *Erosion and Sediment Control Guidelines for Land Disturbing Activities in the Wellington Region,* February 2021 and the NZTA *Erosion and sediment control guidelines for state highway infrastructure,* September 2014 (the **ESC Guideline**) and addresses the following earthwork activities:

- Establishment of erosion and sediment control measures (clean water control, sediment retention devices and dirty (site) water control);
- Initial vegetation clearance and topsoil stripping;
- Earthworks to recontour the site to a level surface suitable for yard activities;
- Installation of drainage works; and
- Establishment of laydown and working yard areas.

2. CONSTRUCTION PROGRAMME

To be included prior to Council certification.

3. DESCRIPTION OF WORKS

The MGC Yard will be established in advance of the seawall construction site, in order for Wellington International Airport Limited (WIAL) to commence rock and armour unit stockpiling. The MGC Yard establishment works are expected to commence as soon as consent is granted and will take up to 7 years to complete progressively as storage area is required.

The proposed specifications including earthworks of the MGC Yard works are shown in Table 1, with detailed design drawings included in Part C of the application documents.[1]

Parameter	Specification
Yard area	< 4.5 ha
Earthworks area	~4 ha
Earthworks cut volume	~100,000 m^3
Earthworks fill volume	2,000 m^3
Earthworks cut to be removed offsite	100,000 m^3
Paved area (yard entrance and exit)	up to ~400 m^2
All-weather (permeable granular) pavements	30,000 m^2
Yard buildings	~500 m^2, approximately 4 – 5 m high

Table 1 - Proposed specifications of the MGC Yard (source WIAL Southern Seawall Renewal Draft Description of Proposal July 25

3.1. Earthworks

Refer to ESCP-001, 003, 004 and 005, which show the erosion and sediment controls for the MGC Yard, the design details of the sediment retention pond (SRP) and typical details of each control.

The MGC Yard earthworks are to be undertake in stages (staging to be determined by contractor), comprising the Main MGC Yard (Area A) and the Northern Stockpile (Area B) as shown in Figure 3.

1 These figures are approximate and subject to detailed design.

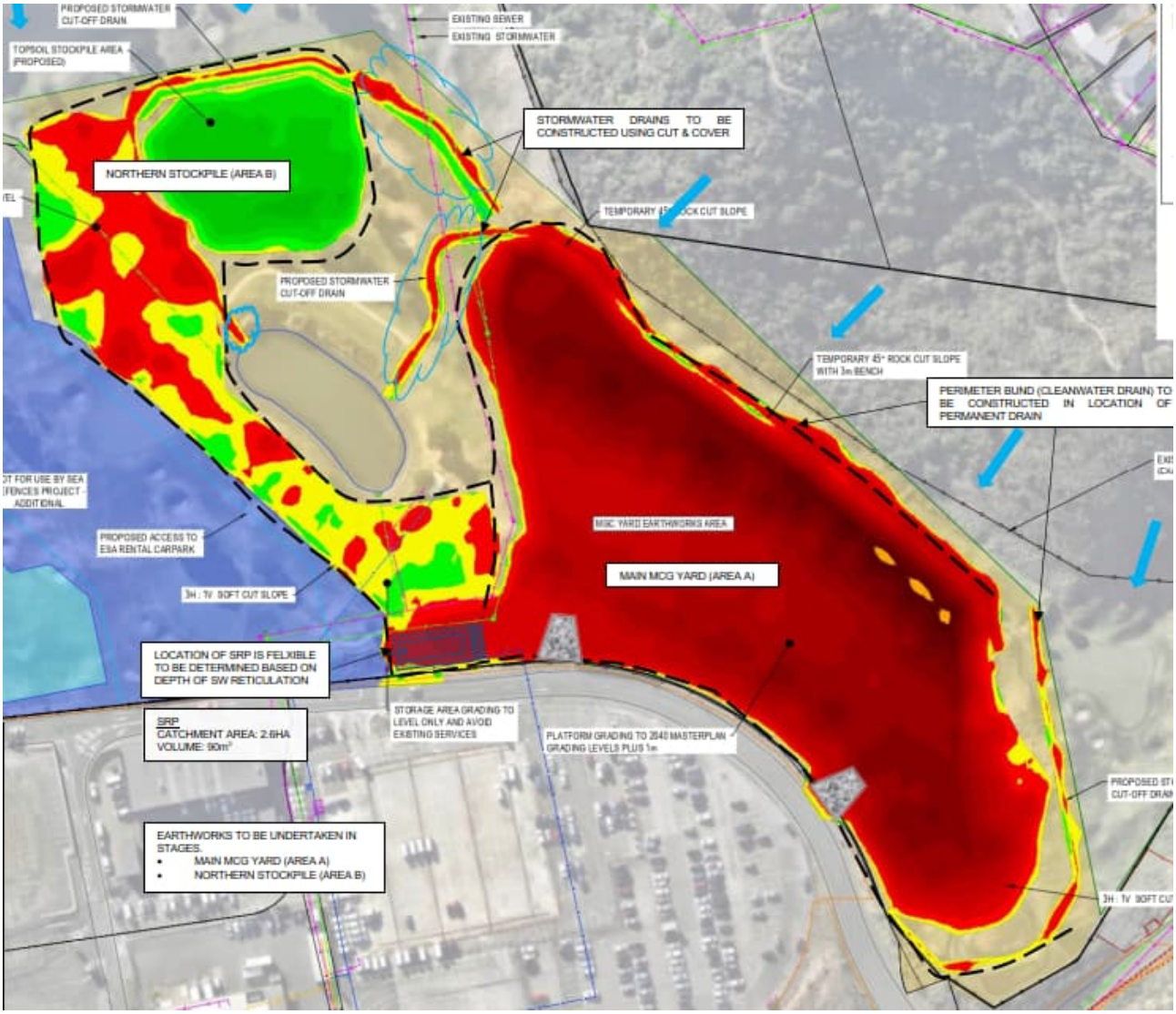


Figure 3: Location of Main MGC Yard (Area A) and Northern Stockpile (Area B)

Main MGC Yard (Area A)

The Main MGC Yard is an area of approximately 2.6ha.

Stabilised construction entrance will be installed in the approximate locations as shown on ESCP-001

A cleanwater diversion will be installed in the location of the permanent stormwater cutoff drain (designed by Beca). Dirty water diversions will be installed to direct sediment laden runoff to SRP1. These are shown as perimeter bunds on ESCP-001.

SRP 1 has been designed in accordance with the NZTA *Erosion and sediment control guidelines for state highway infrastructure*, September 2014 given the sites sandy soils.

The earthworks will be undertaken progressively as a cut to waste operation. As design levels are achieved the surface will be stabilised with aggregate.

Northern Stockpile (Area B)

The Norther Stockpile is an area of approximately 1.9ha.

A perimeter bund (clean and dirty water) will be constructed to divert sediment laden runoff to SRP1.

SRP 1 has been designed in accordance with the NZTA *Erosion and sediment control guidelines for state highway infrastructure*, September 2014 given the sites sandy soils.

The earthworks will be undertaken progressively as a cut to waste operation. As design levels are achieved the surface will be stabilised with aggregate.

Three stormwater drains will need to be constructed using cut and cover.

3.2. Contaminated Soil

Beca has prepared a preliminary site investigation ("PSI") and detailed site investigation ("DSI") for the site. Analytical results identified per-and poly-fluoroalkyl substances ("PFAS") and concentrations of perfluorooctane sulfonic acid ("PFOS") in the western part of the site that appears to correspond with the historical NAC apron and immediately surrounding area.

Any contaminated material encountered will be managed in accordance with the recommendations of those reports.

The contaminated material will be either:

- Removed from site and disposed of to an approved landfill; or
- Temporarily stockpiled and covered in an impervious lining or contained within a sealed and bunded area.

4. EROSION AND SEDIMENT CONTROL DETAILS

4.1. Construction Entrances

Stabilised construction entrances will be installed off Stewart Duff Drive. The entrances will be constructed and maintained in accordance with Section E2.6 of the ESC Guidelines. The typical details are shown on ESCP-004.

4.2. Cleanwater Diversions

Upper catchment clean water will be diverted using clean water diversions, at the approximate locations depicted on ESCP-001

The ESC Guidelines recommends that clean water diversions are designed to carry the flow from the 20% annual exceedance probability (AEP) rain event (plus 300mm freeboard). As the contributing catchments are less than 5ha in area, the typical details as shown in Figure 2 and contained with the ESC Guidelines can be relied on.

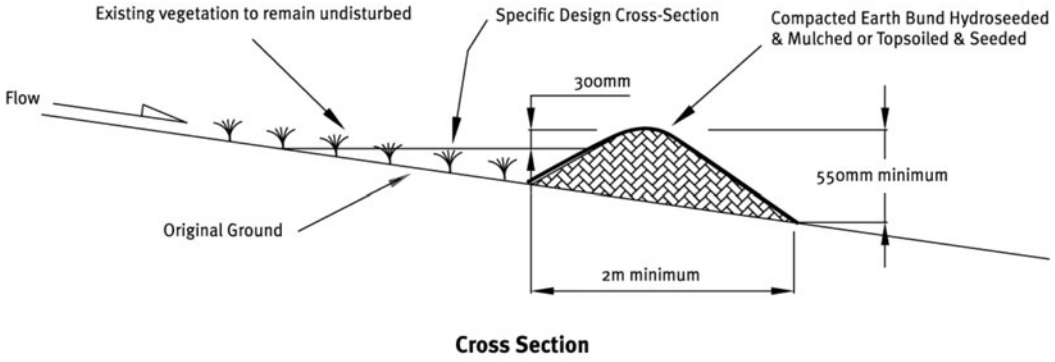


Figure 1: Cross-section of a clean water diversion bund.

4.3. Dirty Water Diversions

Dirty water diversions will direct sediment laden runoff to the sediment control measures. The ESC Guidelines recommends that dirty water diversions are designed to carry the flow from the 20%

annual exceedance probability (AEP) rain event (plus 300mm freeboard). As the contributing catchments are less than 5ha in area, the typical details as shown in Figure 3 and contained with the ESC Guidelines can be relied on.

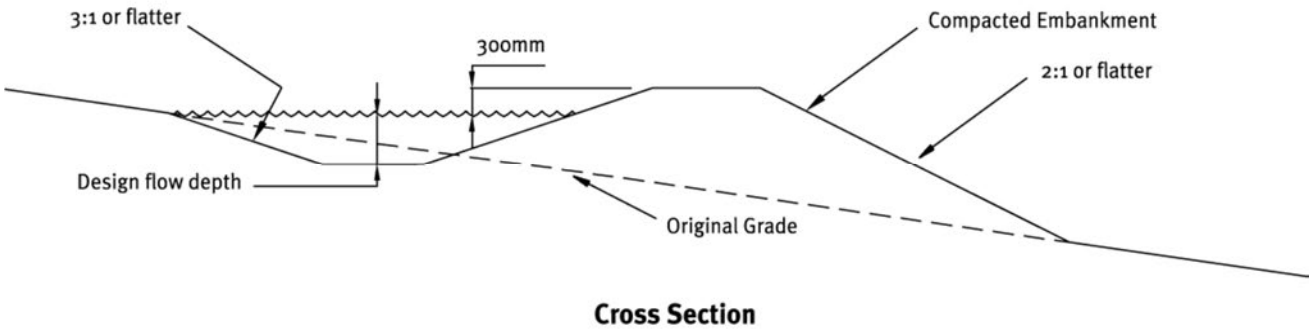


Figure 3: Cross-section of a dirty water diversion.

4.4. Cut and Cover

The stormwater drains will be constructed using a 'cut and cover' approach in accordance with the ESC Guidelines (Section G3.1.2). This approach means that the contractor can only strip an area of the drain where the surface will be stabilised on the same day.

4.5. Sediment Retention Pond

The sizing of the Sediment Retention Pond (SRP) has been undertaken using NZTA *Erosion and sediment control guidelines for state highway infrastructure*, September 2014 given the sites sandy soils.

Section 6 *Hydrological design criteria* of the NZTA ESC Guidelines outlines the approach to sizing SRP's based on the hydrological design. This is based on the following parameters:

- Soil,
- Slope;
- Rainfall;
- Ground cover; and
- Risk associated with the design.

The effect that soil, slope and groundcover have on runoff is well understood but a key element of sizing of practices relates to rainfall and the risk associated with the design. The risk relates to the sensitivity of the receiving environments as exceedance of design criteria could have a significant impact on them.

Design Steps

For sizing using the hydrological design criteria the following steps are to be taken:

1. Determine site location and from that determine latitude and longitude;
2. Determine project duration;

3. Using HIRDS or local data select the 1-hour storm using the appropriate frequency storm event risk factor for the receiving environments. (2-year, 5-year, 10-year, 20-year or 100-year from Table 6-4);

4. Determine site soils and slope to select the C Factor;

5. Determine the site area that would drain to a storage practice;

6. Use the Rational Formula to calculate the peak discharge for the storm selected in step 1; and

7. Multiply the peak discharge by 3,600 seconds to get the volume of the sediment storage practice.

MGC Yard Pond Sizing Calculation

1. Drains to Lyall Bay so design risk factor is 75%, use a 5-year storm. Site latitude is -41.33351521405444, site longitude is 174.813259772435.

2. Project duration > 6 months

3. Rainfall is 22.1mm

4. Site soils are sand with slopes less than 10% – Flat gravel 0.15 (<10%) - Sand 0.1**.** Have assumed flat gravel as great volume of runoff.

5. Site area that would drain to a storage practice - 2.6ha.

6. Q = 0.00278(22.1)(0.15)(2.6) = 0.024m/s

7. Storage Volume = 0.024(3600) = 86.4m^3

The full design details of the SRP are on ESCP-005 and shown in Figure 4.

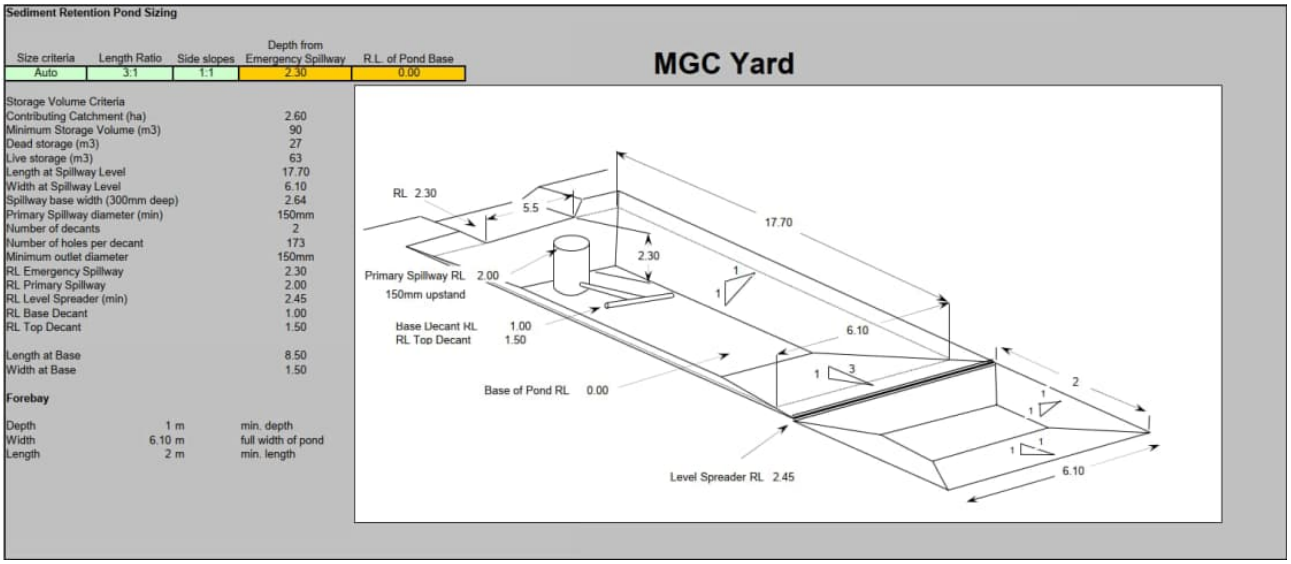


Figure 4: Design details of the Sediment Retention Pond.

4.6. Chemical Treatment

The Chemical Treatment Management Plan (CTMP) provided as Appendix A of the Erosion and Sediment Control Assessment Report provides the methodology for determining the effectiveness and dose rates for chemical treatment to enhance the sediment retention efficiency of sediment retention ponds, decanting earth bunds and other water impoundment devices that will be used throughout the project. It is intended that all SRPs will be chemically treated if necessary and monitored in accordance with the CTMP.

4.7. Stabilisation

Progressive stabilisation will be undertaken throughout the earthwork operations. Both temporary and permanent stabilisation measures will be employed on site. Common stabilisation measures include spreading of aggregate, grassing (with a full cover of grass), applying mulch and the use of geotextiles.

Once the catchment area for a particular ESC device is stabilised then the ESC monitoring and maintenance will cease, and the ESC device could be decommissioned.

4.8. As Builts

Prior to bulk earthworks commencing, as-builts for the erosion and sediment controls will be provided to the Greater Wellington Regional Council. The as-built certification will confirm that the controls have been constructed in accordance with the approved SSESCP.

This SSESCP is intended to be a live document and if the earthworks methodologies or erosion and sediment control measures for the anticipated work changes then an update / review of the SSESCP drawings will be made before the earthworks commence. Any changes to the SSESCP will be confirmed in writing and provided to the Greater Wellington Regional Council for certification, prior to the implementation of any changes proposed.

5. EROSION AND SEDIMENT CONTROL MONITORING

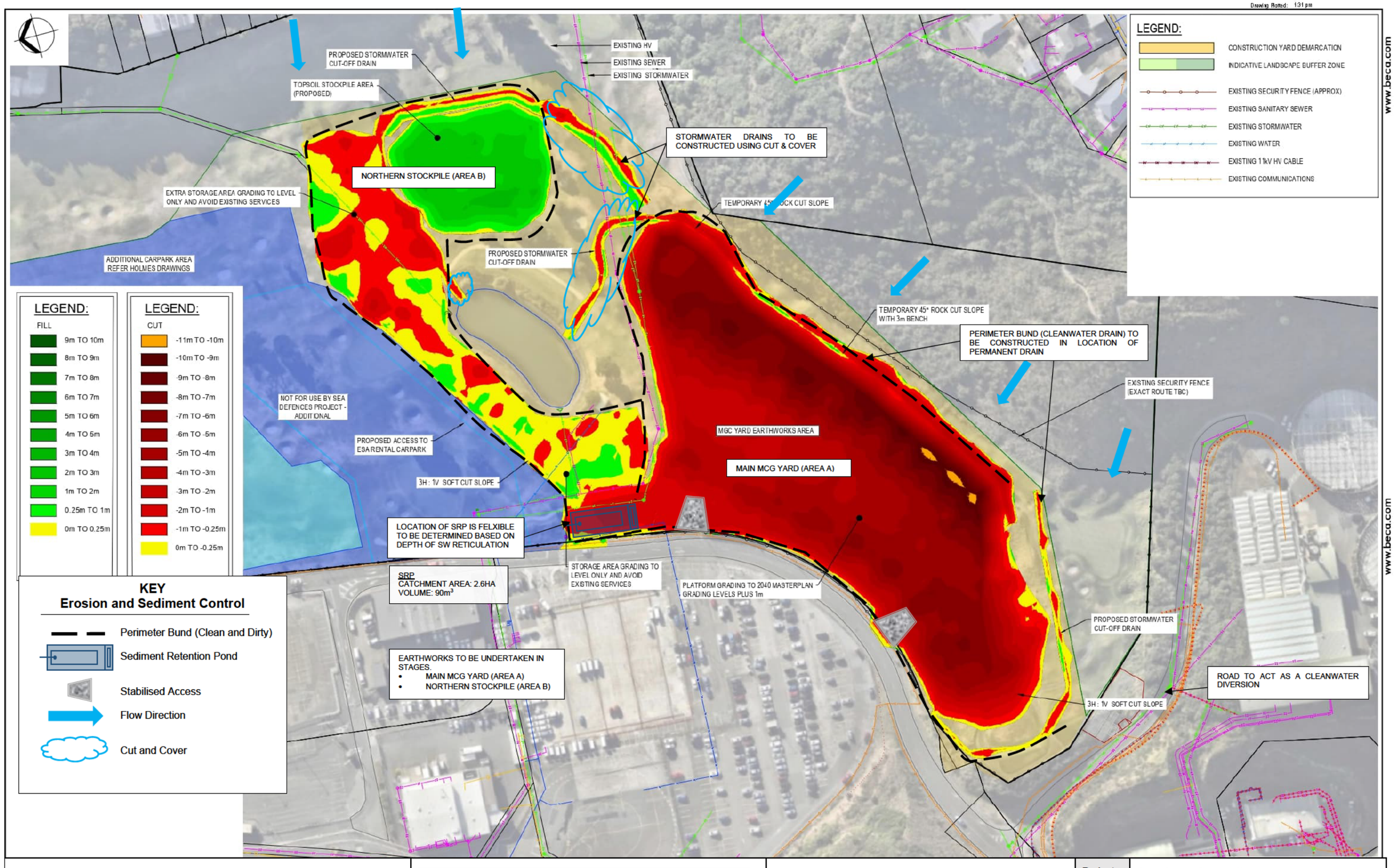
All erosion and sediment control measures will be maintained in accordance with the ESC Guidelines throughout the works until the site is stabilised against erosion.

All erosion and sediment control measures and methodologies will be monitored during the works in accordance with the Erosion and Sediment Control Monitoring Plan (ESCMP) provided as Appendix C of the Erosion and Sediment Control Assessment Report. Any required maintenance or improvements to control measures will be undertaken immediately.

The SRP will be cleaned out before accumulated sediment volume reaches 20% of the total volume. Forebays will be cleaned out if there is any evidence of sediment deposition.

Once an area is stabilised and the controls removed, the operational requirements commence and monitoring under the ESCMP will cease.

Drawing Plotted: 1:31 pm



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GENERAL EROSION AND SEDIMENT CONTROL NOTES

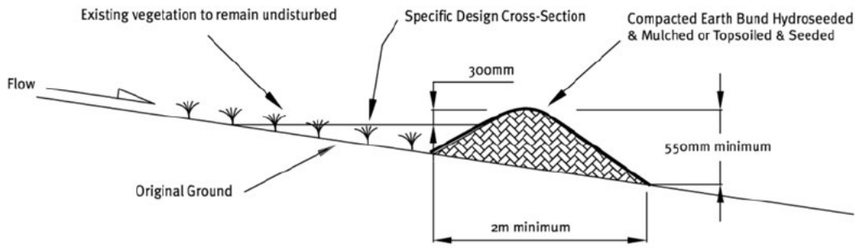
1. All erosion and sediment controls will be installed and maintained in accordance with Greater Wellington Regional Council's *'Erosion and Sediment Control Guideline for Land Disturbance Activities in the Wellington Region'* and NZTA Erosion and sediment control guidelines for state highway infrastructure, September 2014.
2. All erosion and sediment control measures will be inspected weekly by the site foreman.
3. Site monitoring will be undertaken before and immediately after rain as well as during heavy rainfall events. Any required maintenance or improvements to control measures will be undertaken immediately.

REV	DATE	REVISION DETAILS	APPROVED
A	18.12.24	Draft for review.	
B	22.07.25	Updated drawing – Draft for review	
C	23.09.25	Final Draft	
D	16.10.25	Final	

Project	**Southern Seawall**
Title	**Erosion and Sediment Control Plan MGC Yard**

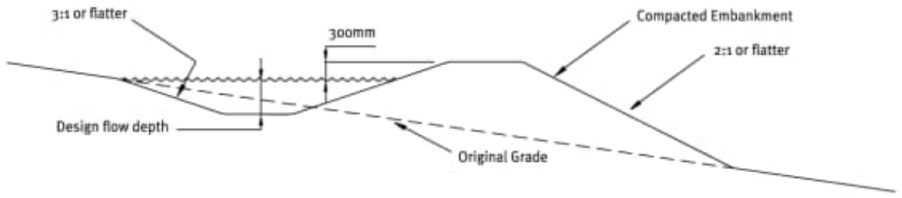
Drawn	Checked	Drawing No.	Sheet No.
GM	CS	ESCP-001	1

Document No.: 7257383-CNST-21.dwg



Cross Section

Schematic of a Perimter Bund/ Cleanwater Diversion



Cross Section

Schematic of a Dirty Water Diversion

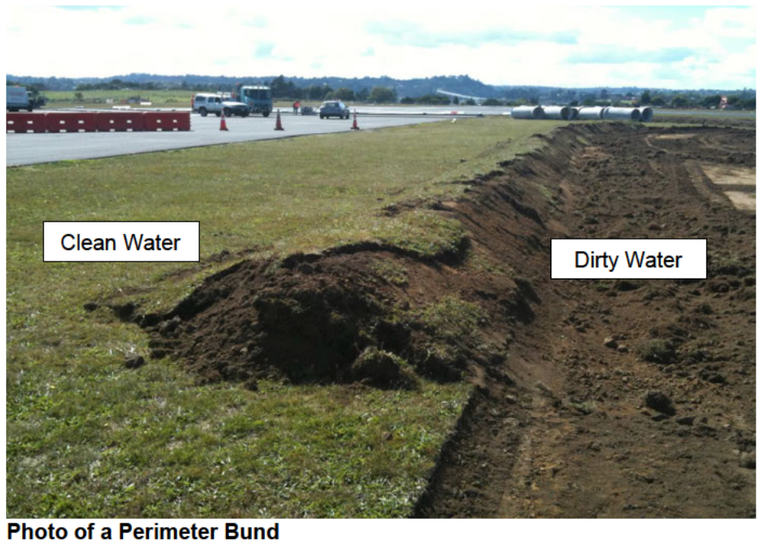
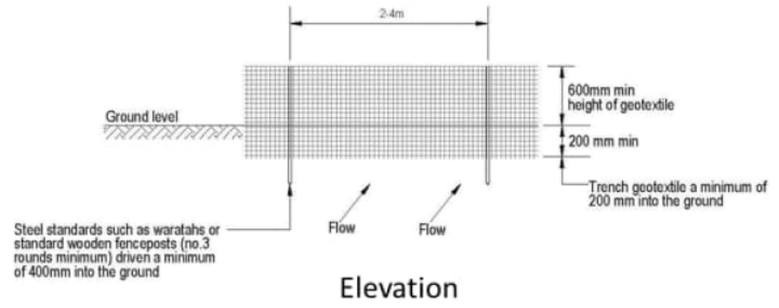
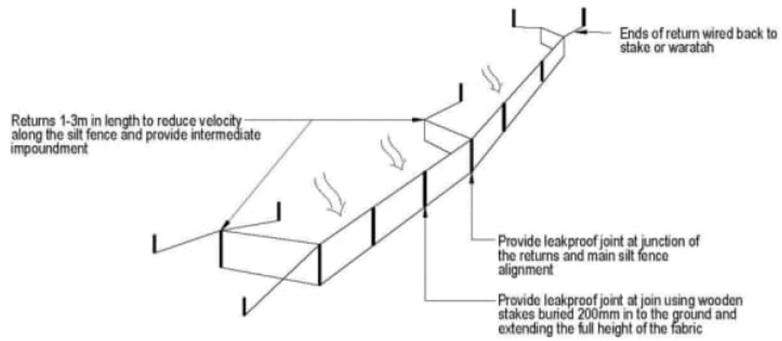


Photo of a Perimeter Bund



Elevation



Silt fence with returns and support wire

Schematic of a Silt Fence

GENERAL EROSION AND SEDIMENT CONTROL NOTES

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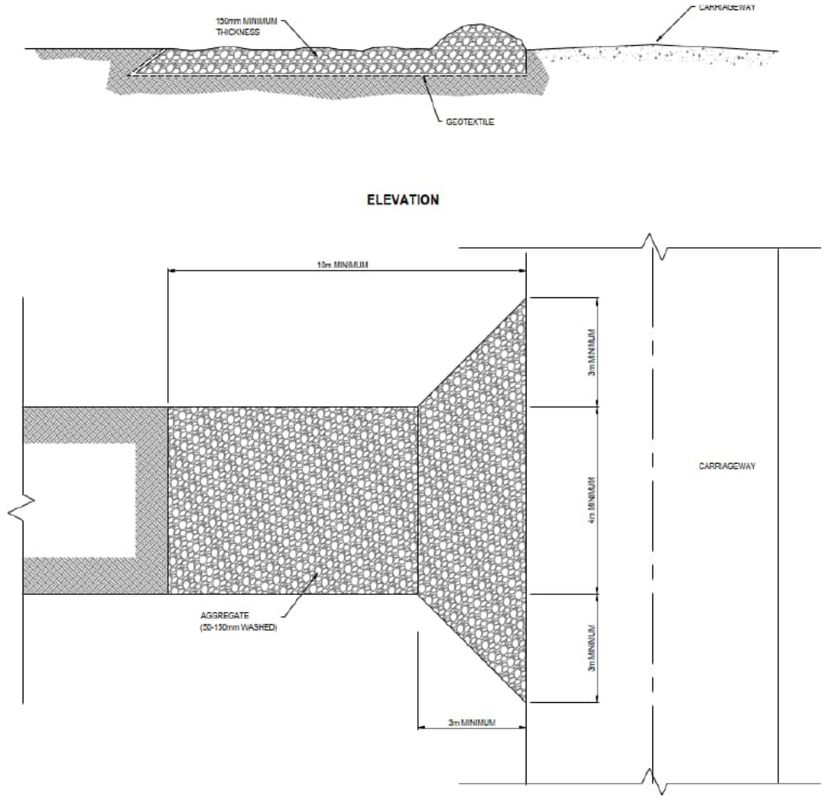
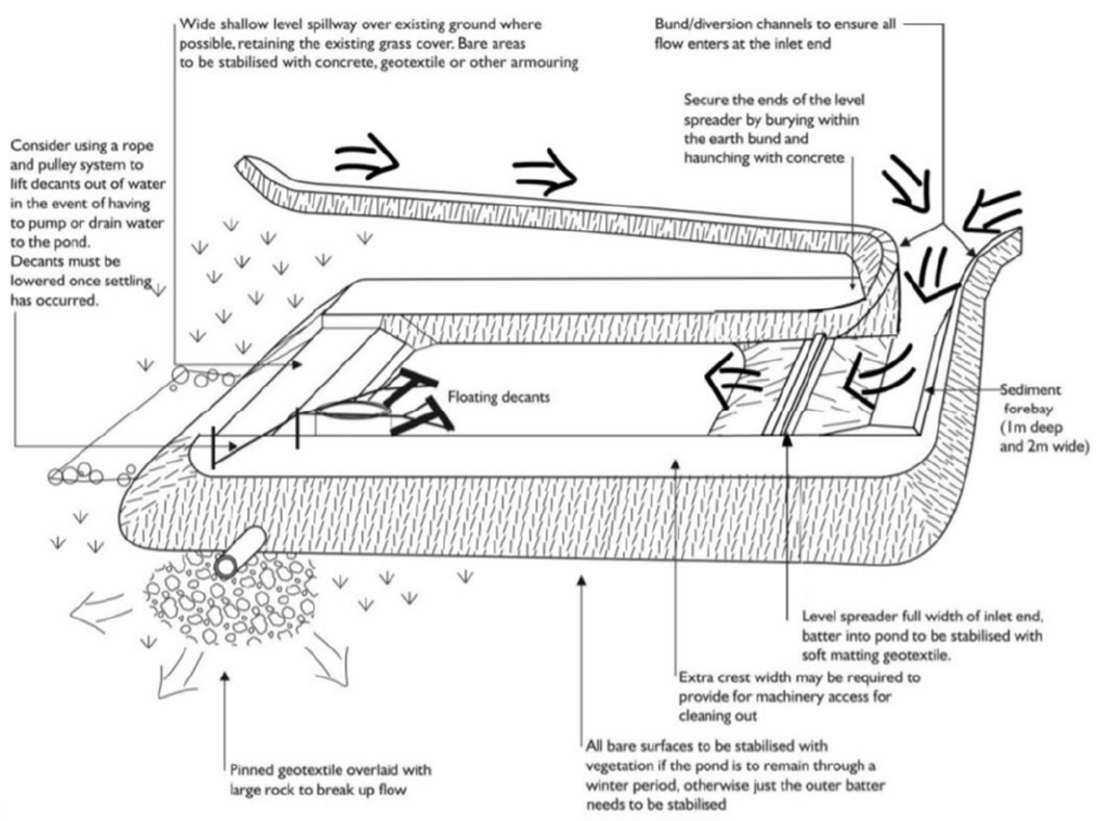
REV	DATE	REVISION DETAILS	APPROVED
A	25.07.25	Draft for review.	
B	16.10.25	Final	

		Project	**SOUTHERN SEAWALL**
		Title	**Erosion and Sediment Control Plan** **Typical Details**
Drawn GM	**Checked**	**Drawing No.** ESCP-003	**Sheet No.** 1



Design parameter	Specification
Aggregate size	50 - 150 mm washed aggregate
Minimum thickness	150 mm
Minimum length	10 m
Minimum width	4 m

Schematic of a construction entrance



Schematic of a Sediment Retention Pond

GENERAL EROSION AND SEDIMENT CONTROL NOTES

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A	25.07.25	Draft for review.	
B	16.10.25	Final	

Drawn: GM	Checked:	Drawing No.: ESCP-004	Sheet No.: 1

Project	**SOUTHERN SEAWALL**
Title	**Erosion and Sediment Control Plan** **Typical Details**

Sediment Retention Pond Sizing

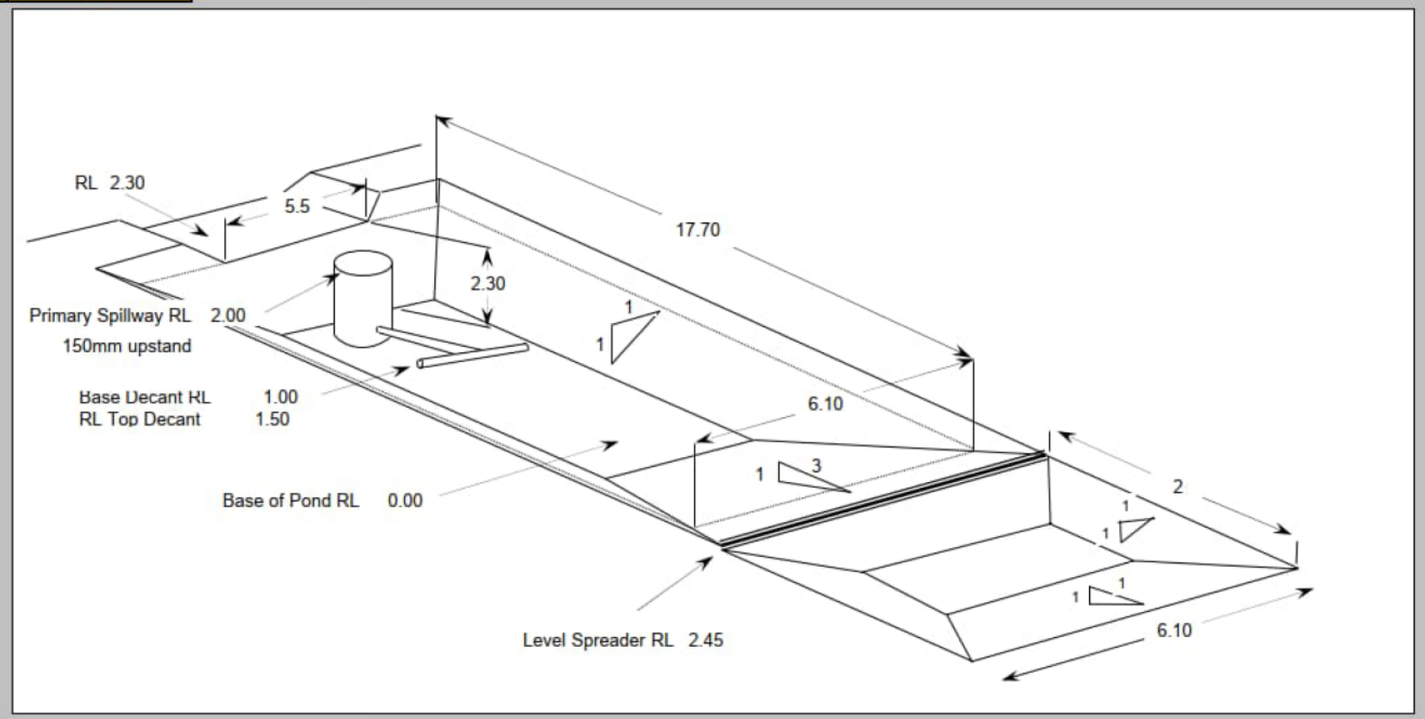
Size criteria	Length Ratio	Side slopes	Depth from Emergency Spillway	R.L. of Pond Base
Auto	3:1	1:1	2.30	0.00

MGC Yard

Storage Volume Criteria	
Contributing Catchment (ha)	2.60
Minimum Storage Volume (m3)	90
Dead storage (m3)	27
Live storage (m3)	63
Length at Spillway Level	17.70
Width at Spillway Level	6.10
Spillway base width (300mm deep)	2.64
Primary Spillway diameter (min)	150mm
Number of decants	2
Number of holes per decant	173
Minimum outlet diameter	150mm
RL Emergency Spillway	2.30
RL Primary Spillway	2.00
RL Level Spreader (min)	2.45
RL Base Decant	1.00
RL Top Decant	1.50
Length at Base	8.50
Width at Base	1.50

Forebay

Depth	1 m	min. depth
Width	6.10 m	full width of pond
Length	2 m	min. length



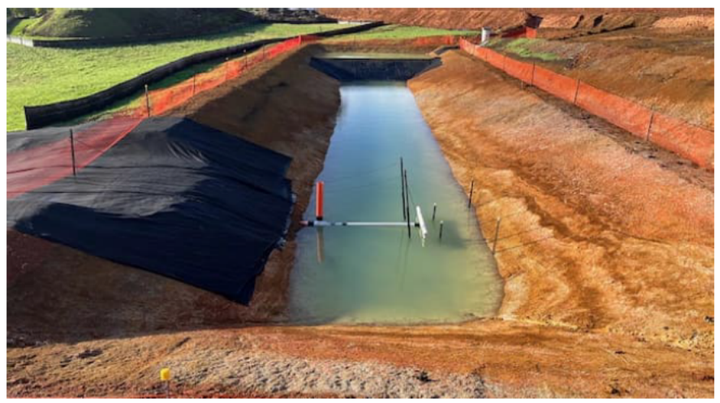


Figure 1: Example of a SRP.

Figure 2: Level spreader.

Figure 1: Anti-seep collar.

GENERAL EROSION AND SEDIMENT CONTROL NOTES

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A	25.07.25	Draft for review.	
B	16.10.25	Final	

		Project	**SOUTHERN SEAWALL**
		Title	**Erosion and Sediment Control Plan** **Sediment Retention Pond – MGC Yard**
Drawn GM	**Checked**	**Drawing No.** ESCP-005	**Sheet No.** 1

SOUTHERNSKIES ENVIRONMENTAL

Site Specific Erosion and Sediment Control Plan
Moa Point Yard

Southern Seawall Project

Wellington International Airport Limited

October 2025

Document Control

Project Name	Southern Seawall Project
Client	Wellington International Airport Limited
Date	16/10/2025
Version	Rev C
Issue Status	Final
Originator	Gregor McLean - SouthernSkies Environmental
Reviewer	Michael Parsonson - SouthernSkies Environmental
Consultant details	SouthernSkies Environmental Limited 107B / 19 Surrey Crescent, Grey Lynn PO Box 46-188 Herne Bay, Auckland 1147
	[redacted]
	www.southernskies.co.nz

Contents

1. INTRODUCTION

This Site-Specific Erosion and Sediment Control Plan (**SSESCP**) relates to the activities associated with the establishment of the Moa Point Construction Yard ("**Moa Point Yard**"). The location is shown in Figure 1.

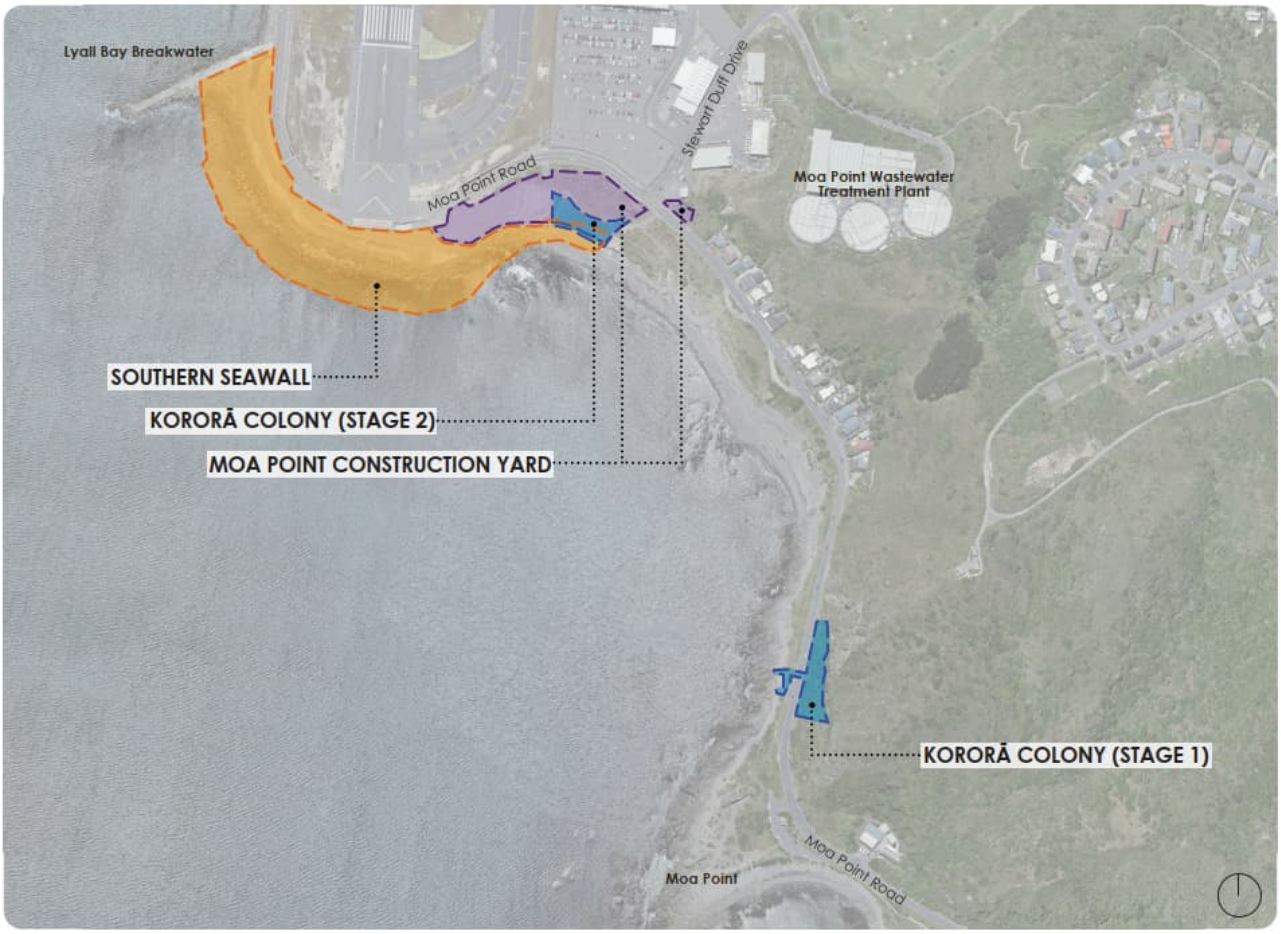

Figure 1: Location of Moa Point Yard

This SSESCP provides design erosion and sediment control (ESC) measures indicating how the site will manage runoff during these construction activities.

This SSESCP has been prepared in accordance with the principles of the Greater Wellington Regional Council *Erosion and Sediment Control Guidelines for Land Disturbing Activities in the Wellington Region,* February 2021 (the **ESC Guideline**) and addresses the following earthwork activities:

- Establishment of erosion and sediment control measures (clean water control, sediment retention devices and dirty (site) water control);
- Initial vegetation clearance and topsoil stripping;
- Earthworks to recontour the site to a level surface suitable for yard activities;
- Installation of drainage works; and
- Establishment of laydown and working yard areas.

2. CONSTRUCTION PROGRAMME

To be included prior to Council certification.

3. DESCRIPTION OF WORKS

The Moa Point Yard, will be the main operational storage area during the seawall construction works. It will be used for storing construction materials and general plant setup and maintenance facilities adjacent to the seawall workface. The Moa Point Yard will also be used for servicing large equipment that cannot easily be transported to the George Bolt Yard.

3.1. Earthworks

Refer to ESCP-002, 003 and 004, which show which show the erosion and sediment controls for the Moa Point Yard and typical details of each control.

The proposed specifications including earthworks of the Moa Point Yard works are shown in Table 1, with detailed design drawings included in Part C of the application documents.[1]

Parameter	Specification
Earthworks area	Up to 10,000 m^2 (including Stage 2 Kororā Colony from Stewart Duff Drive to east end of Eastern Bank rock protection).
Earthworks volume	Up to 25,000 m^3
Paved area (crossings and accessway)	Up to 200 m^2
All-weather (permeable granular) pavements	Moa Point Yard: 9,000 m^2 Moa Point Foreman's Yard: 284m^2
Yard buildings (if required)	Up to 80-100 m^2, and up to 6 m high OR Up to 170 m^2, and up to 4m high

Table 1 - Proposed specifications of the Moa Point Yard (source WIAL Southern Seawall Renewal Draft Description of Proposal July 25

3.2. Contaminated Soils

Beca has prepared a preliminary site investigation ("PSI") and detailed site investigation ("DSI") for the site. Analytical results identified per-and poly-fluoroalkyl substances ("PFAS") and concentrations of perfluorooctane sulfonic acid ("PFOS").

Any contaminated material encountered will be managed in accordance with the recommendations of those reports.

The contaminated material will be either:

- Removed from site and disposed of to an approved landfill; or
- Temporarily stockpiled and covered in an impervious lining or contained within a sealed and bunded area.

1 These figures are approximate and subject to detailed design.

4. EROSION AND SEDIMENT CONTROL DETAILS

Typical erosion and sediment control devices cannot be used in this location given the extreme weather that occurs. As an example, silt fences have been installed for the maintenance works that are being undertaken. Those silt fences have been rendered unusable, as a result of the wind conditions. In that regard the main ESC for the establishment of the yard is a robust construction methodology incorporating progressive and rapid stabilisation.

4.1. Construction Entrance

An existing stabilised access off Moa Point Road has been upgraded to provide for construction traffic associated with the maintenance activities that are currently occurring. The entrance will be constructed and maintained in accordance with Section E2.6 of the ESC Guidelines. The typical details are shown on ESCP-004.

4.2. Cut and Cover

The Moa Point Yard will generally be constructed using a 'cut and cover' approach in accordance with the ESC Guidelines (Section G3.1.2). This approach means that the contractor can only strip an area where the surface will be stabilised with aggregate on the same day.

As a contingency measure, prior to earthworks commencing, a perimeter bund will be installed around the extent of the works to provide containment.

4.3. Stabilisation

Progressive stabilisation will be undertaken throughout the earthwork operations. Both temporary and permanent stabilisation measures will be employed on site. Common stabilisation measures include spreading of aggregate and the use of geotextiles.

Once the catchment area for a particular ESC device is stabilised then the ESC monitoring and maintenance will cease, and the ESC device could be decommissioned.

4.4. As Builts

Prior to bulk earthworks commencing, as-builts for the erosion and sediment controls will be provided to the Greater Wellington Regional Council. The as-built certification will confirm that the controls have been constructed in accordance with the approved SSESCP.

This SSESCP is intended to be a live document and if the earthworks methodologies or erosion and sediment control measures for the anticipated work changes then an update / review of the SSESCP drawings will be made before the earthworks commence. Any changes to the SSESCP will be confirmed in writing and provided to the Greater Wellington Regional Council for certification, prior to the implementation of any changes proposed.

5. EROSION AND SEDIMENT CONTROL MONITORING

All erosion and sediment control measures will be maintained in accordance with the ESC Guidelines throughout the works until the site is stabilised against erosion.

All erosion and sediment control measures and methodologies will be monitored during the works in accordance with the Erosion and Sediment Control Monitoring Plan (ESCMP) provided as Appendix C of the Erosion and Sediment Control Assessment Report. Any required maintenance or improvements to control measures will be undertaken immediately.

Once an area is stabilised and the controls removed, the operational requirements commence and monitoring under the ESCMP will cease.

Drawing Plotted: 2:08 pm

EDGE OF PAVEMENT

MOA POINT ROAD WILL ACT AS A CLEANWATER DIVERION

STORMWATER INLETS ON MOA POINT ROAD WILL REQUIRE TEMPORARY PROTECTION DURING THE WORKS.

INDICATIVE LOCATION OF MOA POINT RD YARD. REFER NOTE 6

STEWART DUFF DRIVE

MOA POINT ROAD

EXISTING SITE ACCESS TO BE REPLACED WITH HEAVY VEHICLE CROSSING

TEMPORARY SITE ACCESS (HEAVY VEHICLE CROSSING)

INDICATIVE LOCATION OF SITE OFFICES, EQUIPMENT STORAGE AND WORKER PARKING. UNPAVED SURFACE STABILISED USING COMPACTED GRANULAR MATERIAL

MOA POINT OUTFALL WASTEWATER MANHOLE

INDICATIVE TOE EXTENT (EXCAVATED AND ROCK BERM TOES)

SITE EARTHWORKS INVOLVE MINOR RECONTOURING. MAJORITY OF WORKS SHOULD BE UNDERTAKEN AS CUT AND COVER

MOA POINT WASTEWATER OUTFALL

EASTERN BANK REMEDIATION LOWER BANK REMEDIATION BURIED BENEATH BEACH (BEACH MATERIAL TO BE REPLACED ON COMPLETION)

NOTES:

1. HORIZONTAL COORDINATE SYSTEM: NEW ZEALAND TRANSVERSE MERCATOR (NZTM2000).
2. VERTICAL DATUM TO NEW ZEALAND VERTICAL DATUM 2016 (NZVD16).
3. BATHYMETRIC SURVEY DATA:
   - DISCOVERY MARINE LIMITED (DML) CONDUCTED APRIL TO MAY 2021
   - NIWA 25m AND 50m DEM 2014.
4. TOPOGRAPHIC DATA:
   - BECA DRONE SURVEY JAN 2024.
5. STORM WATER AND WASTEWATER LOCATIONS EXTRACTED FROM WELLINGTON CITY COUNCIL GIS.
6. LARGE PLANT TYPICALLY PARKED EAST OF EXISTING SITE ACCESS. OTHER PLANT AND STOCKPILED MATERIALS TYPICALLY LOCATED WEST OF EXISTING SITE ACCESS. PLANT AND STOCKPILE LOCATIONS WILL VARY DURING CONSTRUCTION AND MAY OCCUPY ANY PART OF SITE BETWEEN SECURITY FENCE AND SEAWALL.

LEGEND:

- 5.0 — MAJOR CONTOURS (5.0m INTERVALS)
- MINOR CONTOURS (0.5m INTERVALS)
- SW — EXISTING STORMWATER AND MANHOLE
- WW — EXISTING WASTEWATER, VALVE AND MANHOLE
- W — EXISTING WATER
- FO — EXISTING FIBRE OPTIC
- HV — EXISTING HIGH VOLTAGE ELECTRICITY
- YARD, SITE OFFICES, ETC BOUNDARY
- SITE SECURITY FENCE DURING CONSTRUCTION
- AREA RECONTOURED TO PROVIDE EVEN SURFACE, GENERALLY GRADING FROM 7.4m NZVD16 AT WEST END TO EXISTING GROUND LEVEL AT EAST END.

KEY
Erosion and Sediment Control

- Perimeter Bund
- Stabilised Access

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GENERAL EROSION AND SEDIMENT CONTROL NOTES

1. All erosion and sediment controls will be installed and maintained in accordance with Greater Wellington Regional Council's *'Erosion and Sediment Control Guideline for Land Disturbance Activities in the Wellington Region'*.
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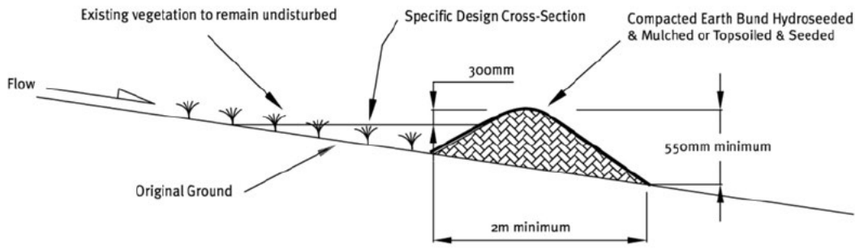
A	18.12.24	Draft for review.	
B	23.09.25	Final Draft	
C	16.10.25	Final	

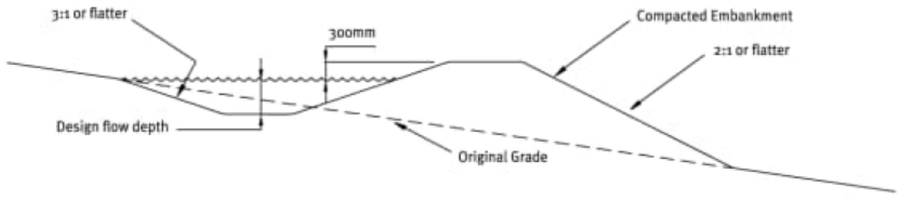
Project	Southern Seawall		
Title	Erosion and Sediment Control Plan Moa Point Yard		
Drawn: GM	Checked: CS	Drawing No.: ESCP-002	Sheet No.: 1

Document No.: 3324388-CA-SH009.DWG



Cross Section

Schematic of a Perimter Bund/ Cleanwater Diversion



Cross Section

Schematic of a Dirty Water Diversion

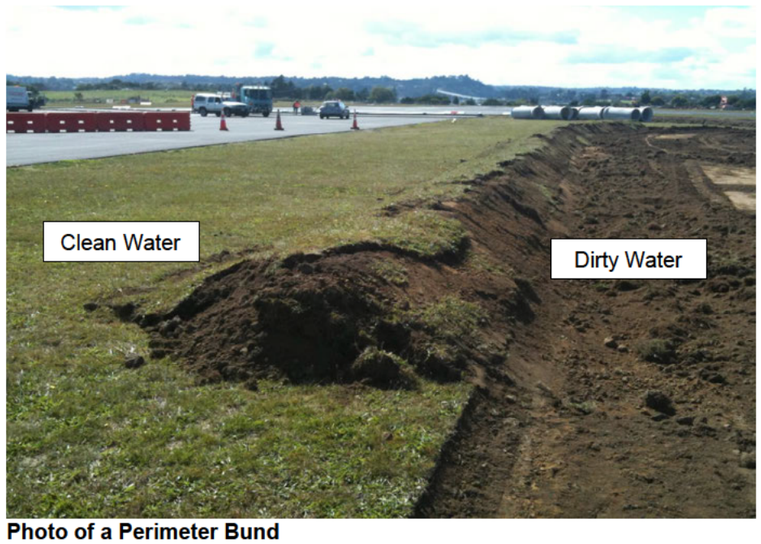
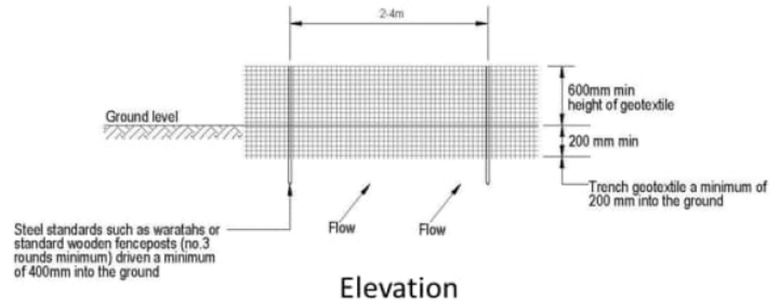
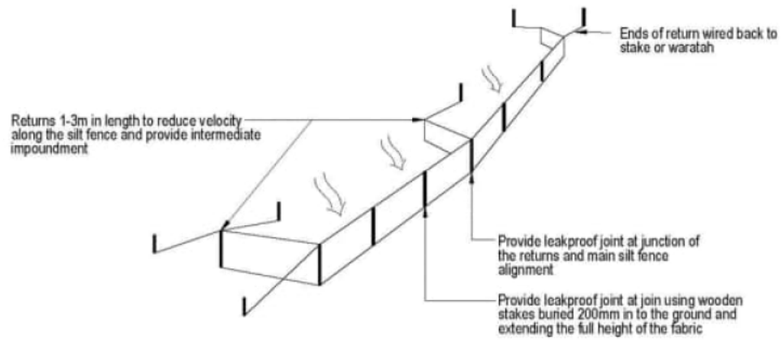


Photo of a Perimeter Bund



Elevation



Silt fence with returns and support wire

Schematic of a Silt Fence

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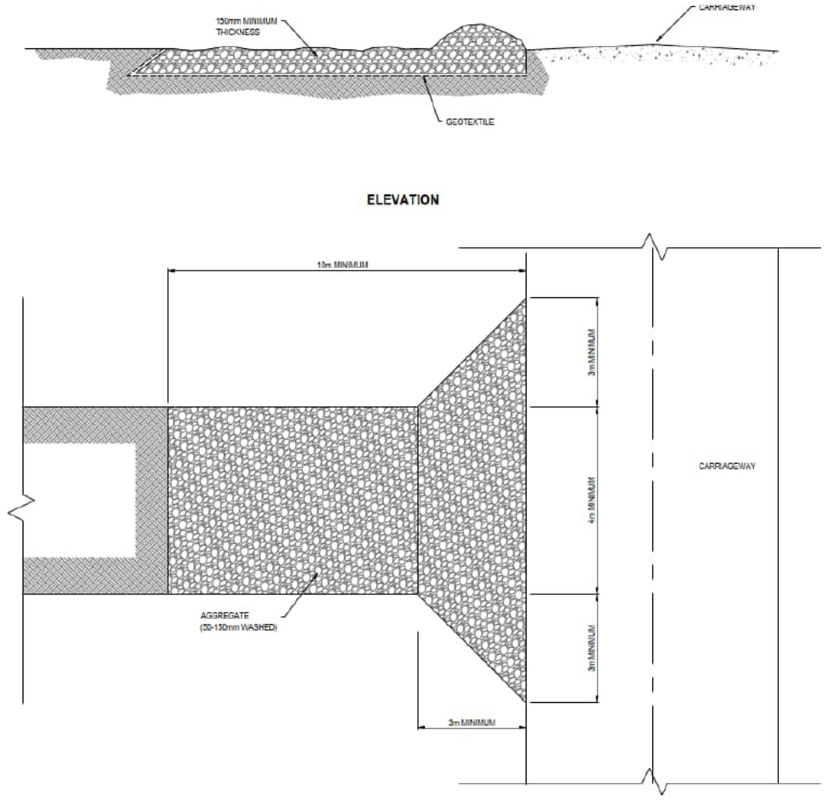
2. All erosion and sediment control measures will be inspected weekly by the site foreman.
3. Site monitoring will be undertaken before and immediately after rain as well as during heavy rainfall events. Any required maintenance or improvements to control measures will be undertaken immediately.

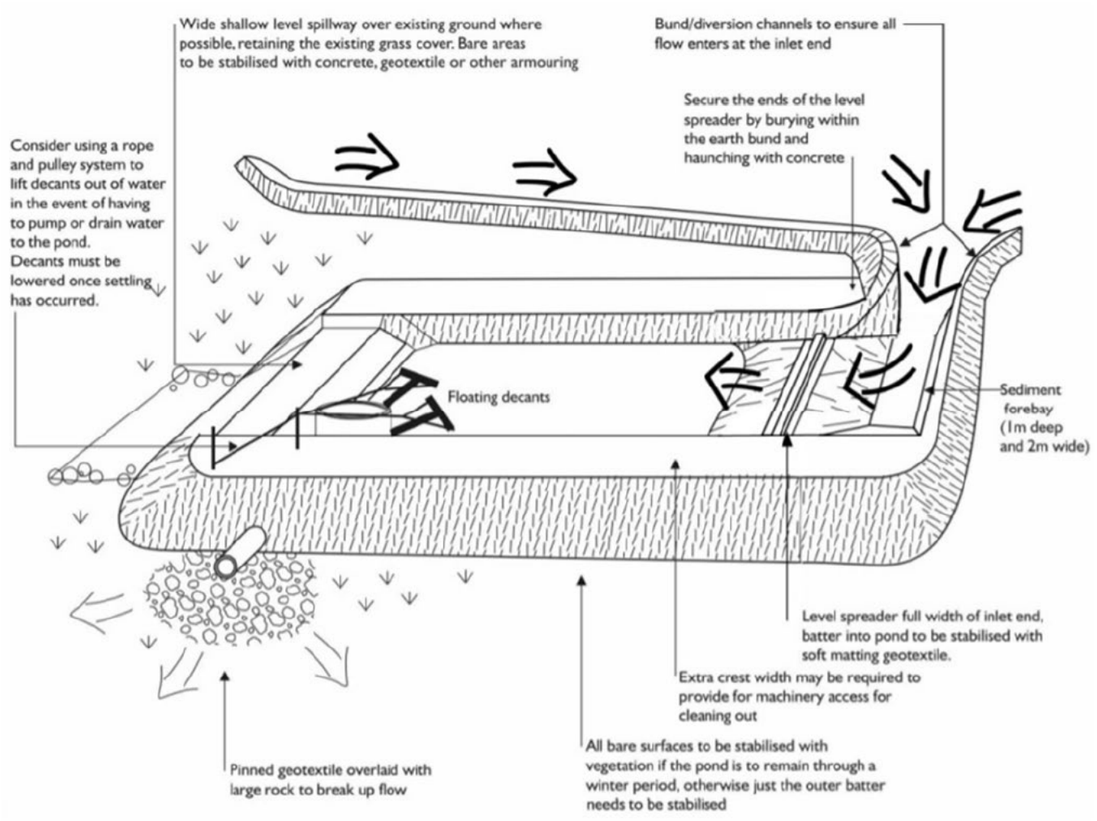
REV	DATE	REVISION DETAILS	APPROVED
A	25.07.25	Draft for review.	
B	16.10.25	Final	

		Project	**SOUTHERN SEAWALL**
		Title	**Erosion and Sediment Control Plan** **Typical Details**
Drawn GM	**Checked**	**Drawing No.** ESCP-003	**Sheet No.** 1



Design parameter	Specification
Aggregate size	50 - 150 mm washed aggregate
Minimum thickness	150 mm
Minimum length	10 m
Minimum width	4 m

Schematic of a construction entrance



Schematic of a Sediment Retention Pond

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Drawn: GM	Checked:	Drawing No.: ESCP-004	Sheet No.: 1

Project	**SOUTHERN SEAWALL**
Title	**Erosion and Sediment Control Plan** **Typical Details**

SOUTHERNSKIES ENVIRONMENTAL

Erosion and Sediment Control Monitoring Plan

Southern Seawall Project

Wellington International Airport Limited

October 2025

Document Control

Project Name	Southern Seawall Project
Client	Wellington International Airport Limited
Date	16/10/2025
Version	Rev E
Issue Status	Final
Originator	Gregor McLean - SouthernSkies Environmental
Reviewer	Michael Parsonson - SouthernSkies Environmental
Consultant details	SouthernSkies Environmental Limited 107B / 19 Surrey Crescent, Grey Lynn PO Box 46-188 Herne Bay, Auckland 1147
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Contents

1. INTRODUCTION

The purpose of this Erosion and Sediment Control Monitoring Plan (**ESCMP**) is to detail the erosion and sediment control (ESC) management and monitoring system that will be implemented for the duration of the site preparatory earthworks activities associated with Wellington International Airport Limited Southern Seawall project (**the Project**). The ESCMP includes details of process and procedures that will be followed and confirms how the ESC management and monitoring will be undertaken and the methods used in the context of the Project to ensure that effects and performances are managed appropriately.

This monitoring plan has been written to detail how the Project proposes to manage and monitor ESC measures during construction and of the Miramar Golf Club Construction Yard **(MGC Yard**) and Moa Point Construction Yard **(Moa Point Yard**)**,** to ensure the performance of the Project ESC and to provide rapid and real time information and control to the Project management team.

The ongoing monitoring and reporting that is proposed in this plan creates a continuous feedback loop of the performance of the Project ESC site and device management. This plan provides the approaches to be followed regarding ESC maintenance, monitoring, and reporting.

The ESCMP covers:

- Site management structures, practices, and procedures
- Weather Monitoring
- Erosion and Sediment Control Monitoring
    - Scheduled site visits, pre and post rain event monitoring and water sampling.
    - Rainfall event triggered water clarity and pH monitoring.
- Reporting
    - Rainfall trigger event reporting following a rainfall trigger event.
    - Recommendations of changes that need to be implemented onsite and modifications to any ESC will also be included.

Chemical treatment if required, will be monitored in accordance with the Project's Chemical Treatment Management Plan (Appendix B to the Project Erosion and Sediment Control Assessment Report (**ESCAR**)).

2. SITE SPECIFIC EROSION AND SEDIMENT CONTROL IMPLEMENTATION

The construction of all erosion and sediment controls will be managed as follows:

- An ESC Technical Specialist will prepare the Site-Specific Erosion and Sediment Control Plans (**SSESCPs**) in conjunction with the relevant construction Project Engineer and the Environmental Manager. Draft Site Specifics are included in Appendix C of the Erosion and Sediment Control Assessment Report.
- Each SSESCP will be approved by the Environmental Manager and then submitted to Greater Wellington Regional Council (**GWRC**) for certification against the ESC Guidelines.
- Once certified, the Environmental Manager will issue the certified SSESCP to the Project Manager (staff member) responsible for the implementation.
- A pre-construction meeting will be held by the Environmental Manager where the erosion and sediment controls to be built will be discussed and specific direction given on construction.

- The location of the controls and requirements of the relevant SSESCP will be confirmed on site with the construction team and the Environmental Manager.
- The construction of the controls will be overseen by the Environmental Manager and / or the ESC Technical Specialist.
- Hold points for construction will be established for each control whereby the Environmental Manager (or ESC Technical Specialist) will inspect the work completed, for example the installation of anti-seep collars or the installation of the primary outlet.
- Each control will be 'as built' certified by the Environmental Manager (or ESC Technical Specialist) to confirm compliance with the certified SSESCP prior to bulk earthworks commencing in the catchment of the device(s).
- Copies of the 'as-built' certifications will be submitted to GWRC.

3. WEATHER MONITORING

3.1. Rain Forecast

Rain forecasts relevant to the site will be checked daily using the MetService / MetVuw online / NIWA forecasting systems. Close monitoring of the rain forecast will be necessary to ensure the appropriate site works can be implemented prior to rainfall trigger events.

During working days, daily weather forecast checks will be forwarded to all Project Engineers and recorded in the daily prestart job sheets.

If the forecasts show more than 20mm of rainfall over a 24-hour period, then this will trigger the pre-rain event inspections (rain event with forecast >20mm over 24 hours), refer to Section 4.1 for further details. The purpose of these inspections is to check that the ESC devices and controls are set-up and ready for the rain event. This is in addition to the routine pre-rain event inspections undertaken by Project Engineers.

3.2. Rain Gauges

Rainfall will be recorded at the existing weather stations located 'Newtown at Carmichael Reservoir' and 'Miramar at Miramar Bowling Club'. The Environmental Manager will monitor rainfall recorded at those sites. Rainfall trigger responses will be based on recorded events at those locations, which is sufficiently close to the various earthworks packages to be undertaken during the Project.

4. EROSION AND SEDIMENT CONTROL MONITORING

The Environmental Manager or nominated environmental staff will conduct routine inspections of the sites. These inspections will take place with adequate time allocated and will be thorough and systematic. Members of the project construction team including the Project Engineer, will accompany the Environmental Manager or ESC Technical Specialist on these inspections so that the Environmental Manager or ESC Technical Specialist can better understand the work occurring at that time and that is programmed to take place. It is also useful for the Project Engineers to be reminded of their ESC obligations and for both parties to recognise good performance and outcomes, and where performance has not been to the standard expected or required by consents. This is particularly relevant in identifying how communication between personnel can be improved to avoid a recurrence of an issue.

Communication is critical to the successful implementation of SSESCPs. Internal inspections will cover all areas of the Project, even those that may have been dormant for some time, to ensure that the erosion and sediment controls are still operating properly. These internal inspections will be captured in writing and will include actions and timeframes for close out.

4.1. Site Inspections

4.1.1. Internal Site Inspections

Routine inspections are undertaken during and post instalment of ESC devices. During construction, certain stages are identified for inspection, such as during the installation of anti-seep collars, level spreaders, and T-bars.

Post construction monitoring is undertaken once a sediment retention pond (SRP) or decanting earth bund (DEB) is operational. Monitoring will take place as soon as practicable following the first rainfall event that generates runoff to the ESC device. This is to assess the performance of the device and the resulting quality of treated water being discharged from the site.

The site will be inspected weekly as a minimum by the Environmental Manager (or nominated person) and / or ESC Technical Specialist during the course of the works. These inspections will ensure that all ESC devices are installed correctly and then operate effectively throughout the duration of the works. This inspection programme will provide certainty to all parties that appropriate measures are being undertaken to ensure compliance with conditions of consent and the certified SSESCPs. The inspection regime will keep ESC management at the forefront of works on site. Any potential problems will be identified immediately, and remedial works will be promptly carried out.

The inspection programme shall consist of:

- **Weekly** site walkovers involving the environmental team to inspect all ESC measures, identify any maintenance or corrective actions necessary, assign timeframes for completion, and identify any devices that are not performing as anticipated through the certified SSESCP. Any maintenance actions will be undertaken that day where practical. Actions will be recorded and issued to the Environmental Manager with specific actions required and closeout timeframes. Once completed, the Environmental Manager will inspect the works and close-out the item.
- **Pre-rain event:** Prior to all forecast rainfall events, checks will be made of ESC devices, to ensure that they are fully functioning in preparation for the forecast event. These will be undertaken by the Project Engineers, Site Supervisors or Environmental Team.
- **Pre-rain event with forecast >20mm over 24 hours:** These inspections are additional to the 'business as usual' pre-rain inspections. They must be undertaken by the Environmental Manager or nominated and sufficiently experienced person.
- Prior to forecast rainfall "trigger" events, specific site inspections will be undertaken, targeted at any additional ESC measures that are required to be installed to ensure that the site's ESC management system performs effectively during an expected larger event. Such measures may include, additional stabilisation, temporary cut off drains and sealing exposed areas.
- **Rainfall Trigger Inspections**: During or immediately after a rainfall trigger event of >7mm within 1 hour and >20mm rainfall over any 24-hour period (subject to health and safety restrictions) inspections will be made of all discharging SRPs and the following actions taken:
    - Water clarity of the water within the device adjacent to the decant outlet, or taken from the outlet pipe will be measured using a turbidity meter.
    - pH testing of the inlet and outlet flows undertaken along with a general inspection of the sediment control devices.
    - The rainfall trigger alerts will be monitored by the Environmental Manager.
    - Any issues identified will be remedied as soon as practicable, and remedial measures will be recorded.

The purpose of these inspections is to confirm the performance of devices under the stress of heavy rainfall and obtain a spot check efficiency of the device.

- **Post-rain event**: Following all rainfall events including rainfall trigger events, inspections will be made of all ESC measures to ensure that all controls have performed as expected and to identify any maintenance requirements. Any remedial works will be documented during these monitoring inspections and immediately addressed where practical.

4.1.2. External (Regional Council) Site Inspections

The Environmental Manager or Project Manager will accompany the GWRC inspector in all programmed GWRC audits. All ESC maintenance actions identified by the GWRC inspector will be recorded and issued to the Project Manager for actioning, based on GWRC instruction. The Project Manager will report back the completion of those actions to the Environmental Manager will inspect the works and confirm that those actions have been completed. Confirmation will be emailed to the GWRC inspector.

4.2. Water Quality Monitoring

Water quality monitoring will be undertaken during rainfall trigger events (>7mm within 1 hour and >20mm of rain within a 24-hour period), including site walkovers to provide a snapshot of the ESC performance.

Water quality will be monitored by:

- Turbidity – NTU (measured at the outlet end of all discharging devices)
- pH (measured at the outflow of each device)

The following water quality targets apply to the site's ESCs and will be measured during/after each rainfall trigger event (>7mm within 1 hour and >20mm in a 24 hours period):

- 170 NTU; and
- pH between 5.5 and 8.5.

If either of the targets/thresholds identified are breached, then the management actions identified within Section 5.3 will be implemented.

5. MANAGEMENT RESPONSES

5.1. Regular Monitoring Responses

The key to successful implementation of ESC devices and minimising sediment yield will be through the daily and weekly visual monitoring of the site and maintenance of controls. This monitoring will be undertaken by the Site Foreman. The responses to that monitoring will be as follows:

- A checklist record will be made of each device inspected and its condition, noting any maintenance requirements and timeframes of that to be undertaken. Maintenance will be based on ensuring compliance with ESC Guideline requirements.
- Ensuring all sediment retention devices are cleaned out before they reach 20% full of sediment.
- Completion of maintenance actions as soon as possible, and typically within 24 hours for standard issues and 8 hours for urgent issues.
- Emphasis on maintenance necessary prior to forecast rain.
- Sign-off of all completed maintenance and reporting to the Environmental Manager.

5.2. Incident Responses

If one of the following occurs:

i. A failure of an erosion and/or sediment control (e.g. perimeter control, SRP or DEB) that results in visible discharge of sediment to the CMA or the stormwater pond adjacent to the MGC Yard.
ii. Slumping / mass movement or erosion associated with the works, but which is outside the catchment of a sediment control device or has resulted in a device being over-topped by sediment, where that sediment has discharged to a stream.

The responses will be:

- Inform GWRC.
- Remedy the failure or event to prevent further uncontrolled discharges.
- Determine if the discharge is an isolated case or is likely to be repeated; and
- Investigate and implement modifications. Modifications could include:
    - Make alterations to erosion and sediment control measures and methodologies;
    - Consider additional ESC;
    - Refinement of chemical treatment systems;
    - Progressive stabilisation in sub catchments;
    - Increase maintenance of controls; and
    - Amendments to methodologies and sequencing of works and refinement of controls necessary.

5.3. Threshold / Target Exceedance Responses

If either of the water quality targets or thresholds detailed in Section 4.2 are not met the following management responses will occur:

- Within 24hrs of a threshold exceedance, a full audit of the condition of the control device and its contributing catchment will be carried out and recorded in writing.
- Remedy and record any obvious causes on site that may have contributed to a threshold exceedance as soon as practicable.
- Identify any additional reasons for the exceedance and opportunities to modify the management of the site to improve overall performance which may include:
    - Consider additional ESC;
    - Increase maintenance of controls;
    - Progressive stabilisation in sub-catchments; and
    - Make amendments to methodologies and sequencing of works and refine controls if necessary (check that a further approval is not required from the GWRC).

6. REPORTING

6.1. Rainfall Trigger Event Report

Following a rainfall trigger event (>7mm within 1 hour and >20mm in a 24 hours period), a summary report of the performance of the overall ESC system observed during the rainfall event report will be provided to GWRC. The report will include:

- A summary of the rainfall (total and intensity)
- A summary of the manual monitoring undertaken and comparison of manual monitoring results to previously recorded results.
- A summary of the site performance against the performance targets.
- A record of any other matters which may have compromised the overall ESC performance during the rain event and the identified mitigation, maintenance, and management response.

The Rainfall Trigger Event Report will be provided to GWRC within 10 working days of the rainfall trigger event.