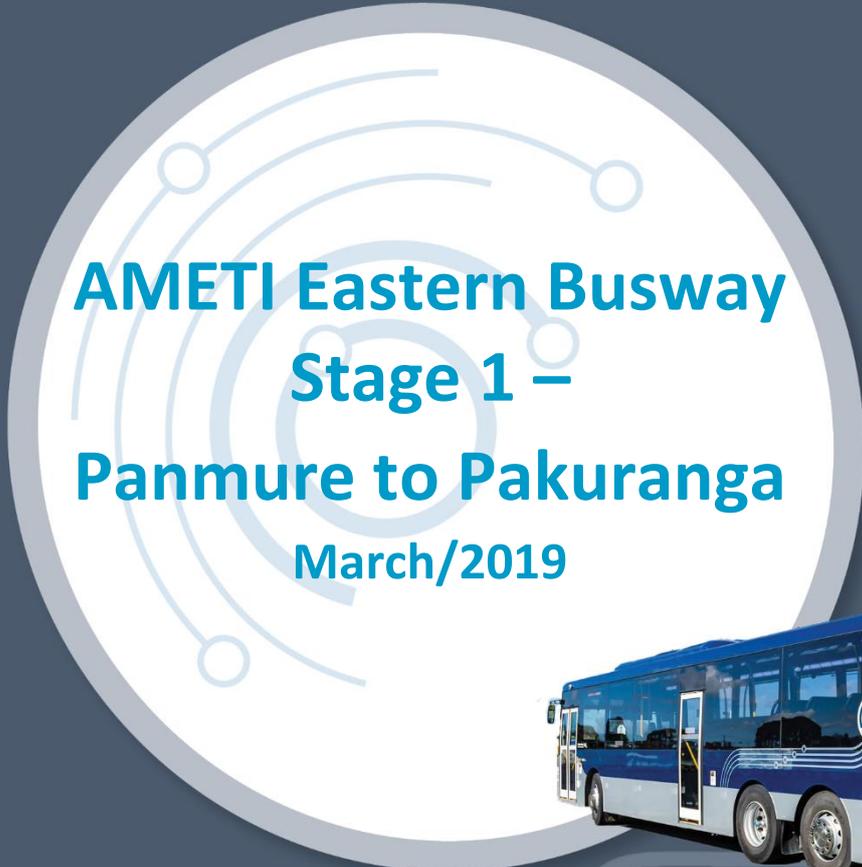




# Erosion and Sediment Control Plan



**AMETI Eastern Busway  
Stage 1 –  
Panmure to Pakuranga  
March/2019**



### Document History and Status

Revision	Date	Author	Reviewed by	Approved by	Status
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### Document Details

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### Integrated Management System



\* Note: Some Management Plans are currently being written or amended. Any changes to the current IMS Framework will be advised and amended accordingly.

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# 1 Introduction

## 1.1 Purpose

The following Erosion and Sediment Control Plan (ESCP) forms a part of the overarching Construction (Environmental) Management Plan (CEMP) for the construction of the AMETI Eastern Busway Stage 1 – Panmure to Pakuranga (the Project). The purpose of this plan is to manage the environmental impacts associated with erosion and sediment control (ESC) during construction of the project such that the effects on the receiving environment are managed to the satisfaction of Auckland Council Site Specific ESCPs (SSESCPs) drawings will be submitted prior to the commencement of works in an area and or activity in accordance with this document. The detailed SSESCPs will be appended to Appendix B as they are submitted. This is a living document and it is likely that further updates will be necessary during the project. Once the plan is certified, any further amendments to this Erosion and Sediment Control Plan will be submitted for further review by Auckland Council.

### 1.1.1 Objective

The objectives of this Plan can be summarised as follows:

- To support the CEMP and SSESCPs
- To define the appropriate standards and level of service with regards to ESC adopted for the Project;
- To outline potential environmental impacts associated with earth disturbing activities and the environment;
- To outline forms of erosion, how these may apply to various situations during construction and to summarise best practice ESC measures to be utilised during construction;
- To define the ESC principles to be adopted during construction;
- To outline the risk-based approach that will be adopted for ESC design and methodology;
- To summarise earth moving activities and assess the effect of sediment yield during construction;
- To outline procedures for monitoring of ESC practices during construction.
- The principles outlined in the CEMP and this Plan will be used by Fulton Hogan (FH) to detail actual practices and mitigation for site specific work areas highlighted within the SSESCPs.

## 1.2 Roles and responsibilities

The team approach is a concept whereby planning and implementation of all the erosion and sediment control methodologies and measures are undertaken by an experienced and involved team to ensure that all relevant aspects of the Project are taken into consideration as part of these decisions. This will ensure that adequate resources, commitment and expertise are provided to erosion and sediment controls from start to finish of the Project (design through to dis-establishment).

The Fulton Hogan Environmental Management team will include:

**Table 1 Roles and responsibilities**

Name	Role	Contact details	Responsibility
James Weller	Project Manager	<a href="mailto:James.weller@fultonhogan.com">James.weller@fultonhogan.com</a> 027 274 2961	Overall project responsibility
Jeremy Gordon	Structures Manager	<a href="mailto:Jeremy.Gordon@fultonhogan.com">Jeremy.Gordon@fultonhogan.com</a> 027 704 6916	Responsibility for structures and CMA works.
David McGoey	Construction Manager	<a href="mailto:David.McGoey2@fultonhogan.com">David.McGoey2@fultonhogan.com</a> 027 809 4604	Implementation of the CEMP and sub management and mitigation plans onsite. Ensuring compliance with the various environmental requirements of the project.
Jason Haggerty	Construction Environmental Manager	<a href="mailto:Jason.haggerty@fultonhogan.com">Jason.haggerty@fultonhogan.com</a> 027 547 0140	Onsite environmental compliance auditing. Inspections, auditing and checking of environmental management practices and procedures during construction CS VUE consent condition management.

			Liaison with Council's monitoring officers. Review and updating management plans and associated documents to meet environmental compliance objectives.
<b>Omar Seychell</b>	National Environmental Manager	<a href="mailto:Omar.Seychell@fultonhogan.com">Omar.Seychell@fultonhogan.com</a> 027 705 4450	Inspections, auditing and checking of environmental management practices and procedures during construction.
<b>Campbell Stewart</b>	Erosion and Sediment Control Specialist	<a href="mailto:campbell@southernskies.co.nz">campbell@southernskies.co.nz</a> 021 837 824	Suitable qualified and experienced erosion and sediment control specialist who prepares the erosion and sediment control plans and audits their implementation.

## 2 Resource consent condition requirements

This document is not intended to meet the consent requirements of the erosion and sediment control resource consent conditions as detailed below. Rather this document sets the framework and provides standard detail information for the preparation of the SSESCPs.

**Table 2: Resource consent requirements for erosion and sediment control**

Condition Reference Number	Conditions	Compliance Reference
14	Prior to commencement of the earthworks activity for the project, a finalized Erosion and Sediment Control Plan ( ESCP ) must be prepared in accordance with the Council's Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region Guideline Document 2016/005 ( GD05 ) and is to include, but not be limited to:	Section 4
	a) specific erosion and sediment control works for each stage (location, dimensions, capacity) in accordance with industry best practice as well as GD05:	Appendix B
	b) supporting calculations and design drawings;	Appendix B
	c) details of construction methods;	Section 5
	d) monitoring and maintenance requirements;	Section 8
	e) catchment boundaries and contour information; and	Appendix B
	f) details relating to the management of exposed areas (e.g. grassing, mulch).	Section 6
	The finalised ESCP is to be submitted to the Team Leader, Southern Monitoring for certification. No earthworks activity on the site is to commence until certification by the Team Leader has been provided.	Section 1
<i>Advice note: In the event that minor amendments to the ESCP are required, any such amendments are limited to the scope of this consent. Any amendments which affect the performance of the ESCP may require an application to be made in accordance with section 127 of the RMA. Any minor amendments should be provided to the Team Leader, Southern Monitoring prior to implementation to confirm that they are within the scope of this consent</i>		
15	Prior to commencement of the earthworks activity, the consent holder is to arrange and conduct a pre-start meeting that:	Section 4.2.1

Condition Reference Number	Conditions	Compliance Reference
	<p>a) is located on the project route;  b) is scheduled not less than five days before the anticipated commencement of the earthworks;  c) includes a representative from the Council Monitoring Advisor(s) should they request to be in attendance; and  d) includes representation of the contractors who will undertaking the works.</p> <p>The pre-start meeting is to discuss the erosion and sediment control measures, the earthworks methodology, and to ensure all relevant parties are aware of and familiar with the conditions of the consents applying to the project.  The following information is to be made available by the consent holder at the pre-start meeting:  a) Timeframes for key stages of the works authorised by this consent;  b) Resource consent conditions; and  c) Erosion and Sediment Control Plans.</p> <p><i>Advice Note:  To arrange the pre-start meeting please contact the Team Leader, Southern Monitoring on monitoring@aucklandcouncil.govt.nz, or 09 301 01 01. All additional information required by the Council should be provided at least 2 days prior to the meeting.</i></p>	
16	Pursuant to section 128 of the RMA the conditions of this consent (LUC60123881) may be reviewed by the Council's Team Leader, Southern Monitoring at the consent holder's cost within one year of initiation of the earthworks activity and/or at five yearly intervals following the commencement of consent. The purpose of this review will be to deal with any adverse effect on the environment which may arise or potentially arise from the exercise of this consent, and is appropriate to deal with at a later stage, in particular adverse effects relating to the earthworks activity and the associated erosion and sediment controls.	Section 8.8
17	The erosion and sediment control measures must be constructed and maintained in general accordance with the Council's Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region Guideline Document 2016/005 (GD05) and any amendments to that document, except where a higher standard is detailed in the documents listed in these consent conditions, in which case the higher standard is to apply.	Section 4
18	Prior to earthworks commencing, a certificate signed by an appropriately qualified and experienced person is to be submitted to the Team Leader, Southern Monitoring to certify that the erosion and sediment controls have been constructed in accordance with this consent. The certified controls are to include the decanting earth bunds, sediment retention pond, clean and dirty water diversion bunds, silt fences, cesspit protection and stabilized construction entrances. The request for certification for these measures is to be supplied immediately on completion of their construction. The information supplied, if applicable, is to include: a) Contributing catchment area; b) Volume of structure (dimensions of structure); c) Stabilization of the structure.	Section 4.2.3 and Section 9
19	The operational effectiveness and efficiency of all erosion and sediment control measures specifically required as a condition of this consent or by the certified Erosion and Sediment Control Plan are to	Section 8

Condition Reference Number	Conditions	Compliance Reference
	be maintained throughout the duration of earthworks activity, or until the site is permanently stabilised against erosion.	
20	<p>All decanting earth bunds utilised during earthworks must be designed to ensure that they have:</p> <ul style="list-style-type: none"> <li>a) as a minimum two percent storage capacity, being at least two cubic metres of impoundment volume for every 100m<sup>2</sup> of contributing catchment;</li> <li>b) a level invert and two layers of geotextile covering and pinned securely to the emergency spillway to prevent erosion; and</li> <li>c) use floating decant devices that discharge at a rate of 3 litres per second, per hectare of contributing catchment.</li> </ul>	Section 6.6 and Appendix B
21	<p>There must be no deposition of earth, mud, dirt or other debris on any road or footpath resulting from earthworks activity on the project route. In the event that such deposition does occur, it is to be removed immediately. In no instance are roads and/or footpaths to be washed down with water without appropriate erosion and sediment control measures in place to prevent contamination of the stormwater drainage system, watercourses and/or receiving waters.</p> <p><i>Advice Note:</i>  <i>The following methods may be adopted to prevent or address discharges should they occur:</i></p> <ul style="list-style-type: none"> <li>a) provision of a stabilised entry and exit(s) point for vehicles</li> <li>b) provision of wheelwash facilities</li> <li>c) ceasing vehicle movements until materials are removed</li> <li>d) cleaning road surfaces using street-sweepers</li> <li>e) silt and sediment traps</li> <li>f) catchpits.</li> </ul> <p><i>In no circumstances should washing 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. Please contact the Team Leader, Southern Monitoring for more details. Alternatively, please refer to the Council's Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region Guideline Document 2016/005 ('GD05').</i></p>	Section 6.9
22	<p>On completion or abandonment of earthworks on the route, all areas of bare earth must be permanently stabilized against erosion to the satisfaction of Team Leader, Southern Monitoring.</p> <p><i>Advice Note:</i>  <i>Stabilisation measures may include:</i></p> <ul style="list-style-type: none"> <li>a) use of mulch</li> <li>b) top-soiling and grassing otherwise bare areas of earth</li> <li>c) aggregate or vegetative cover that has obtained a density of more than 80% of a normal pasture sward</li> </ul>	Section 8.9
23	The sediment and erosion controls at the site of the works are to be inspected on a regular basis and within 24 hours of each rainstorm event that is likely to impair the function or performance of the erosion and sediment controls. A record is to be maintained of the date, time and any maintenance undertaken in association with this condition which is to be forwarded to the Team Leader, Southern Monitoring on request.	Sections 8.2, 8.4, 8.5, 8.6 and 8.7

## 3 Potential impact of earthworks on the environment

### 3.1 Protection of waterways

All watercourses affected by construction will be protected from adverse effects of sediment by applying the principles and practices outlined in this ESCP.

The Tamaki River including the Panmure Basin is a significant waterway of the region, and has significant cultural, ecological and community values.

### 3.2 Key waterway construction effects on the environment

Short-term effects on the environment are principally those associated with construction related earthworks. When compared to the process of natural erosion, construction related earthwork activities dramatically increase erosion rates. This is because during earthwork activities, soil particles become detached from the ground surface making them easier to transport via stormwater to the downstream receiving environment. Consequently, if best practice ESC measures are not established to mitigate this increase in sediment runoff, one or several of the following adverse environmental effects may occur to the downstream receiving environment:

- Smothering of aquatic life by build-up of sediment in the river bed
- Alteration of habitats
- Abrasive action against aquatic life (e.g. increasing susceptibility to disease)
- Scouring of algae (i.e. aquatic life food supply)
- Increased turbidity
- Temperature change (associated with turbidity)
- Reduction in biological productivity due to increased turbidity and associated decrease in photosynthetic activity
- Accumulation of contaminants transported by sediments
- Reduced aesthetic value
- Dust nuisance from exposed earthwork surfaces
- Risks to vehicles and pedestrians

Section 6 of this report outlines the erosion and sediment control management practices and principles that will be adopted for this Project to mitigate the short-term effects of erosion and increased sediment during construction.

### 3.3 Description of earthworks

It is noted that across the project site the actual “earthworks” areas are not large in area or volume. The majority of the works are civil operations and works within the existing pavement layers.

To construct the project the earthworks and construction activities are:

Area of earthworks:

- Widening of Lagoon Drive including the construction of retaining walls (the existing Lagoon Drive Cliff face to be cut back to allow for the widening);
- Bridge abutment excavations;
- Reclamation and filling on the Kerswell Corner Reserve area;
- Widening of Pakuranga Road.

Key construction activities:

- Bridge construction of the Tamaki River;
- Retaining wall construction;
- MSE wall construction;
- Service relocations;
- Resurfacing and realigning of traffic lanes (civils)

The earthworks program is expected to take approximately two years.

## 4 Construction and erosion and sediment control methodology

All ESC devices will be designed and sized in accordance with GD05.

The detailed SSESCEPs will be prepared and submitted prior to the commencement of earthworks in each area (or activity) and will be attached in Appendix B as completed. The detailed SSESCEPs will include sizing and design information. The general philosophies and strategies behind the SSESCEPs are outlined below.

The SSESCEPs will be designed to accommodate works operations being undertaken concurrently at several locations. This will provide flexibility in the management of the works to meet programming requirements.

The proposed materials and methodologies will be designed to meet the project requirements and to meet the requirements of GD05. Following confirmation on site of the exact location of each ESC device and outlet location, the device will be constructed and as built certification prepared. The as-built process will confirm compliance with the design requirements, guidelines, including the volume of the device and contributing catchment.

#### **4.1 Site Specific Erosion and Sediment Control Plans**

The SSEMPs will be developed in accordance with this ESCP and will specifically respond to Resource Consent Condition 14. The SSEMPs will be prepared in a staged manner as final construction details and methodologies are confirmed and will integrate design elements, environmental management and monitoring methods into a set of plans for each stage or location, defining how the ESC components of the Project will be practically implemented on site.

Each SSECP will be submitted to AC for certification prior to commencement of earthworks in that area. Works will not commence without receipt of the written certification.

The format of the SSEMPs will be a succinct document with a standard format, with the majority of the information presented in a 'bullet point' type format. As a guiding principle, lengthy descriptions and repetition of the overarching information provided in this ESCP will be avoided.

#### **4.2 ESC set up process**

The project team will prepare SSECPs and gain their certification from AC for all areas and activities associated with the Project. Prior to commencing works in an area, the following processes will be undertaken. These processes will form part of our standard practices and procedures to be recorded in CS-Vue.

##### **4.2.1 Site prestart meeting**

The site engineer responsible for the works will arrange a site prestart meeting with the ESC Specialist or the Construction Environmental Manager. This will allow the ESC practices and methodologies to be discussed in detail and any questions from the Site Engineer answered. Following the completion of the site prestart meeting, installation of the ESCs can commence. At the pre start meeting, the construction team will outline and provide the information as set in condition 15. This includes the below:

- (a) Conducting the pre start meeting on the project route
- (b) The pre start meeting is scheduled not less than five days before the anticipated commencement of the earthworks;
- (c) The pre start meeting includes a representative from the Council Monitoring Advisor(s) should they request to be in attendance; and,
- (d) Includes representation of the contractors who will be undertaking the works.

In addition, Fulton Hogan will make available the following information;

- (a) Timeframes for the key stages of the works authorised by this consent;
- (b) Resource consent conditions; and
- (c) Erosion and Sediment Control Plans

##### **4.2.2 ESC device installation**

Works will commence on the installation of the ESC devices.

##### **4.2.3 ESC as-builts**

Upon completion of the ESC practices for the area, the site engineer will fill out the ESC as-built sheets. Once completed, the ESC Specialist or the Construction Environmental Manager will inspect the devices with the Site Engineer and the As-Built sheets to confirm measurements and design detail.

It is a key principle that the Site Engineer is initially responsible for completing the as-built sheet prior to inspection by the ESC Specialist or the Construction Environmental Manager. This is an excellent training tool

for teaching the intricacies of the ESC devices. This process also forms part of the ownership and accountability culture to be developed on site.

#### 4.2.4 Sign off to start

Works can commence once the as-builts have been signed off by the ESC Specialist or the Construction Environmental Manager and a copy of the as built submitted to AC.

## 5 Methodology

### 5.1 Zone overview

The construction of the Project will be implemented via a zone-based management approach to progress the works in multiple areas concurrently and meet the specified programme dates for each separable portion (SP) of work. This approach is summarised in Figure 1 below and detailed in the SSES CP.

The Zone breakdowns area as follows:

- **Zone 1:SP1 West – Areas 1 to 5**  
Zone 1 includes: construction of the Panmure Roundabout; Basin View Intersection; Lagoon Drive Intersection; and Church Crescent Intersection.
- **Zone 2:SP2 – Area 6**  
Zone 2 refers to the construction of the Panmure Busway Bridge.
- **Zone 3:SP1 East / SP3 – Areas 7 to 9, 10**  
Zone 3 includes: construction of Ti Rakau Drive Intersection; Tamaki Bay Drive cul de sac; Williams Avenue Intersection; Kerswill Place; and Pakuranga Road.



	Zone 1 SP 1 West Chainage 0-1180	Zone 2 SP 2 Busway Bridge Chainage 1180-1590	Zone 3 SP 1 East & SP 3 Chainage 1590-2600
	Areas 1-5	Area 6	Areas 7-9, 10
Key Features	<ul style="list-style-type: none"> <li>› Panmure intersection</li> <li>› Major service relocations (water, HV/LV power, fibre, etc)</li> <li>› DG Law retaining wall</li> <li>› Basin View Lane intersection</li> <li>› Soil nail walls</li> <li>› Church Crescent intersection</li> <li>› Pavement widening and rehabilitation</li> </ul>	<ul style="list-style-type: none"> <li>› 210 metre, 3-span steel bridge structure</li> <li>› Bridge piers located in the water</li> <li>› Cycleway/footpath with viewing decks</li> <li>› Mokoia Pā Park</li> <li>› Hunua 2 relocation</li> <li>› Howick Interceptor relocation</li> <li>› EPS embankment</li> </ul>	<ul style="list-style-type: none"> <li>› Ti Rakau Drive intersection</li> <li>› MSE retaining wall on sand drains</li> <li>› New public accessways/driveways</li> <li>› Pavement widening and rehabilitation</li> <li>› 6m wide old concrete road</li> <li>› Rain garden construction</li> <li>› Separate pedestrian and cycleways</li> </ul>
Key Risks and Constraints	<ul style="list-style-type: none"> <li>› Bus and traffic flows/travel times</li> <li>› Retaining wall construction close to existing buildings</li> <li>› Disruption to local businesses daily operations</li> <li>› Utility service cut overs</li> <li>› Pedestrian and cycle movements</li> <li>› Working in close proximity to Hunua 2 and Howick Interceptor pipes</li> <li>› Soil nail wall construction adjacent to live road</li> </ul>	<ul style="list-style-type: none"> <li>› Building bridge piers over water</li> <li>› Large staging required for piers in the water</li> <li>› Launching the steel bridge from eastern abutment</li> <li>› Large section steel work required for bridge construction</li> <li>› Archaeology finds in and around the Mokoia Pā area</li> <li>› Hunua 2 cut in between April and September</li> <li>› Residents property access</li> </ul>	<ul style="list-style-type: none"> <li>› Timely completion of Ti Rakau Drive ahead of EB2.</li> <li>› MSE wall stability during construction</li> <li>› MSE wall settlement duration</li> <li>› Traffic switches</li> <li>› Interface with stakeholders</li> <li>› Bus and traffic flows/travel times</li> <li>› Removal of old concrete road</li> <li>› High ground water table</li> <li>› Key service relocations and cut overs</li> </ul>
Construction Methodology	<ul style="list-style-type: none"> <li>› Implement traffic signals to optimize bus throughput</li> <li>› Signalise Basin View Lane early to free up RAB.</li> <li>› Minimise switching of traffic or altering routes</li> <li>› Ensure Stakeholder liaison and information flow</li> <li>› Plan service cut overs with each provider using Last Planner processes</li> <li>› Ensure critical pipes are located prior to excavation</li> </ul>	<ul style="list-style-type: none"> <li>› Innovative pier head construction</li> <li>› Launching of bridge allows 1 set of staging to be utilised at each pier head</li> <li>› Ensure steel is ordered as early as possible to allow for any delivery constraints</li> <li>› Ensure early investigation works near Mokoia Pā area</li> <li>› Ensure detailed programme works and ensure Last Planner processes used</li> </ul>	<ul style="list-style-type: none"> <li>› Early pavement widening to increase lanes at Ti Rakau intersection</li> <li>› Construct MSE wall early to allow float for settlement</li> <li>› Ensure robust monitoring of the wall is set up to track wall stability</li> <li>› Traffic switches to be kept to a minimum to maintain familiarity</li> <li>› Plan service cutovers with each provider using Last Planner processes</li> </ul>

Figure 1: Construction zones to manage concurrent work activities and interfaces across each separable portion

### 5.1.1 Zone 1 west

Zone 1 takes into account the Lagoon Drive northern side of the work (apart from a localised widening at the roundabout and some drainage outlets no work is to take place at the southern side of Lagoon drive).

The programme for Zone 1 revolves around early works to remove the roundabout and set up a signalled intersection.

The existing kerb and channel will be retained to direct that clean water through the existing stormwater system. For areas where there is no kerb and channel, Hotmix bunds will be installed to keep the clean water off the site.

There will also be some minor earthworks to remove the roundabout and to realign and signalise the intersection. This will involve some cutting and filling operations. The majority of the works are within the pavement (aggregate) layers requiring no actual earthworks.

Moving east toward the bridge a piled retaining wall is to be built at DG Law building. At the next intersection at Basin View Lane a minor realignment is to be completed and full signalisation of the intersection as early works.

Further down Lagoon Drive a soil nail wall is to be constructed. These works will require tree clearance and vegetation removal. The existing embankment is to be cut back requiring a cut to waste earthworks operation.

### 5.1.2 Stage 2 busway bridge

Zone 2 involves the construction of the new Busway Bridge over the Tamakai River. Temporary staging will be installed to facilitate the installation of the bridge. The main super structure will be constructed on the eastern abutment and “launched” out across the river. A Coastal Works Management Plan will be prepared which will detail the specific staging and controls required to construct the bridge

### 5.1.3 Stage 3 – east

Zone 3 takes into account the Pakuranga Road side of the work. These works can be undertaken off line in the area of the recently demolished houses.

This area will include multiple intersection re-alignments and services diversions. The existing kerb and channel will be retained during the majority of the works to divert existing runoff away from the construction zone. The area is generally flat and only minor earthworks will be required at various locations across the zone.

As part of the works in Zone 3 an MSE wall is to be constructed east of Kerswill Road. As part of these works a minor reclamation of the Coastal Marine Area is required.

Once the reclamation has been completed, the sand drains will be installed. All sand drains will be installed prior to construction of the MSE wall.

## 6 Specific erosion and sediment retention measures

### 6.1 Stabilisation

Stabilisation forms a key component of the overall environmental strategy for the Project.

Any topsoil bunds will be seeded and mulched immediately. Progressive stabilisation and staging will be undertaken, partially as a result of working adjacent to and within a live road environment and the requirement to maintain an operational road network at all times.

The bulk earthworks operations will be staged and will be progressively stabilised. The methodology will ensure that that the site will be in a continual state of progressive stabilisation.

In addition, the imported fill material will be “hard fill” which is regarded as a stabilised material in accordance with GD05 definitions. That material presents a low risk from a sediment generating perspective.

It is noted that across the project site there are only small isolated areas where actual “earthworks” will be undertaken.

In many areas, other than the initial topsoil stripping, all the works will be undertaken using hardfill ensuring that the works are generally a stabilised operation. This is referred to as a cut and cover methodology. All remaining works following the site set up will be stabilised works.

### 6.2 Cut and cover

Rapid cut and cover is a process of rapid same day construction during fine weather. The concept in terms of sediment control is that exposed dirt is not left uncovered overnight and involves small areas being worked on

quickly and covered or stabilised either immediately or after several hours. The stabilisation of these surfaces will either involve aggregate, geotextile fabrics, or hay mulch. The advantage of a cut and cover methodology is that it is less reliant on sediment controls and more efficient and minimising sediment discharge.

Due to the nature of the project working adjacent to a live roading network it is anticipated that rapid stabilisation and cut and cover methodologies will be used extensively.



**Photo 1: Rapid stabilisation (geotextiles and aggregate) used on the Albany Highway project**

### 6.3 Site exits

Site entry and exits points will be strictly controlled. All site exits will be via a stabilised exit point. If the exit point is not already stabilised then one will be created (a Concrete/ Asphalt/ Rock aggregate apron).

The emphasis will be on maintaining the vehicles in a “clean” state to maximise the effectiveness of the stabilised site entrances and further minimise the risk of tracking any sediment off-site. If any material is tracked onto a road it will be swept up immediately.

### 6.4 Perimeter bunds/clean water drains

Perimeter diversion bunds are to be installed in a number of locations around the works area. The bunds will also create a physical barrier for staff and help define the extent of works.

Perimeter bunds will be installed to prevent cleanwater from other areas entering the work sites. However, due to the topography and relative levels of the proposed works and filling, there are only minor areas where upslope cleanwater could actually enter a works site should a bund not be in place.

The perimeter bunds will be created from the topsoil strip and will be sized as a minimum in accordance with GD05 guidelines. Specific sizing will be included on the detailed SSES CP drawings to be submitted. The topsoil bunds will be stabilised as they are constructed.

In addition, there will be times where Hotmix bund are installed to create temporary curbs to divert road runoff away from the works areas.

## 6.5 Silt fences

The primary sediment control measure for the works will be the installation of silt fences across the project. The silt fence will be installed as close to the extent of the works boundary as possible.

The silt fence will remain in place until the site / area is fully stabilised.

## 6.6 Decanting earth bunds

Decanting Earth Bunds (DEBs) will be the main control devices utilised during the initial construction of the filling operations. The DEBs will be designed and constructed in accordance with GD05 requirements.

The DEB will have the following features:

- The primary decanting structure will consist of a floating T-bar identical to that used in sediment retention ponds detailed in the Guidelines. The T-bar height will be set to activate when 70% of the storage volume of the DEB is achieved. The T-bar decant will be able to float up to within 100mm of the emergency spillway.
- The capacity of the DEB will be a minimum 2% of the treatment area.
- The inlet to the DEB will be set at least 10m away from the outlet wherever physically achievable and as the control capacity increases so too will the minimum distance between the inlet and outlet.
- The emergency spillway will be covered with two layers of non-woven geotextile fabric pinned at 500mm centres.

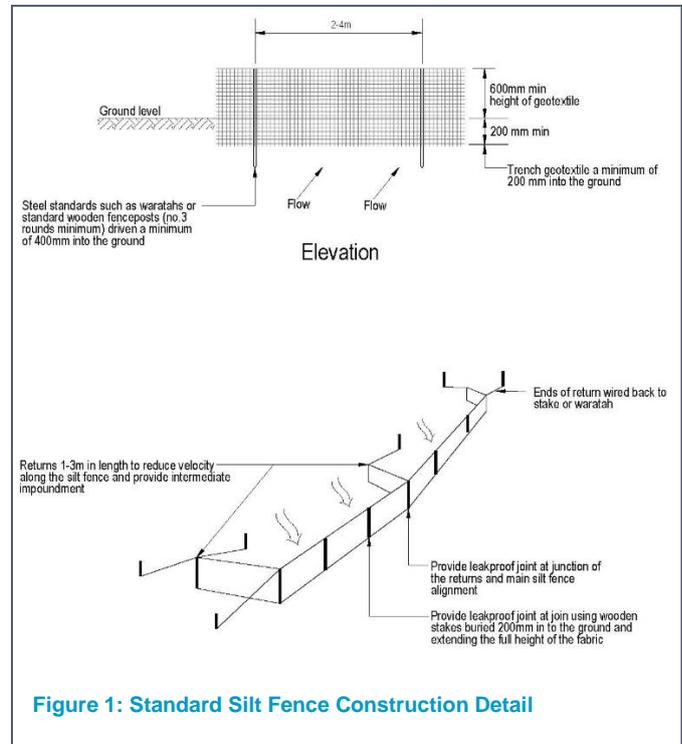
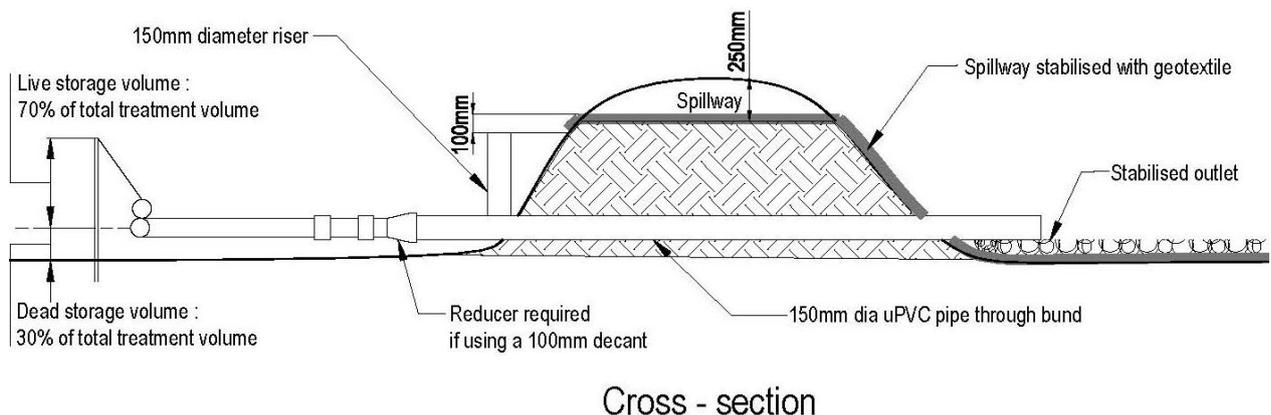


Figure 1: Standard Silt Fence Construction Detail



Cross - section

Figure 2: DEB Construction Detail (Cross Section)

## 6.7 Cesspit protection

Cesspit inlet protection is a secondary sediment control device and is not considered a standalone device. In active works areas they will be used in conjunction with other ESC methods and measures, as part of a broader and more comprehensive ESC system.

In and around live cesspits, cesspit protection will be installed during active works but will be removed at the end of the day once the works have been completed and the works area stabilised, to ensure the stormwater network can operated as per design.



**Photo 3: Example of Cesspit Protection**

## 6.8 Silt socks

Silt socks will be used as a secondary control within larger treatment areas and as primary controls within smaller discrete treatment areas. They are particularly useful for controlling the velocity of stormwater or sediment laden water on route to treatment devices such as decanting earth bunds.

Silt socks will be frequently positioned in road side berms adjacent entranceways, around storm water inlets and cesspits, and along perimeters of flat or near flat sections of exposed material.



**Photo 4: Silt or Filter Socks used as Edge Protection**



Photo 5: Silt or Filter Socks used as Edge Protection

## 6.9 Road sweeping

The site will be regularly swept with a combination of tractor mounted road broom and sucker truck to maintain a clean road surface leaving the site. This will mitigate any spilt material that may end up on the local road as a consequence of material and debris being tracked out onto the road on the wheels and tracks of vehicles. Sweeping will be carried out in a manner that ensures that material being swept is collected and removed off site



Photos 6 & 7: Examples of the Proposed Road Sweeping Vehicles

## 6.10 Dewatering

There is a potential need for some on site dewatering activities as part of these earthworks, and an associated potential risk of sediment discharge to the receiving environment.

Sediment control for dewatering will comprise a water treatment container. Sediment laden water from within excavation areas will be pumped via a manifold system prior to discharge into the treatment container system. The manifold will consist of PVC pipe system which will allow for the introduction of chemical treatment if required to enhance settlement of suspended solids in the container system, providing appropriate water quality of discharges from the site (refer to the section 6.11 Chemical Treatment below).

The water treatment container generally follows GD05 principles with regard to dimension ratios and will promote sheet flow at the inlet and outlet ends. Treated water from the container will discharge to the adjacent stormwater network (or possibly to trade waste, subject to Watercare approval). A drain valve at a lower level will be used to dewater the containers for desilting and transporting. The drain valve outlet will be capped during operations, and when the valve is opened will promote decanting of the water inside the container to allow cleaner water to be skimmed from the top down.

During pumping, water clarity within the container will be tested using the black disc method and pH will be tested using pH strips or an electronic pH meter. The results of these tests will be recorded. If the water is found to be outside acceptable levels for clarity (<100mm depth) or pH (5.5-8.5), then pumping will cease and appropriate contingencies will be put in place. This will likely involve re-circulating the water from the container through the treatment manifold to provide additional chemical dosing, or possibly discharging to the trade waste system upon approval from Watercare.



Photo 8: FH Water Treatment Container

## 6.11 Chemical treatment

The flocculation (chemical treatment) procedure is based around providing industry best solutions to achieve optimal sediment removal efficiencies. Chemical treatment will be investigated for all sediment retention (impoundment) devices (DEBs and the water treatment container).

In this regard samples will be taken from the excavated materials when bulk works commence (within the catchment of the sediment retention devices) and bench testing will be undertaken to determine the optimum chemical dosing regimen. The bench testing will consider the effects on pH of the treated water for the sediment retention devices. Results of the bench testing will be forwarded to Auckland Council. Ongoing monitoring will also be undertaken of the sites sediment retention devices as outlined in Section 9 below. If the monitoring highlights any deficiencies further bench testing will be undertaken.

Chemical treatment for DEBs will be operated via rainfall activated treatment sheds supported by batch dosing as determined.

A Chemical Treatment Management plan has been prepared and is attached to Appendix A.

## 7 Dust control

The emphasis of the site dust strategy will be one of prevention. The topsoil stockpile and bunds will be covered with geotextile or grassed and mulched immediately.

Vehicle movements on site will be governed by speed restrictions which will, among other things, assist in preventing dust generation.

A water cart will be made available if required. The Supervisors will obtain daily weather forecasts and circulate to all appropriate staff to ensure that during dry weather everyone knows the probability of dust creation. Dust control measures will be put on standby if dry, windy conditions are forecast.

## 8 Monitoring and maintenance

The erosion and sediment control measures will be inspected, and as-builts completed and signed off by the Environmental Manager or the ESC Specialist prior to the commencement of works within a particular area. This documentation will be held on site.

All erosion and sediment control measures will be inspected on a daily basis by the site foreman and on a regular basis by the Project Engineer/s. 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. Sediment retention measures will be cleaned of sediment when 20% full of sediment. All erosion and sediment control measures will be maintained in accordance with GD05 Guidelines.

### 8.1 Rainfall monitoring

The Environmental Manager will monitor weather forecasts and provide regular updates to the Construction Manager to ensure that the construction staff are aware of any pending bad weather and can put in place any additional controls if heavy rainfall is expected in the Project area.

### 8.2 Routine device and site monitoring

The Environmental Manager or the ESC Specialist will conduct routine inspections of the site. These inspections will take place with adequate time allocated and will be thorough and systematic. Members of the construction team including the Construction Manager, and Zone Managers will accompany the Environmental Manager or the ESC Specialist on these inspections so that the Environmental Manager or the ESC Specialist can clearly understand the work that is going on at present and the work that is programmed to take place. Internal inspections will cover all areas of the Project, even those that may have been dormant for some time, to ensure that the controls are still operating properly. The project team will ensure that ESC remedial work is completed as soon as practicably possible.

A thorough and systematic audit will identify the gaps between the primary controls and where the site intersects with aspects of the physical world such as streams, roads, and where at least 80% of compliance issues are generally found.

This process described above is outlined in more detail below.

### 8.3 Best practice tools

The Environmental Management team along with the site engineers and supervisors will be responsible for ESC measures on site. These individuals with the ESC Specialist will be responsible for developing SSES CPs, ESC construction supervision, inspections, monitoring, maintenance and decommissioning of practices.

- The list below is not exhaustive but outlines the minimum level of service with regards to installation, monitoring and evolution of ESCs during the construction phase. All of the points below will be undertaken by members of project team who are suitably qualified and experienced in the field of ESC.
- Project staff responsible for ESC must be conversant with consent conditions, this ESCP plan, best practice guidelines, monitoring requirements, site geology and areas sensitive to sediment yield generation.
- The project team will develop and maintain the SSES CPs that clearly number and show the location of each ESC measure. The SSES CPs will be developed throughout the course of construction and will be used by the Project team during ESC practice inspections.
- The project team will monitor and react to weather forecasts. This is extremely important as construction activities may need to be amended or in extreme circumstances stopped to avoid generation of sediment during a weather event.
- The project team will undertake daily visual inspections of E&SC measures.
- The project team will undertake weekly inspections and self-auditing.

### 8.4 Inspection types

#### 8.4.1 Visual inspections

The visual inspections will function as an early detection tool, with the aim to resolve any problems with ESC practices before a rainfall event occurs. Much of this will revolve around effective on-going maintenance of ESC practices. For this to function effectively a proactive culture and approach to monitoring must be adopted by the FH.

Visual inspections of ESC measures are likely to be the main form of routine monitoring on site during normal operations. Each inspection will comprise (but is not limited too) the following:

- Visually check that the ESC measures are appropriate and comply with the methodologies and principles outlined in the ESCP,
- Visually check the construction of ESC measures to confirm that they have been constructed in accordance with GD05,
- Visually check that the ESC measures are functioning as intended, are fit for purpose and continue to remain so,
- Assess maintenance requirements.

Should any of the above checks identify a defect or issue requiring further action, and depending on the severity of the issue, the project team will seek to rectify the problem within required timeframes.

A summary of inspection activities are noted below.

**Table 3 – Summary of Inspection Activities**

Inspection Activity	Frequency
Silt fences, DEB's, check dams	Weekly, before and after rainfall events
Clean water and dirty water diversion drains / bunds (perimeter bunds)	Weekly, before and after rainfall events
Stormwater sump (cesspit protection as required)	Daily
Road exit points free from dirt/housekeeping	Daily
Completed areas stabilised	Weekly
Cut and Cover operations	Daily
Stockpiles (runoff or dust emissions)	Weekly, before and after rainfall events
Water carts available	Daily
Vehicle inspections for plant transporting excavated materials	Prior to transporters leaving work site
Weather forecasting	Daily

## 8.5 Weekly self-auditing

Once a week a self-audit of all ESC measures on site shall be undertaken by a member of the Environmental Management team. Self-auditing is a proactive tool that encourages ownership and can instil a sense of pride with regards to ESC performance.

**Table 4 – On site rating guide for ESC measures**

Rating	Construction/Maintenance	Examples (not exhaustive)
1	Best practice no further action required.	
2	Minor technical issue with the control device, where the purpose of the guidelines/ESDCP/consent conditions has been met. Work to be carried out within 3 days	No silt fence support Minor holes in silt fence Minor discrepancy live/dead storage Minor lack of volume in DEB's
3	Controls absent or construction of the device is so poor that it leads to/is likely to lead to failure as an efficient erosion/sediment control method. Work to be carried out immediately	No returns in silt fence Internal DEB embankment collapse Discharge at DEB outlet causing erosion Inappropriate DEB volumes Significant discrepancy between live/dead storage volumes Flow paths or spillways inadequately stabilised Diversion channels or bunds inadequately sized Silt fence not trenched in
4	Controls absent or construction of the device is so poor that it leads to failure as an efficient erosion/sediment control method leading to an uncontrolled sediment discharge Work to be carried out immediately	

## 8.6 Triggered device monitoring

Over and above the Routine Device and Site Monitoring, more frequent inspection, monitoring and environmental management maybe required on-site in response to certain activities and or potentials site risks. This is considered as “business as usual” however recent documentation has referred to this as “triggers” monitoring. The “triggers” for these more intensive / repeat investigations include observations such as:

- Activities observed to be happening on-site that are likely to compromise the effectiveness or integrity of that site’s erosion and sediment controls;
- Taking into account antecedent climatic conditions, a conspicuous change of water colour at the downstream receiving environment that is very different to the colour that is normally associated with conditions at the same site, and with such change in colour not evident at upstream locations above the construction zone;
- Obvious accumulation of sediment in the vicinity of the discharge points, or anywhere else within or in proximity to the active construction zones;
- Streambank collapse or obvious signs of channel erosion / instability in the immediate receiving environments;
- Visual reports / evidence of changes to downstream community structure (e.g. fish kills, death or discolouration of instream plant communities); and
- Spillage / accident reports by site personnel.

If the results of any routine device monitoring identify any of these triggers, then in more detail:

- Ascertain that in all probability the issue is associated with the Project;
- Inform and liaise with Auckland Council;
- Ascertain the magnitude of the adverse effects (this may involve undertaking immediate monitoring of the ecological variables);
- If the effects have been more than minor, ascertain what response is necessary;
- Determine how to monitor the effectiveness of the response(s); and
- Implement and monitor the response.

## 8.7 Weather events

Best management practices will be used to minimise sediment yields and monitor any potential effects. In addition to the visual inspections and weekly self-auditing, if a severe weather event is forecast, (a severe weather event is defined as greater than a 5% AEP) the following actions will be implemented.

Pre-Weather Event Procedure:

- Visually check controls on site prior to weather event to ensure, as far as practicable, that they will function as intended;
- Depending on site specific circumstances and practices used on site, consider limiting or ceasing earthwork activities to limit land disturbance;
- As far as practicable, stabilise disturbed areas. Such practices will help limit the effects of sheet and rill erosion that may occur upstream of decanting earth bunds.
- Photograph critical ESC measures prior to the weather event to document pre-weather event condition.

In addition during a weather event that results in the discharge of treated discharges from the sediment retention devices water quality inspections will be undertaken at all discharge locations where treated discharge could enter a waterway.

## 8.8 Auckland Council condition review

Subsequent to stabilisation being achieved on the project site, in accordance with condition 16, the consent conditions may be reviewed by the Southern Monitoring Team Leader within one year of initiation of earthworks activity. The purpose of this review will be to deal with any adverse effect on the environment which may arise from the activities enabled by this consent. In particular, adverse effects relating to the earthworks activity and associated erosion and sediment controls.

## 8.9 Decommissioning ESC devices

In accordance with condition 22, upon completion or abandonment of earthworks on the route, all areas of bare earth must be permanently stabilised against erosion to the satisfaction of the Team Leader, Southern Monitoring Council representative.

## 9 As-builts & documentation

All ESC devices will be constructed in accordance with SSESPPs. The site will have a Work Instruction that shows an employee how to construct each device. Each zone will have a Process Control Plan and the associated check sheets that are required to be signed off once these devices are complete. These as-builts are then sent on to AC for a copy of the devices constructed on the Project.

## Appendix A

## Chemical Treatment Management Plan



# Chemical Treatment Management Plan

**AMETI**  
**Eastern Busway**  
**(EB) 1**  
**Construction**  
February 2019



### Document Details

Document name	Status	Document No.	Author
Chemical Treatment Management Plan	Draft	FHIMS-ChTMP	C Stewart

### Document History and Status

Revision	Date	Author	Reviewed by	Approved by	Status
1	08-02-19	C Stewart	O Seychell		
2	20-03-19	C Stewart	C Redmond		

### Revision Details

Revision	Details
1	Sent to Project Manager for Review & Approval
2	Updated to align with ESCP and SSES CPs

### Integrated Management System



\* Note: Some Management Plans are currently being written or amended. Any changes to the current IMS Framework will be advised and amended accordingly.

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# 1 Introduction

## 1.1 Purpose and scope

This Chemical Treatment Management Plan (ChTMP) is for the construction of the AMETI Eastern Busway Stage 1 – Pamure to Pakuranga (the Project). The purpose of this plan is to support the erosion and sediment control plan if chemical treatment of sediment is required.

The plan sets out management methods, controls and reporting standards to be implemented relating to the chemical treatment of the sediment control devices associated with the project.

The ChTMP shall be implemented throughout the entire construction period and is intended to be the primary tool to inform the projects management of chemical treatment.

## 1.2 Implementation and operation

The listed site personnel in Table 1.1 will be required to ensure erosion effects are considered and signed off in the work method statements and relevant schedules associated with the planned construction activities.

Roles and responsibilities for the implementation of this Plan are provided in Table 1.1.

**Table 1.1: Plan implementation - roles and responsibilities**

Name	Role	Contact details	Responsibility
James Weller	Project Manager	<a href="mailto:James.weller@fultonhogan.com">James.weller@fultonhogan.com</a> 027 274 2961	Overall project responsibility
Jeremy Gordon	Structures Manager	<a href="mailto:Jeremy.Gordon@fultonhogan.com">Jeremy.Gordon@fultonhogan.com</a> 027 704 6916	Responsibility for structures and CMA works
David McGoey	Construction Manager	<a href="mailto:David.McGoey2@fultonhogan.com">David.McGoey2@fultonhogan.com</a> 027 809 4604	Implementation of the CEMP and sub management and mitigation plans onsite. Ensuring compliance with the various environmental requirements of the project.
Jason Haggerty	Construction Environmental Manager	<a href="mailto:Jason.haggerty@fultonhogan.com">Jason.haggerty@fultonhogan.com</a> 027 547 0140	Onsite environmental compliance auditing. Inspections, auditing and checking of environmental management practices and procedures during construction CS VUE consent condition management.
Campbell Stewart	Erosion and Sediment Control Specialist	<a href="mailto:campbell@southernskies.co.nz">campbell@southernskies.co.nz</a> 021 837 824	Suitable qualified and experienced erosion and sediment control specialist who prepares the erosion and sediment control plans and audits their implementation

# 2 Methodology

Decanting earth bunds (DEB's), impoundment areas or water treatment containers may be installed or located on the site as required and detailed in the SSESCP's. It is proposed to chemically dose the DEB's and impoundment devices in accordance with the ChTMP to improve the efficiency of the device and that the ensure water quality discharging off site is in accordance with the Projects expectations and industry best practice.

The ChTMP is based around providing industry best solutions to achieve optimal sediment removal efficiencies. In this regard samples will be taken from the contributing catchment to determine the optimum chemical dosing regime.

Ongoing sampling will also be required as the earthworks progress or when imported fill material is used. In this regard protocols have been established and are set out in Section 5.

The testing methodology to be used is based on best practice and guidelines developed by Auckland Council.

Prior to the work being started bench test trials will be undertaken for the new catchments proposed to be worked.

Bench test flocculation trials will be undertaken using chemicals to determine soil reactivity to chemical treatment in accordance with the Auckland Council GD05 guidelines.

The three chemicals to be tested are:

1. Poly Aluminium Chloride (PAC).
2. SuperFloc. SuperFloc is a blend of PAC and PolyDADMAC. To be tested with a blend ratio of 80% PAC to 20% PolyDADMAC.
3. Vital Eco SuperFloc. Vital SuperFloc is a water-based product containing chitosan, a natural biopolymer and acetic acid (<2%).

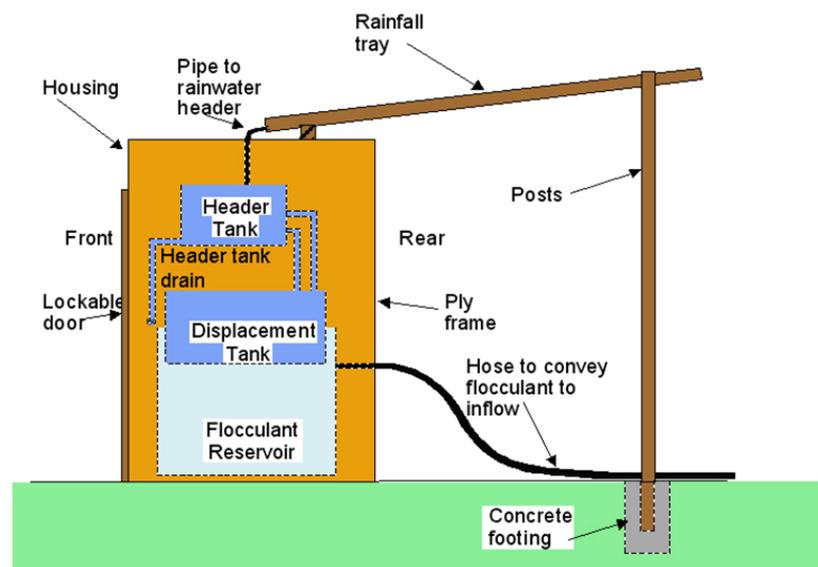
The bench test result will be submitted to the Auckland Council as part of the as built process of the SSES CP's and will also be filed as an amendment to Appendix B.

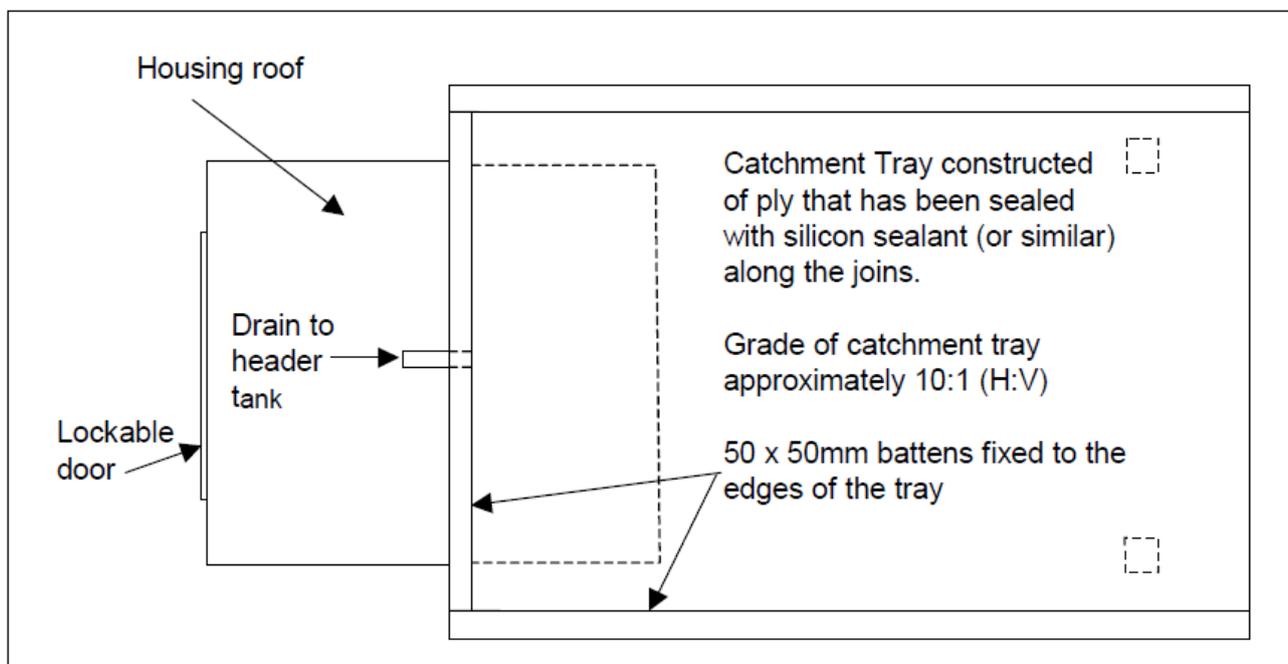
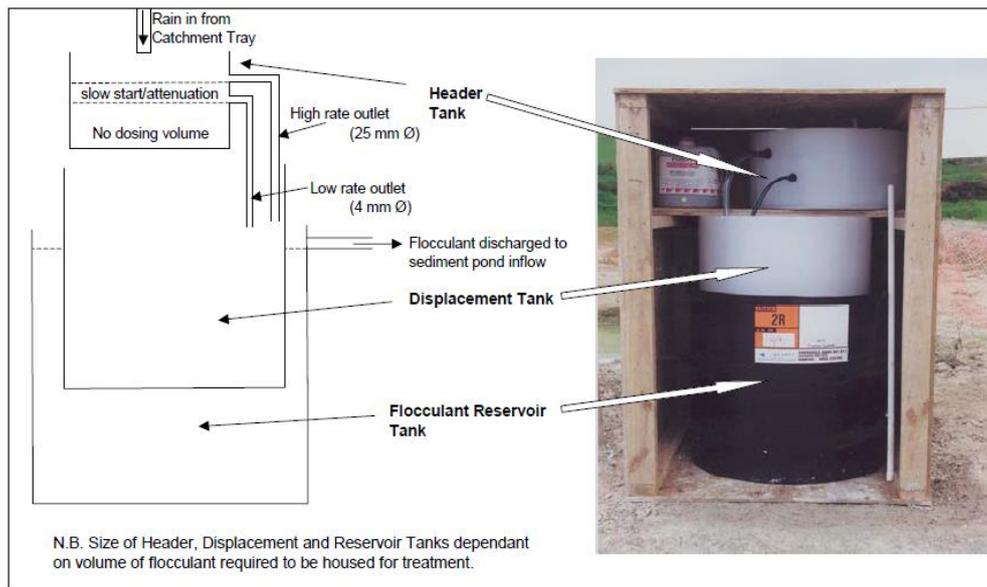
### 3 Flocculation system

#### 3.1 Rainfall activated dosing system

The rainfall activated dosing system 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 400L 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 DEB. 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, and for attenuation of the chemical flow during the initial stages of a storm and after rain has ceased at the end of a storm.





Header Tank Management in summer months to be as per the Council guideline.

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

### 3.1.1 Area of rainwater catchment tray required for rainfall activated system

The area of the rainwater catchment tray is determined by the dose required, and the area of the earthworks catchment draining to the DEB.

All water flowing into the DEB needs to be treated, and the rainwater catchment tray size is determined by the total land catchment area draining to the DEB including both the 'open' area and stable areas. If the catchment area draining to a DEB 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.

The required tray size will be calculated and submitted as part of the staged SSERP's and included in Appendix C.

### 3.1.2 Header tank outlet spacing

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 as part of the staged SSES CP's and included in Appendix C.

### 3.1.3 Sediment laden runoff channel and dosing point for rainfall activated system

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 DEB itself.

All sediment laden runoff from the catchment should be combined into a single channel if possible before it reaches the chemical dosing point which should be located at least 10 metres prior to the point where the runoff reaches the ponded water of the forebay, so the chemical can be added to and mixed with the total inflow.

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.

## 3.2 Batch dose treatment

The criterion to establish the need for batch dosing is the clarity of the sediment laden runoff. Clarity is measured using a black disk lowered vertically into the water to be tested. A small black disc of 50-80mm diameter is attached to a 1m long stick with a centimetre scale starting at the disc.

The disc is lowered into the water until it disappears, and then is raised until it just reappears. The depth of reappearance is recorded as the clarity of the water.

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 outlined in Appendix C.

### 3.2.1 Application Procedure (batch dosing)

The chemical dose should be applied evenly over the surface of the DEB as quickly as practicable. It is best to apply the dose in one application, rather than going over the surface of the DEB 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 pond surface so that the chemical divides into drops before hitting the surface.

Following batch treatment and the settlement of the coagulated solids the DEB water can be discharged. Settlement generally requires 1-2 hours.

### 3.2.2 Timing

As the water in a DEB often develops marked temperature gradients during the day which can inhibit mixing of the chemical that is added to the surface of the DEB 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.

If there is a possibility that a DEB will overflow during a large rainstorm as a result of surface sediment laden inflows, batch treatment can be carried out while it is still raining. The clarity of the water in the DEB should be determined, and if the surface clarity is less than 60mm then treatment can be undertaken.

## 4 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 during the preparation of the SSES CP's and the results submitted to Auckland Council as part of the SSES CP approval process.

For areas where imported fill is to be used bench testing will commence as soon as a fill source has been identified or dewatering and pumping is required, and the results provided to Auckland Council. See Appendix C for the Bench Testing Results Sheet.

Ongoing monitoring will also be undertaken of the sites sediment retention devices as outlined in Appendix B. If the monitoring highlights any deficiencies further bench testing will be undertaken.

## **5 Monitoring and maintenance requirements**

### **5.1 Routine management and maintenance**

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

All monitoring records and maintenance checks and actions will be recorded on the monthly record sheet provided in Appendix B. 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 be regularly desilted to ensure that the maximum volume is re-established after rain events.

### **5.2 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 chemical 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 DEB will be tested.

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

A treatment chemical spill contingency procedure is provided in Section 5.6 below.

### **5.3 Record keeping and reporting**

A copy of the maintenance record for the chemical treatment system will be kept on site (Appendix B) and will be provided to the Auckland Council on request.

### **5.4 Storage of flocculent on site**

Bulk PAC, SuperFloc, and Vital Eco Floc which is supplied by the manufacturer in 200L polyethylene drums, and these will be kept in secure storage, either in a locked shed or container. Drums of chemical will always be stored on end with the screw caps uppermost. Topping up of flocculent chemical will be made weekly as part of the regular inspection regime.

### **5.5 Procedure for transportation**

PAC, SuperFloc and Vital Eco Floc will be delivered to the site by commercial carriers in accordance with current Hazardous Goods, Traffic and Transport regulation. These chemicals can be requested from the supplier generally in 20 litre containers, 200 litre drums and/or 1,000 litre IBCs. PAC, SuperFloc and Vital Eco Floc 200L drums all weigh about 250kg and is most easily moved within the site in a loader bucket. The use of these or any other chemical will be done in accordance with the Site Health and Safety Plan.

### **5.6 Flocculation chemical spill contingency procedure**

If there is a spill of either of these chemicals 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.

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 Auckland 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 DEB 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.

## **5.7 Chain of responsibility for monitoring and maintenance**

The Project team shall have primary responsibility for maintenance and monitoring the effectiveness of the chemical treatment systems.

Construction Environmental Manager and the Erosion and Sediment Control Specialist will have overall responsibility for the chemical treatment systems.

### **5.7.1 PAC / SuperFlock**

The Project team will check the effect of PAC dosing on the pH of the treated water once the pond has filled for the first time, and monitor pH and overall performance throughout the duration of works.

### **5.7.2 Vital SuperFloc**

The Project Team will monitor pH and overall performance throughout the duration of works.

## **5.8 Training of person responsibility for maintenance and monitoring**

If a person with experience in the monitoring and maintenance of the chemical treatment system is not available, the Construction 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.

## **5.9 Procedure modification**

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

## Appendices

### Appendix A - Instructions for maintenance of rain activated treatment systems

#### Chemical Dosing System

##### 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 Pond

The pond water quality will be observed at least weekly, and the clarity determined using a black disk 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. 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.

**Pond Clarity:** Record using black disc near pond outlet. (Refer above)

## Appendix B – Chemical Treatment Monitoring and Maintenance Record

Site: AMETI (Panmure – Pakuranga)

DEB Name:

Month:

Maintenance Person:

Date	Visual check	% Header Full	Water depth In Displacement Tank (cm)	Chemical Volume Added	Water Clarity (cm)	pH	Notes on maintenance required or additional information	Initial
01								
02								
03								
04								
05								
06								
07								
08								
09								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
31								

## Appendix C – Bench testing results sheets

### 1 Introduction

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

The three 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. We tested with a blend ratio of 80% PAC to 20% PolyDADMAC.

**3. Vital Eco SuperFloc**

Vital SuperFloc is a water-based product containing chitosan, a natural biopolymer and acetic acid (<2%).

Bench test flocculation trials were undertaken to determine soil reactivity to chemical treatment in accordance with the Auckland Council guideline.

### 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					

Sample 3, 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

Initially, bench tests 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					

Sample 3, 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					

### 2.3 Results of Vital Eco Superfloc Bench Tests

Initially, bench tests using Vital Eco 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					
25					
50					
100					
150					
200					
250					

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					
25					
50					
100					
150					
200					
250					

Sample 3, 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					
25					
50					
100					
150					
200					
250					

### 3 Discussion

Insert discussion and conclusion based on the bench testing results.

Include recommendation / chemical to be used and dose rate

#### 3.1 Batch Dosing Rate

Insert batch dose rate and requirements

#### 3.2 Rainfall Activated Dosing System Details

##### Floc Shed Tray Size

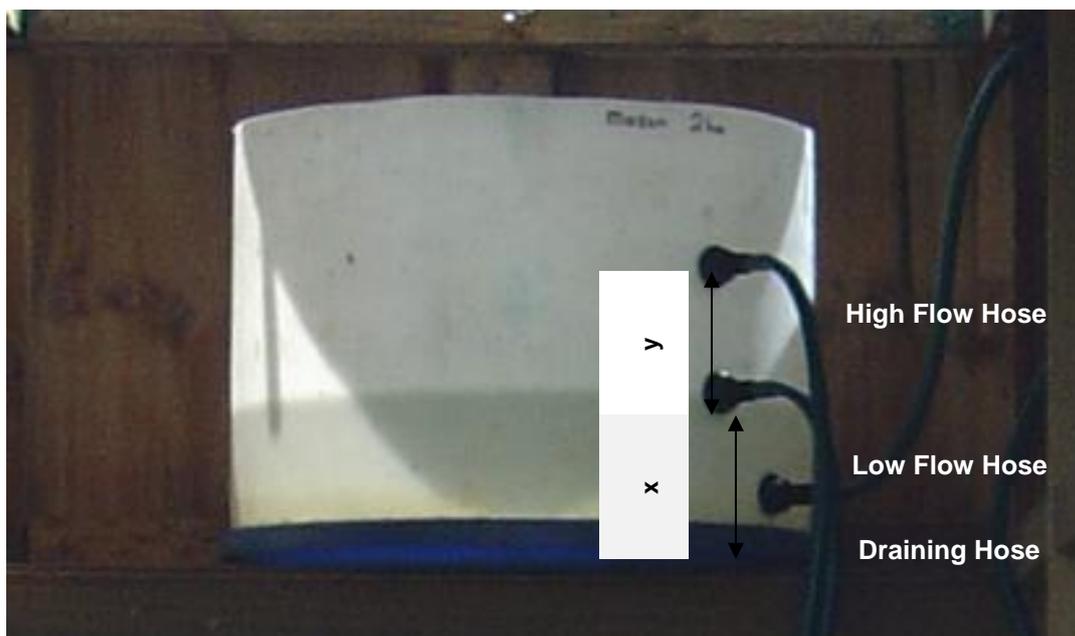
Based on the bench test results displayed in Appendix C undertaken on XX.XX.19 the required tray size is XXX square metres per hectare of exposed land catchment draining to the SRP. This is the area inside the upstand around the edge of the tray.

Sediment Retention Device	Catchment area (ha)	Tray Size (m <sup>2</sup> )
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





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## Appendix B

## Site Specific Erosion and Sediment Control Plans



# Site Specific Erosion and Sediment Control Plan – Panmure Roundabout

**AMETI Eastern Busway  
Stage 1 –  
Panmure to Pakuranga  
March/2019**



**Document Details**

Document name	Status	Document No.	Author
Site Specific Erosion and Sediment Control Plan- Panmure Roundabout	Final Draft	FHIMS-ESCP-01	C Stewart

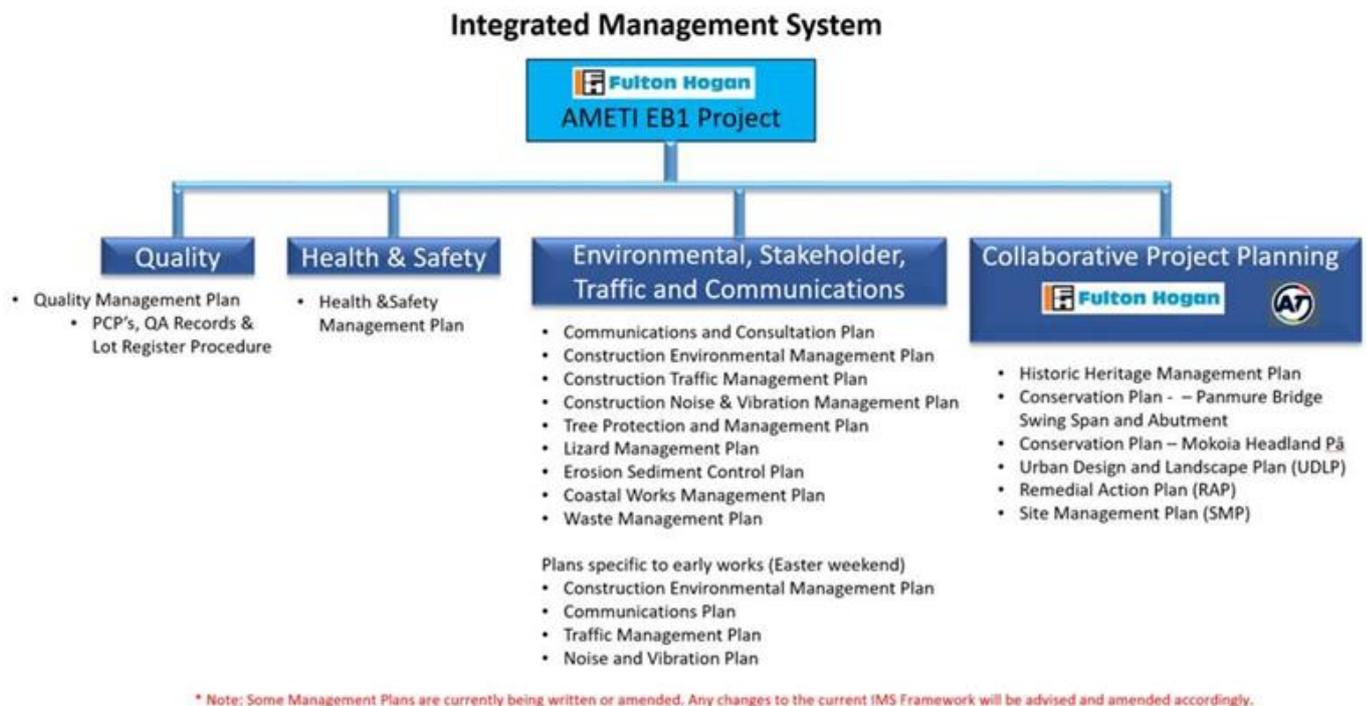
**Document History and Status**

Revision	Date	Author	Reviewed by	Approved by	Status
1	24/02/19	C Stewart	O Seychell		Draft
2	11/03/19	C Stewart	C Redmond		Final Draft
3	20/03/2019	C Stewart	C Redmond		Final Draft

**Revision Details**

Revision	Details
1	Draft for review
2	Includes review from Jacobs and incorporates comments from AT
3	Updated to include additional AT comments where applicable

**Integrated Management System**



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# 1 Introduction

## 1.1 Purpose and scope

The (Site Specific) Erosion and Sediment Control Plans (known as SSES CPs) are required by condition of resource consent to address the potential sediment implications from earthworks associated with specific sections of the AMETI Eastern Busway Stage 1 – Panmure to Pakuranga Project (the Project). They deal with specific construction areas and activities and will be submitted for approval prior to the commencement of works in the specific construction areas or activities. This SSES CP addresses the proposed erosion and sediment control measures associated with the redevelopment of the Panmure Roundabout and immediate surrounds (Appendix A).

The SSES CP is to be read in conjunction with the project Erosion and Sediment Control Plan (ESCP) appended to the Construction Environmental Management Plan (CEMP).

The specific erosion and sediment control methods to be utilised are detailed in Section 2.1 of this SSES CP. The works are programmed to start in April 2019.

## 1.2 Implementation and operation

Fulton Hogan has worked with Southern Skies Environmental Limited to develop this Site Specific ESCP (SSES CP#2 – Panmure Roundabout).

The finalised SSES CP is to be submitted by Auckland Transport to the Team Leader, Southern Monitoring for certification. No earthworks activity on the site is to commence until certification by the Team Leader has been provided.

In the event that minor amendments to the SSES CP are required, any such amendments will be limited to the scope of BUN60078023. Any material amendments to the SSES CP will be provided to the Team Leader, Southern Monitoring prior to implementation to confirm that they are within the scope of this consent.

## 1.3 Resource consent condition requirements

**Table 1: Resource consent conditions to be complied with**

BUN60078023 Consent Condition (14)	Section reference
Prior to commencement of the earthworks activity for the project, a finalised Erosion and Sediment Control Plan (“ESCP”) must be prepared in accordance with the Council’s Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region Guideline Document 2016/005 (“GD05”) and is to include, but not be limited to:	This document which is referred to as a Site Specific Erosion and Sediment Control Plan (SSES CP).
a) specific erosion and sediment control work for each stage (location, dimensions, capacity) in accordance with industry best practice as well as GD05:	Section 2.1. Methodology (therefore no specific control devices) in accordance with best practice and GD05

BUN60078023 Consent Condition (14)	Section reference
b) supporting calculations and design drawings;	Section 2.1. Methodology (therefore no specific control devices) in accordance with best practice and GD05
c) details of construction methods;	Section 2.1
d) monitoring and maintenance requirements;	Section 3 and Erosion and Sediment control Plan appended to CEMP.
e) catchment boundaries and contour information; and	Section 2.1 Methodology (therefore no specific control devices) in accordance with best practice and GD05
f) details relating to the management of exposed areas (e.g. grassing, mulch).	Section 2.1
The finalised ESCP is to be submitted to the Team Leader, Southern Monitoring for certification. No earthworks activity on the site is to commence until certification by the Team Leader has been provided.	Section 1.2  (Note: This document is referred to as a Site Specific Erosion and Sediment Control Plan (SSESCP).  (Note: Auckland Council Central Monitoring is monitoring the Project).

#### 1.4 Location of works

The works are located at the Panmure Roundabout and the immediate surroundings, extending approximately 150m along Lagoon Drive to upgrade the roundabout to a signalised intersection.

The works will be generally undertaken within the road carriageway and existing footpath areas. The one area of widening is along the western side of Lagoon Drive immediately south of the roundabout, which requires widening of the road approximately 10m beyond the existing curb and channel.

#### 1.5 Programme

This SSESCP details the works associated with the staged re development of the Panmure Roundabout and immediate surrounds over an 18-month period. The works detailed in this SSESCP are programmed to commence in April 2019 utilising the Easter break.

The works are to be tightly staged due to the technically complex nature of the traffic requirements in order to maintain a fully functioning intersection. The largest single volume of works is the removal of the roundabout and the widening of Lagoon Drive immediately to the southeast of the roundabout which is scheduled to be undertaken over the 2019 Easter to ANZAC Day period.

Following the Easter to ANZAC 2019 operation, the works in the area will be small scale civil works.

- Refer to drawing ESCP-002-01 for Easter /ANZAC 2019 works.
- Refer to drawing ESCP-002-02 for post Easter/ANZAC 2019 works.

## 2 Description of works and construction methodology

This SSESCP details the works associated with the staged re development of the Panmure Roundabout and immediate surrounds over an 18-month period.

The works involve:

- The removal of pedestrian footpath, the establishment of temporary footpaths before the construction of the permanent footpath;
- Removal of the existing traffic islands and sealing to allow for the realignment of traffic lanes;
- Widening of Lagoon Drive immediately south of the roundabout;
- Installation of new services and the removal of old;
- Installation retaining walls;
- Installation of new stormwater system (pipelines and new cesspits; and
- New footpaths, curbing and parking.

The majority of the works are regarded as standard “civil” operations and do not require land disturbing activities (i.e. earthworks). These works area regards as stabilised and no specific erosion and sediment control measures will be used.

The small area of works that will require earthworks, for example the removal of the landscaping within the Panmure roundabout, the widening of Lagoon Drive immediately to the southeast of the Panmure roundabout, some of the retaining wall works and some of the deeper trenching will be undertaken as cut and cover operations. For these specific areas at the end of each day any exposed areas will be backfilled with aggregate and sealed with asphalt or covered with geotextile.

The importation of aggregate and sealing or the covering with geotextile will ensure that the site is rapidly stabilised throughout the day and in a stabilised state at the end of each day within any works area. Although the Panmure Roundabout works are a complex operation managing traffic and service relocations the actual earthworks are minor in scale and area.

The widening of Lagoon Drive is the single largest area of works requiring land disturbing activities (i.e. earthworks), albeit the cut operation will likely be in rock. The widening of Lagoon Drive requires a cut to waste operation of approximately 2,000m<sup>3</sup>. The rock will be progressively cut and loaded directly onto trucks for removal off site. As the embankment is cut to profile the base will be covered with aggregate and the batters will be covered with geotextile where soil is exposed. The works will be staged to ensure that the working area is stabilised at the end of each day. Prior to works commencing cess pit protection will be installed. This works package will be completed in the within the Easter Break. Upon completion of the cut to waste operation a retaining wall will be constructed. This will be a civil operation in a stabilised environment.

Stabilised access will be directly off the project route road network.

### 2.1 Erosion and sediment control measures

The methodology is an erosion control measure. Erosion control is the most effective means of minimising sediment discharge. GD05 specially emphasises the use of a cut and cover methodology as a specific best practice ESC for inner city roading and utilities operations. (GD05 Section G3.1.2).

*The emphasis is on utilising a ‘cut and cover’ methodology and stabilising exposed areas at the end of each day’s operations. Depending on the extent and nature of the works, they can often be limited to works within the subgrade or widening operations that allow for a cut to waste and replace with a stabilised product (aggregate).*

The majority of the works in the area are civil and paving operations over the 18-month period and are not earthworks.

The earthworks operations are minor in nature, will be isolated and tightly staged as detailed in section 2.

The emphasis in GD05 is to prevent sediment laden water from earthworks operations being generated in the first place. For our small and isolated earthworks operations FH (in accordance GD05 Section G3.1.2) will implement and cut and cover operation to achieve this.

For the minor general earthworks including the removal of material from the landscaped area of the Panmure roundabout and berms a cut and cover operation will be adopted. Material will be loaded directly on a truck and removed off site. At the end of the day any exposed areas of soil will either be covered with aggregate or with geotextile. In the specific area of the roundabout as soon as the roundabout has been removed the area will be sealed with asphalt to create the new temporary roading layout.

For the service relocations and stormwater upgrades cut and cover methods will also be used. A combination of hydro excavation and standard trenching techniques will be used for the installation of services, stormwater infrastructure, cesspits and cesspit leads. Both activities will create isolated, precise excavations within the road alignment.

Hydro excavations are regarded as a non-sediment generating operation for inner city works.

At the conclusion of each excavation (only several metres at a time), and at the end of each day, all excavations will be filled with aggregate which will be trucked to site as required to avoid the need for stockpiles. This will always ensure that the site is regarded as stabilised.

If rain occurs during the day, trenching will cease and the small area needed will be rapidly backfilled.

At the start of each day, a small amount of aggregate will need to be dug out to commence trenching, which will be trucked off site.



**Figure 1: Example of low impact hydro excavation**

When conducting a standard open cut excavation, the cut material will be loaded directly onto a truck and removed off site. At the end of the day, and once the services or pipes have been installed, the trench will be backfilled with aggregate to ensure that the site is left in a stabilised state.

As described above, the works will be progressively stabilised with hard fill, which is regarded as a stabilised material in accordance with GD05 definitions.

The removal of the landscaping within the Panmure Roundabout will involve minor earthworks and will be completed in less than 2 days over the Easter break as a staged cut to cover operation.

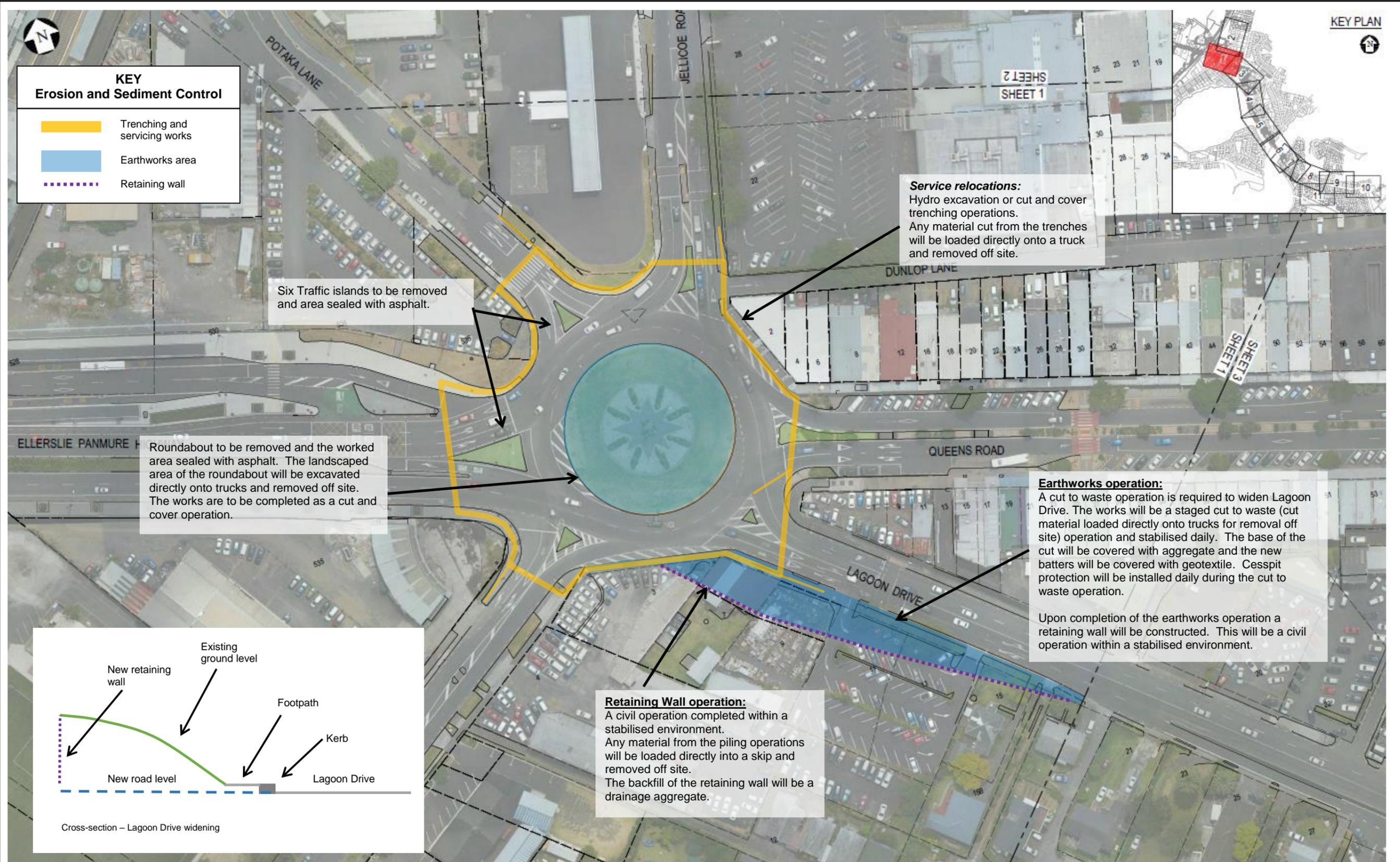
The main works that involve “land disturbing” activities involves the widening of Lagoon Drive to the southeast of the roundabout. Approximately 2,000m<sup>3</sup> of material is to be cut to waste. The cut is predominantly in rock and will therefore not be high sediment generating. Nevertheless, the works will be staged and at the end of each day the base will be covered with aggregate and the batters covered with geotextile. Cesspit protection will be installed during the day prior to works commencing. At the end of each day the area will be swept, and when rain is forecast the cesspit protection will be removed to mitigate the risk of localised flooding. This operation will be completed over the Easter break period.

Upon completion of the cut to waste operation a retaining wall will be constructed. This will be a civil operation in a stabilised environment and will continue on for several weeks following the Easter break works. Any material from the piling operations will be loaded directly into a skip and removed off site. Retaining wall works are also required on the opposite side of Lagoon Drive on the property referred to as the DG law property.

The overall works in and around the Panmure Roundabout is expected to take approximately 18 months to complete.

### **3 Appendices**

#### **3.1 Appendix A – Erosion and Sediment Control Drawings**



**KEY**  
**Erosion and Sediment Control**

	Trenching and servicing works
	Earthworks area
	Retaining wall

Six Traffic islands to be removed and area sealed with asphalt.

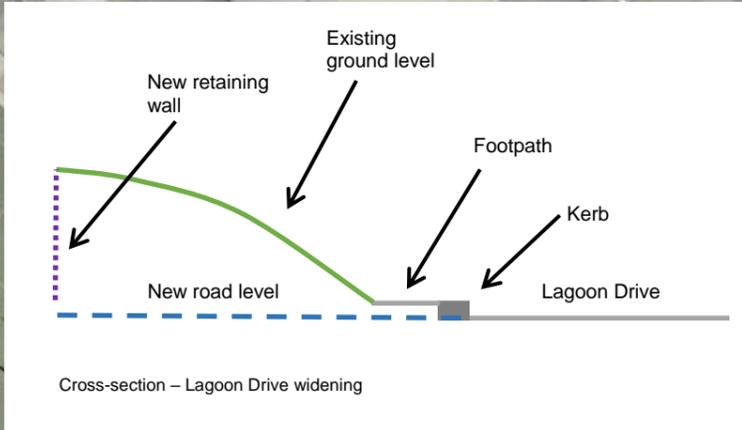
Roundabout to be removed and the worked area sealed with asphalt. The landscaped area of the roundabout will be excavated directly onto trucks and removed off site. The works are to be completed as a cut and cover operation.

**Service relocations:**  
Hydro excavation or cut and cover trenching operations. Any material cut from the trenches will be loaded directly onto a truck and removed off site.

**Earthworks operation:**  
A cut to waste operation is required to widen Lagoon Drive. The works will be a staged cut to waste (cut material loaded directly onto trucks for removal off site) operation and stabilised daily. The base of the cut will be covered with aggregate and the new batters will be covered with geotextile. Cesspit protection will be installed daily during the cut to waste operation.

Upon completion of the earthworks operation a retaining wall will be constructed. This will be a civil operation within a stabilised environment.

**Retaining Wall operation:**  
A civil operation completed within a stabilised environment. Any material from the piling operations will be loaded directly into a skip and removed off site. The backfill of the retaining wall will be a drainage aggregate.



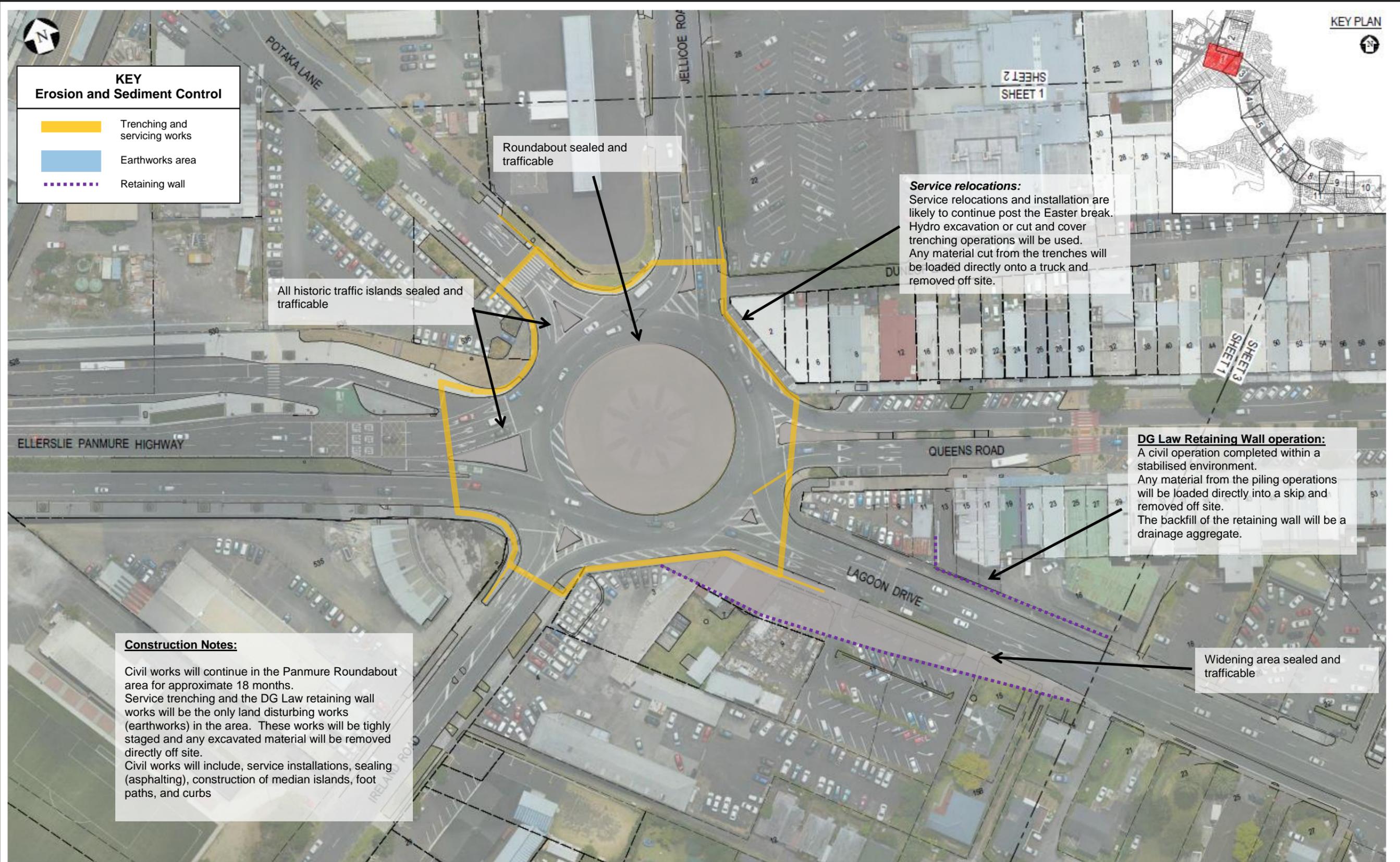
- NOTES**
- All erosion and sediment controls will be installed and maintained in accordance with Auckland Council Guideline Document 2016/005 'Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region' (GD05).
  - Earthworks are to be programmed to ensure rapid stabilisation in accordance with GD05.
  - Cesspit protection to be installed during active operations on a day to day basis. No cesspit protection is to be left in overnight on a 'live' cesspit when rain is forecast. The active works area must be stabilised and swept clean at the end of each day.
  - All erosion and sediment control measures or methodology (cut and cover operations must be stabilised at the end of each day) will be inspected on a daily basis by the site foreman.
  - 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.

<b>Drawn</b> CS	<b>Approved</b> CS
--------------------	-----------------------

<b>Date</b> 20-02-2019	<b>Sheet No.</b> 1 of 2
---------------------------	----------------------------

**Drawing Title**  
Erosion and Sediment Control Plan #2  
Ameti – Panmure Roundabout Easter Works

<b>Drawing No.</b> ESCP - 002-01	<b>Revision</b> A
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**KEY**  
**Erosion and Sediment Control**

	Trenching and servicing works
	Earthworks area
	Retaining wall

**Construction Notes:**

Civil works will continue in the Panmure Roundabout area for approximate 18 months. Service trenching and the DG Law retaining wall works will be the only land disturbing works (earthworks) in the area. These works will be tightly staged and any excavated material will be removed directly off site. Civil works will include, service installations, sealing (asphalting), construction of median islands, foot paths, and curbs

- NOTES**
- All erosion and sediment controls will be installed and maintained in accordance with Auckland Council Guideline Document 2016/005 'Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region' (GD05).
  - Earthworks are to be programmed to ensure rapid stabilisation in accordance with GD05.
  - Cesspit protection to be installed during active operations on a day to day basis. No cesspit protection is to be left in overnight on a 'live' cesspit when rain is forecast. The active works area must be stabilised and swept clean at the end of each day.
  - All erosion and sediment control measures or methodology (cut and cover operations must be stabilised at the end of each day) will be inspected on a daily basis by the site foreman.
  - 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.

**Auckland Transport**  
An Auckland Council Organisation

**Fulton Hogan**

<b>Drawn</b> CS	<b>Approved</b> CS	<b>Date</b> 20-02-2019	<b>Sheet No.</b> 2 of 2
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<b>Drawing Title</b> Erosion and Sediment Control Plan #2 Ameti – Panmure Roundabout – Post Easter Break	
<b>Drawing No.</b> ESCP - 002-02	<b>Revision</b> A