CONTRACTOR'S EROSION AND SEDIMENT CONTROL PLAN (ESCP)

Client: Watercare Services Ltd

Project: Motions Collector Sewer

Location: Western Springs, Morningside, Kingsland, Grey Lynn, Eden Terrace & Auckland Central, Auckland

Project No: 7114

Doc No: HSE-ENV-PLN002-GEN-7114

Revision History

Rev	Date	Details	Author	Reviewer	Approver
A	29/07/2025	Draft for consent application	M. McConnell	B. Barnett	
B	06/08/2025	Updated to include Jacobs comments.	M. McConnell	T. Hegarty	B. Barnett

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1 INTRODUCTION

This Erosion and Sediment Control Plan (ESCP) has been prepared by McConnell Dowell on behalf of Watercare Services Limited to support an application for resource consent for the Motions Catchment Improvements Project.

This ESCP has been prepared as a preliminary document to demonstrate how the actual and potential effects of sediment discharges from the proposed works will be managed.

The specific erosion and sediment controls detailed within this ESCP are preliminary and are based on the preliminary design and anticipated construction methodologies.

A final ESCP will be prepared following the completion of design, prior to commencement of works and subject to certification by Auckland Council.

1.1 REFERENCE DOCUMENTS

The following documents have been used to inform this plan:

a. Motion Collector Sewer Concept Design Drawings 2014581.001 to 2014581.019 all Rev A.
b. Motions Collector Sewer Constructability Report: Rev 1, March 2025 – McConnell Dowell.
c. Contaminated Land Management Plan: Rev A, July 2025 – Aurecon.

2 PROJECT OVERVIEW

The Western Isthmus Water Quality Improvement Programme (WIWQIP) Motions Catchment Improvements Project (the Project) involves the construction of a new collector sewer approximately 3.2 kilometres in length from Canada Street in Auckland's Central Business District (CBD) to Western Springs Park in Western Springs. The collector sewer is proposed to be a diameter ranging from 2.4m up to 4.5m and will have three branch connections. Two branch connections will go under State Highway 16 connecting the Newton Catchment to Suffolk Reserve and connecting Arch Hill Scenic Reserve and southern parts of Grey Lynn to Nixon Park. The third branch connection will connect Suffolk Reserve to Basque Park. There will also be 16 Engineered Overflow Points (EOPs) and 16 local network connections. The Project will tie into the Central Interceptor at Western Springs Park.

The Project is part of the WIWQIP which aims to significantly reduce wastewater overflows into the Waitematā Harbour in order to improve stream and beach water quality across the City's Central Western Isthmus. The aim of the Project is to build a new pipeline to collect combined wastewater, and stormwater flows from the Motions Catchment and convey these to the Central Interceptor at Point Erin Park, where they can then be safely conveyed to the Māngere Wastewater Treatment Plant. The WIWQIP is a joint initiative between Watercare and Auckland Council's Healthy Waters that was established in 2017 and has been identified in Watercare's Asset Management Plan 2021 – 2041 as a key programme to further protect the environment and provide clean harbours and waterways. At a high level, the three main goals of the WIWQIP are:

- To reduce risks to public health by alleviating uncontrolled discharges into local catchments.
- To remove the permanent health warning status of both Meola Reef and Cox's Bay; and

- To reduce intermittent beach closures in the area over the next 10 years.

The Project is a critical component of the wider WIWQIP which will enable Watercare to bring about considerable environmental benefits, reduce risks to public health and improve the amenity of the Motions catchment. For further detail regarding the proposed works and the Project's objectives, please refer to Section 4 of the Assessment of Effects on the Environment.

2.1 SCOPE OF PHYSICAL WORKS

The Project comprises a collector sewer which essentially duplicates the alignment of Watercare's existing Branch 7 sewer along State Highway 16 from the Central Motorway Junction in Central Auckland to Western Springs where it will connect with the main Central Interceptor tunnel. The Motions collector sewer comprises a 3.2 km long, pipeline which will be constructed using a micro-tunnel machine (also known as pipe jacking machine), with an internal diameter (ID) up to 2.4m or tunnel boring machine (TBM), with ID 3.0 m up to 4.5 m. The exact construction methodology is yet to be confirmed for the Project. There are 17 construction shafts proposed for the Motions collector sewer, varying in size 3 m to 10 m ID and depths of 6 m to 29 m, dependent of its purpose (i.e. launching (larger) or receiving (smaller) machinery and equipment or for future operations and maintenance). Refer to Figure 1 for Project extent.

2.1.1 **Shafts**

Shaft	Location	Method	Depth	Pipe Jack Function
SH01	East St.	Secant (6m Ø)	21m	Reception.
SH02	Suffolk St. Reserve	Secant (10m Ø)	29m	Jacking and Reception.
SH03	Mostyn St.	Secant (6m Ø)	16m	Reception.
SH04	Forth Ave	Secant (10m Ø)	22m	Jacking Shaft.
SH05	Kingsland Ave	Secant (6m Ø)	21m	Reception.
SH5a	Back of properties	Caisson (3m Ø)	20m	None – Manhole only.
SH06*	Finch St.	Secant (10m Ø)	21m	Satellite Jacking Shaft {Could Delete}
SH07	Myrtle St.	Secant (10m Ø)	20m	Jacking Shaft.
SH07a	Ivanhoe Rd.	Auger sunk (3m Ø)	21m	None – Manhole only.
SH08	Western Springs	Secant (10m Ø)	25m	Jacking Shaft
SH09	Edinburgh Street	TBC	9m	Reception
SH10	Gundry Street	TBC	6m	Jacking Shaft
SH11	Burgoyne Street	TBC	18m	Reception
SH12	Basque Park	TBC	17m	Reception
SH13	Cooper Street	TBC	8m	Reception
SH14	Arch Hill Reserve	TBC	13m	Jacking Shaft
SH15	Arch Hill Reserve	TBC	6m	Reception

Figure 2 - Shaft Summary

**Note: Shaft SH06 may be required if the contractor proposes an EPB methodology.*

2.2 CONSTRUCTION SHAFT ACTIVITIES

As the sewer installation is undertaken as a tunnelling operation the areas of earthworks are limited to those required to construct and utilise the shafts.

The Jacking Shafts are utilised to launch the pipe jacking machine and to remove the material excavated by the pipe jacking machine. These areas are also where the pipe jacking operational plant is location and where the pipes are loaded into the tunnel. The typical equipment at these shafts includes:

- Piling Rig
- Crane
- 1000 KVa Generator (or similar), where suitable mains power connections cannot be sourced
- Separation Plant (or Spoil Handling Facility)
- Excavators
- 6-Wheeler, Articulated Trucks and Truck and Trailer Units Pipe Storage Area
- Ventilation Fans
- Small Workshops
- Worker Facilities and Ablutions

The Reception Shafts are typically smaller and are utilised to retrieve the pipe jacking machine. The greatest activity in these areas are the construction of the shafts themselves. During the construction of the shafts the typical equipment at these plants includes:

- Piling Rig
- Crane
- Excavators
- 6-Wheeler, Articulated Trucks and Truck and Trailer Units
- Worker Facilities and Ablutions

Once the shaft is constructed, until the pipe jacking machine is retrieved, the reception shafts are largely unused, although may be used for storage.

2.3 CONSTRUCTION SHAFT CONSTRUCTION

The area of each shaft is relatively small, typically between 300m^2 to 1,000m^2, shaft 2 (3,500m^2) & 8 (5,000m^2) are larger.

The majority of the shaft sites are adjacent to existing roads, so no additional access is required. Shafts 8, 2, 14, 15 & 12 will require additional access tracks to be formed.

The initial activity in each shaft site will be to construct the access (where required), then formation of a stabilised works area over the site's footprint. Roads, carparks, driveways and similar will be retained if they can used as a practical working area. Other areas will be stripped of topsoil, trimmed and an aggregate layer placed for stabilisation.

The excavated material from stripping the topsoil etc. will be removed from the site as there is typically insufficient room to stockpile this material.

The existing drainage features in each location will be retained, appropriate sediment control measures will be installed (refer Section 3.0).

The shafts themselves are constructed predominantly as secant piled shafts although other methods may be used. In broad terms for the shaft construction, the shaft walls (secant piles, sheet piles, caissons) will be installed and then the material inside these walls will be excavated to form the shaft. This excavation is typically undertaken by a small excavator within the shaft, loading into skips which are then removed by a crane and emptied in a bunded area (typically with sealed concrete blocks). This excavated material will then be removed from site.

The Contaminated Land Management Plan (CLMP) has identified the disposal requirements for excavated material from the shaft sites. For shafts 3 and 7 the material excavated up to 2m deep can be disposed of as clean fill. For all other shaft sites, excavation up to 2m deep are to be disposed of as Class 3 (Managed Fill). For all shafts (with the exclusion of shafts 12 and 12a) excavated material from deeper than 2m can be disposed of as clean fill. As shafts 12 and12a are within a historic closed landfill, this material is also to be disposed of as Class 3 (Managed Fill).

An accidental discovery will also be employed for the remainder of the Project's alignment.

The estimated site area for the 17 shaft locations, based on Concept Design is anticipated to be approximately 16,000m^2, but it is noted that as a large portion of these areas are already paved the earthworks area is likely to be in the order of 13,000m^2. The finalised earthworks areas are likely to vary dependent on the confirmed construction methodology.

2.4 CONSTRUCTION SHAFT OPERATION

Following the completion of the shaft construction, during the tunnelling operation, there are no earthworks to be undertaken in the shaft site areas.

2.4.1 **Jacking Shafts**

The tunnel excavation will be undertaken by a Micro Tunnel Boring Machine (MTBM) using a pipe jacking method.

The cuttings from the head of the MTBM are mixed with slurry in the mixing chamber and then pumped back up the tunnel suspended in the carrier fluid, which is either water or enriched with bentonite and polymer depending on conditions.

The slurry is pumped from the mixing chamber via a pump located behind the MTBM in the jacking pipe and a further pump located in pit bottom to boost the slurry mix up the shaft to the separation plant. The separation plant separates the solid spoil material within the slurry from the water and returns the water to the cutting face of the MTBM. The slurry is fed to the machine from a feed pump located on the surface at the separation plant.

The separation plant for each section of tunnel is located at the jacking shafts.

The spoil discharged from the separation plant will be discharged into a muck bay constructed from inter-blocks and sealed with expanding foam. The muck bay will be regularly loaded out into sealed trucks to remove this material from site and dispose of in accordance with the CLMP.

As the MTBM progresses, the pipe sections are lowered into the shaft and then added to the existing pipes being jacked forward. A stockpile of pipes will be stored at each jacking site to enable this.

As the jacking sites are the principal location of activity on each section of pipe, this is also where the site offices and ablutions will be located.

2.4.2 **Receiving Shafts**

As noted earlier, until the MTBM has reached the receiving shaft there will be limited activity at each receiving Shaft. Due to space restrictions elsewhere on site the receiving shafts may be utilised for addition plant and material storage and satellite offices.

Once the MTBM has reached a receiving shaft, the base of the shaft around the MTBM will be excavated (in a similar manner of the shaft construction) allowing removal of the MTBM by a crane.

3 EROSION AND SEDIMENT CONTROL

The key principles to be employed for the project are to undertake land disturbing activities in a manner that reduces the potential for erosion of bare soils (erosion control) and, to employ treatment devices to control all sediment laden water prior to discharging from the site (sediment control). The basic erosion and sediment control principles applicable to this project are as follows:

1. **Minimise disturbance:** Only work those areas required for construction to take place.
2. **Stage construction:** Carefully plan works to minimise the area of disturbance at any one time.
3. **Protect steep slopes:** Steep slopes should be avoided where possible. Where disturbed, steep slopes should be rapidly stabilised and special protection may be required.
4. **Stabilise exposed areas rapidly**.
5. **Install perimeter controls:** Divert clean water away from areas of disturbance and divert runoff from areas disturbed to sediment control measures.
6. **Employ detention devices:** Treat runoff by methods that allow sediment to settle out.
7. **Experience and training:** Make sure an experienced and trained person is responsible for installing and maintaining erosion and sediment control practices.
8. **Make sure the ESCP evolves:** As construction progresses and the nature of land disturbing activities change, the ESCP needs to be modified to reflect the changing conditions on site.
9. **Assess and adjust:** Inspect, monitor and maintain control measures.

3.1 STANDARDS / GUIDELINES

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

3.2 CONTROL METHODS

Auckland Council provides guidance on the construction and sizing of erosion and sediment control devices in GD05. The proposed measures described below will be installed in accordance with that guideline.

In general, the controls on site will typically be 'small site' controls appropriate for the nature of works.

As part of planning, Site Specific Erosion and Sediment Control Plans (SSESCPs) will be developed for each shaft Site and included as appendices to the final ESCP. This ESCP along with its appendices will be updated as required and will be submitted to Auckland Council for certification prior to commencement of each phase of works.

The scope of these SSESCPs will vary with the specific activities that they address.

3.2.1 Erosion and Sediment Control Measures

Regarding erosion and sediment control the shaft sites do not have the potential to generate significant volumes of sediment. The overarching approach for erosion and sediment control will be:

- Where practical the existing kerb and channel will be retained.
- Clean water and overland flow paths will be diverted around the shaft sites by either hotmix bunds or by using sections of PVC pipe where the kerb and channel has been removed. These sections of pipe will be suitably supported so that the existing water flow is impeded as little as possible and any potential flooding risks are addressed.
- Sediment generated by the shaft construction will be retained within the shaft.
- The primary control measure during shaft site operation is to keep the area of the shaft site clean, excavated material will be retained within sealed containment areas. Any dropped or spilt material will be removed as soon as practical.
- All plant, including light vehicles and trucks will remain on the stabilised area, if any material is dropped or tracked onto public roads, outside the work site footprints, it will be removed as soon as practical.
- A key component of the sediment control for these works will be the dewatering of the shafts, which will include the removal of sediment laden water.
- Dewatering treatment requirements will be assessed based on site needs, including volumes of groundwater and will be consistent with the methods described in Section 4.

The main control measures to be utilised include:

- Clean water Diversions – GD05 E2.1
- Pipe Drop Structures and Flumes – GD05 E2.5
- Stabilised Construction Entranceways – GD05 E2.6
- Silt Fences – GD05 F1.3
- Super Silt Fences – GD05 F1.4
- Silt Socks – GD05 F1.5
- Stormwater Inlet Protection – GD05 F1.6
- Coagulant and flocculant treatment (as part of dewatering) – GD05 F2.0
- Dewatering – GD05 G1.0

3.3 SPECIFIC EROSION AND SEDIMENT CONTROL MEASURES

3.3.1 **Shaft 01**

Shaft 01 is located on East Street and is a reception shaft. There is potential to utilise some or part of the ex-CRL project yard. As such there would be no earthworks required to form the shaft site. Earthworks will be limited to the actual forming of the shaft including piling and excavation.

Figure 3 Working Area for SH01.

The erosion and sediment control measures to manage this activity include:

- Retention of existing kerb and channel. Where this is not practical the existing kerb and channel flows will be diverted by hot mix bunds or temporary pipes.
- Existing catchpits will be protected by silt socks or catchpit bags.

3.3.2 **Shaft 02**

Shaft 02 is located within the Suffolk Reserve and is a jacking shaft. Most of the area is grassed or has landscape planting. The site is relatively steep and will require earthworks to form a series of level platforms.

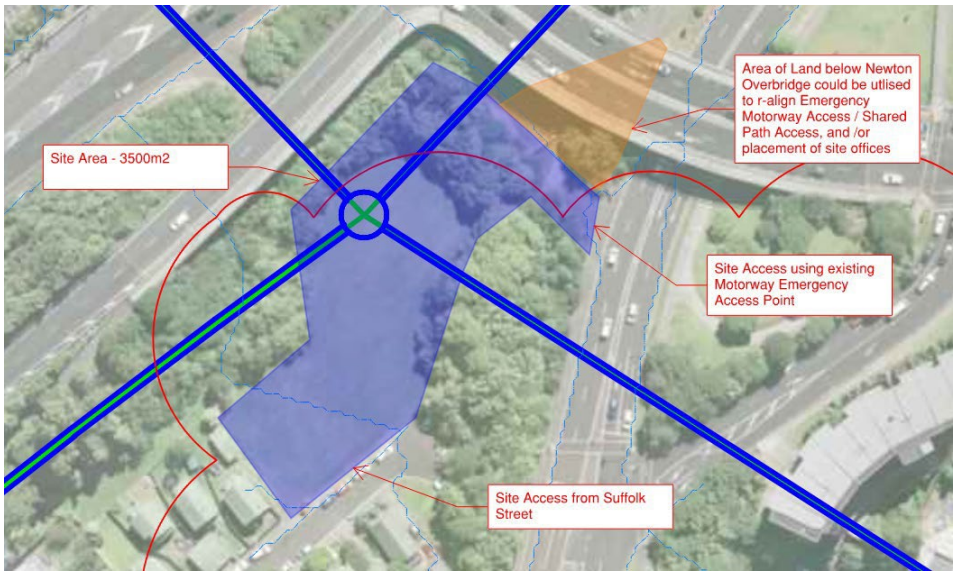

Figure 4 Working Area for SH02.

The erosion and sediment control measures to manage this activity include:

- Clean water diversion bunds at the top of the site, typically on the edges of the cycle path and the SH16 emergency access.
- Progressive construction of the platforms (as practical).
- Silt Fences and duper silt fences will be installed at the lower extent of the platforms.
- Existing catchpits will be protected by silt socks or catchpit bags.

3.3.3 **Shaft 03**

Shaft 03 is located at the lower end of Mostyn Street and is a reception shaft. Most of the area is grassed or has landscape planting. The site is flat but is at the base of a steep street. There are also overland flow paths on either side of the area, which is at a highpoint between these flow paths.

Figure 5 Working Area for SH03.

The erosion and sediment control measures to manage this activity include:

- Clean water diversion bunds at the end of Mostyn Street and along the edge of the cycle path.
- Silt fences on either side of the platform.
- Existing catchpits will be protected by silt socks or catchpit bags.

3.3.4 **Shaft 04**

Shaft 04 is located within the Nixon Park Carpark at the intersection of Fourth Avenue and Central Road, and is a Jacking Shaft. The majority of the area is a sealed carpark with landscape planting, including mature trees. The site is relatively flat but is at the base of a steep street.

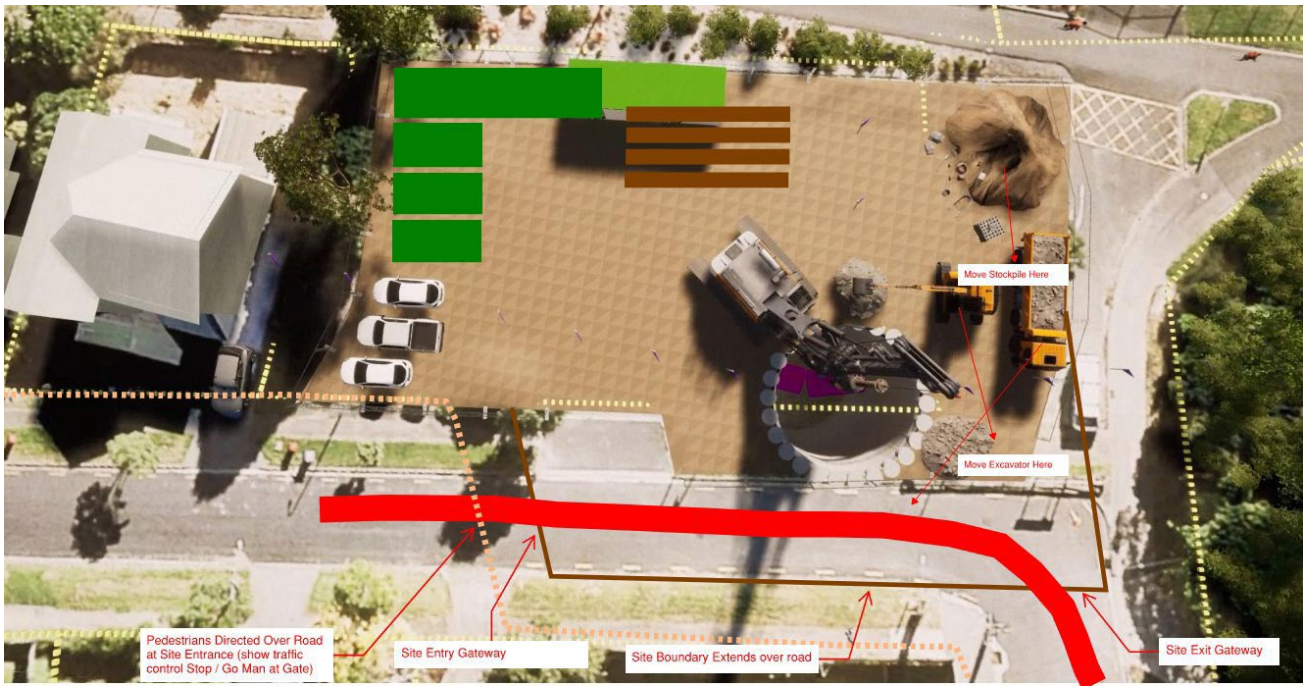

Figure 6 Working Area for SH04.

The erosion and sediment control Measures to manage this activity include:

- Clean water diversion bunds at the end of Fourth Avenue and Central Road directing runoff into the existing catchpits.
- The existing catchpits within the carpark will be retained and or be relocated to ensure the drainage capacity in the low point is retained.
- Silt fences on either side of the platform and along the edge of Fourth Avenue.
- Existing catchpits will be protected by silt socks or catchpit bags.

3.3.5 **Shaft 05**

Shaft 05 is located at the end of Kingsland Avenue and is a Reception Shaft. There is an overland flow path between cul-de-sac and the cycleway. The full required extent of this shaft areas has not been finalised. However, there are no site-specific conditions in this area that preclude the use of GD05 compliant measures to manage the erosion and sediment control for this location.

The Erosion and sediment control measures to manage this activity include:

- Clean water diversion bunds at the end of Kingsland Avenue directing runoff into the existing catchpits.
- The existing catchpits within Kingsland Avenue will be retained and or be relocated to ensure the drainage capacity in the low point is retained.
- Silt fences around the perimeter of the platform.
- Existing catchpits will be protected by silt socks or catchpit bags.

3.3.6 **Shaft 06**

Shaft 06 is located at the end of Finch Street and is a Jacking Shaft. There is an overland flowpath between cul-de-sac and the cycleway. The full required extent of this shaft areas has not been finalised, and this shaft may be deleted. As with Shaft 05, there are no site-specific conditions in this area that preclude the use of GD05 compliant measures to manage the erosion and sediment control at this location.

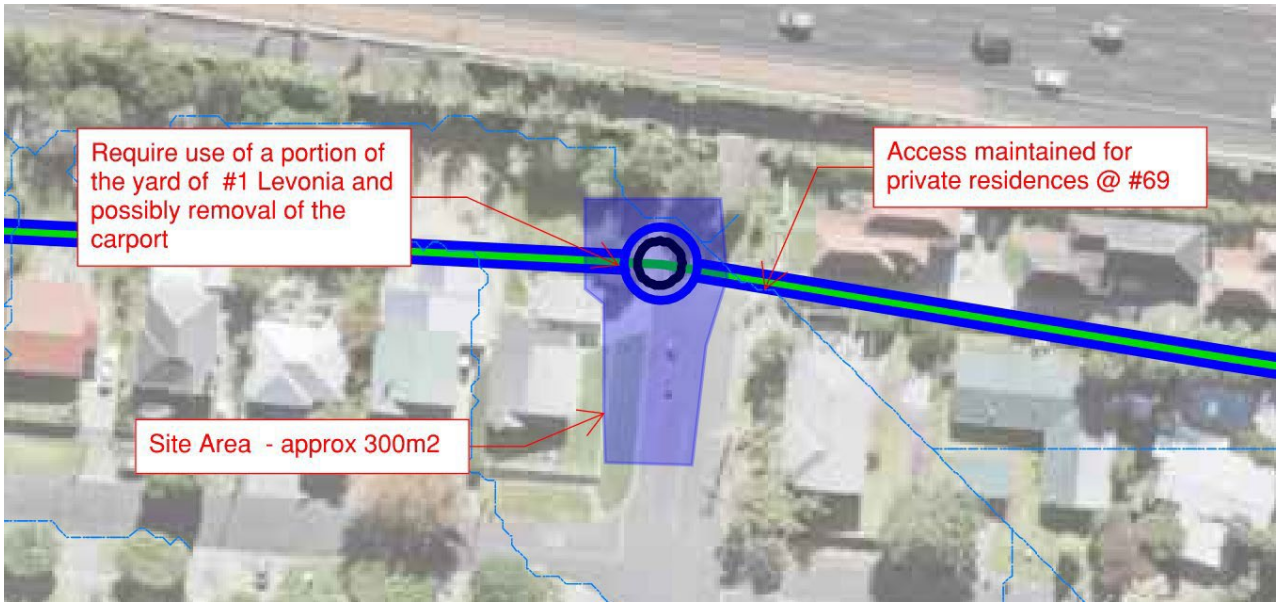

Figure 7 Working Area for SH06.

The erosion and sediment control measures to manage this activity include:

- Clean water diversion bunds on Finch Street directing runoff into the existing catchpits.
- The existing catchpits within Finch will be retained and or be relocated to ensure the drainage capacity in the low point is retained.
- Silt fences around the perimeter of the platform.
- Existing catchpits will be protected by silt socks or catchpit bags.

3.3.7 **Shaft 07**

Shaft 07 is located on Myrtle Street and is a reception shaft. This area is flat and is grassed with some specimen trees.

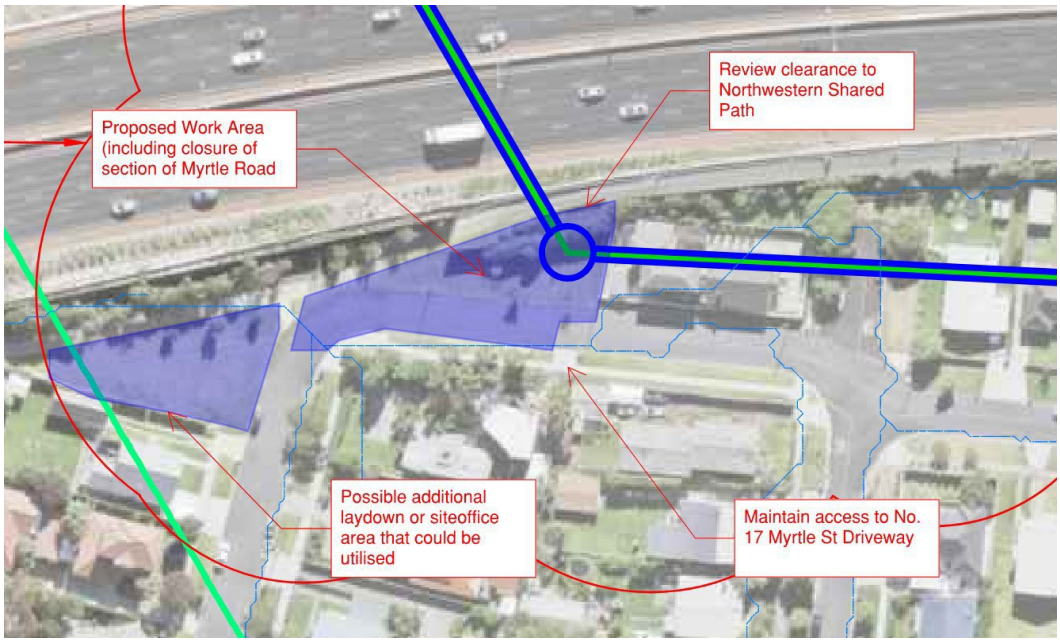

Figure 8 Working Area for SH07.

The erosion and sediment control measures to manage this activity include:

- Clean water diversion bunds along the edge of the cycleway directing runoff into Myrtle Street.
- The existing catchpits within Myrtle Street will be retained and or be relocated to ensure the drainage capacity in the low point is retained.
- Silt fences around the perimeter of the platform.
- Existing catchpits will be protected by silt socks or catchpit bags.

3.3.8 **Shaft 08**

Shaft 08 is the northern side of the Western Springs outer fields where the main line will connect into the completed Central Interceptor Western Springs Shaft. The expectation is to retain use of, or part of, the existing Central Interceptor project yard.

Figure 9 Working Area for SH08.

The erosion and sediment control measures to manage this activity include:

- Clean water diversion bunds and Silt fences around the perimeter of the platform.

3.3.9 **Shaft 09**

Shaft 09 is located at the lower end of Edinburgh Street and is a reception shaft. This area is a sealed road with some minor vegetation behind the kerb.

Figure 10 Working Area for SH09.

The erosion and sediment control measures to manage this activity include:

- Clean water diversion bunds on Edinburgh Street directing runoff into the existing catchpits.
- The existing catchpits within Edinburgh Street will be retained and or be relocated to ensure the drainage capacity in the low point is retained.
- Silt fences around the perimeter of the platform.
- Existing catchpits will be protected by silt socks or catchpit bags.

3.3.10 **Shaft 10**

Shaft 10 is located at the lower end of Gundry Street and is a jacking shaft. This area is a sealed road with some minor vegetation behind the kerb.

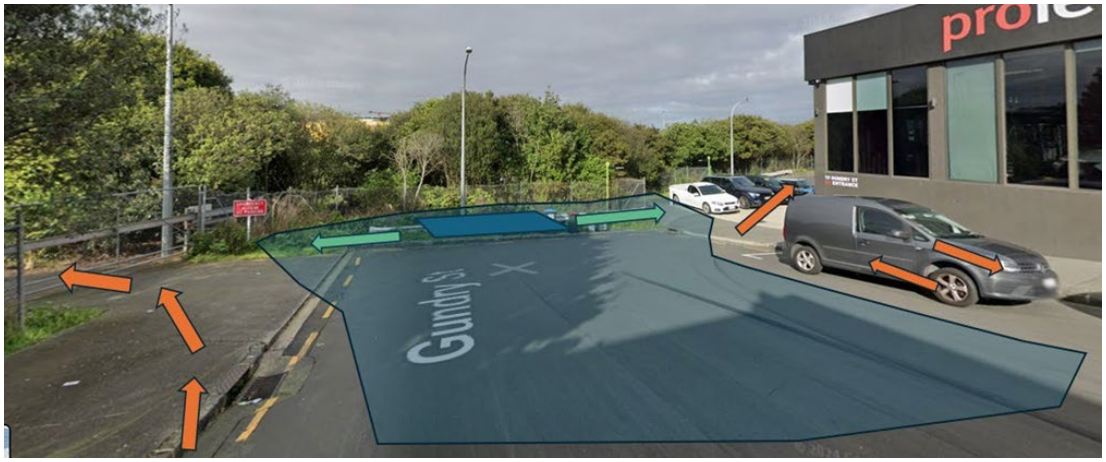

Figure 11 Working Area for SH10.

The erosion and sediment control measures to manage this activity include:

- Clean water diversion bunds on Gundry Street directing runoff into the existing catchpits.
- The existing catchpits within Gundry Street will be retained and or be relocated to ensure the drainage capacity in the low point is retained.
- Silt fences around the perimeter of the platform.
- Existing catchpits will be protected by silt socks or catchpit bags.

3.3.11 **Shaft 11**

Shaft 11 is located at the lower end of Burgoyne Street and is a reception shaft. This area is a sealed road with some minor vegetation behind the kerb.

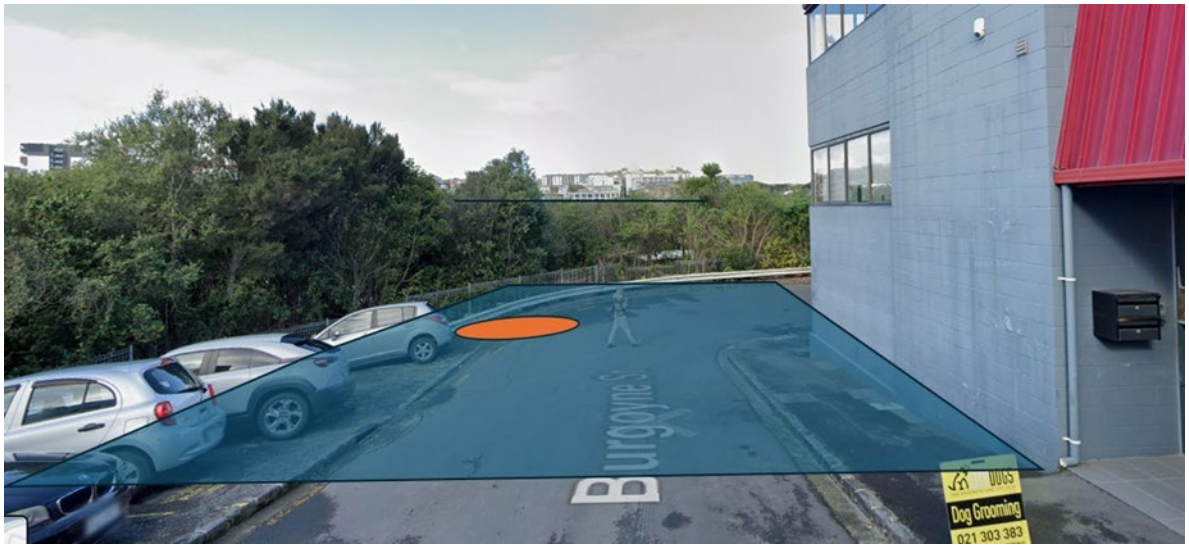

Figure 12 Working Area for SH11.

The erosion and sediment control measures to manage this activity include:

- Clean water diversion bunds on Burgoyne Street directing runoff into the existing catchpits.
- The existing catchpits within Burgoyne Street will be retained and or be relocated to ensure the drainage capacity in the low point is retained.
- Silt fences around the perimeter of the platform.
- Existing catchpits will be protected by silt socks or catchpit bags.

3.3.12 **Shaft 12a**

Shaft 12a is to be constructed in a small, angled parking area in Fleet Street where it meets Basque Park and is a Reception Shaft. This area is a sealed road with some minor landscaping vegetation behind the kerb.

The construction method for the line between Shaft 12 and Shaft 12a has not been determined; this area may be an open cut trench. Notwithstanding this, there are no site-specific conditions in this area that preclude the use of GD05 compliant measures of the line between Shafts 12 and 12a.

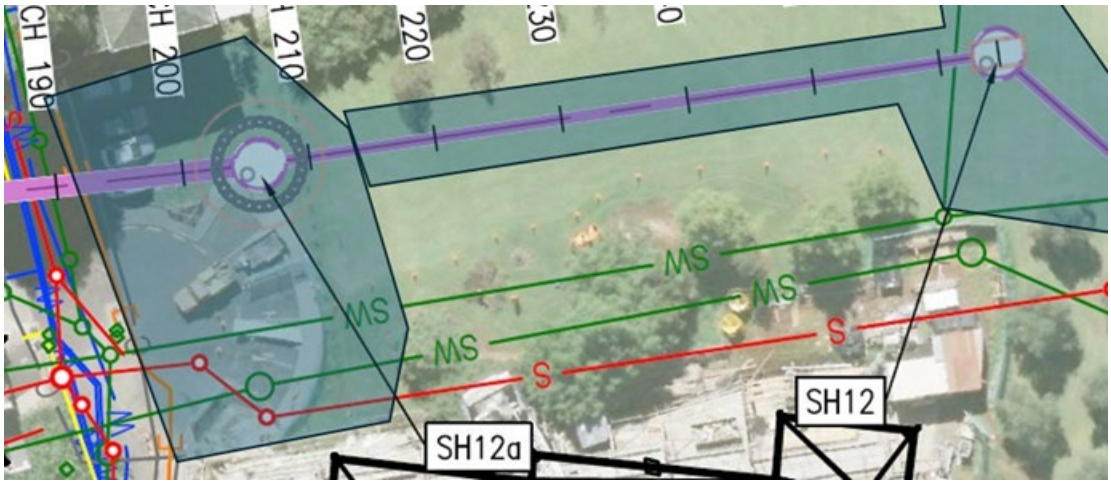

Figure 13 Working Area for SH12a.

The erosion and sediment control measures to manage this activity include:

- Clean water diversion bunds on Fleet Street directing runoff into the existing catchpits.
- Clean water diversion bunds within Basque Park to divert flows around the shaft site.
- The existing catchpits within Fleet Street will be retained and or be relocated to ensure the drainage capacity in the low point is retained.
- Silt fences around the perimeter of the platform.
- Existing catchpits will be protected by silt socks or catchpit bags.
- If constructed as an open cut trench the line between Shafts 12 and 12a, including Shaft 12, would be controlled by clean water diversion bunds and silt or super silt fences.

3.3.13 **Shaft 13**

Shaft 13 is located at the lower end of Cooper Street and is a reception shaft. This area is a cul-de-sac.

An access track will be constructed between Shaft 13 and Shaft 14. This will be constructed as a cut and cover operation ensuring that at the end of the day or before rain, whichever is first, all exposed areas will be stabilised with geotextile or aggregate.

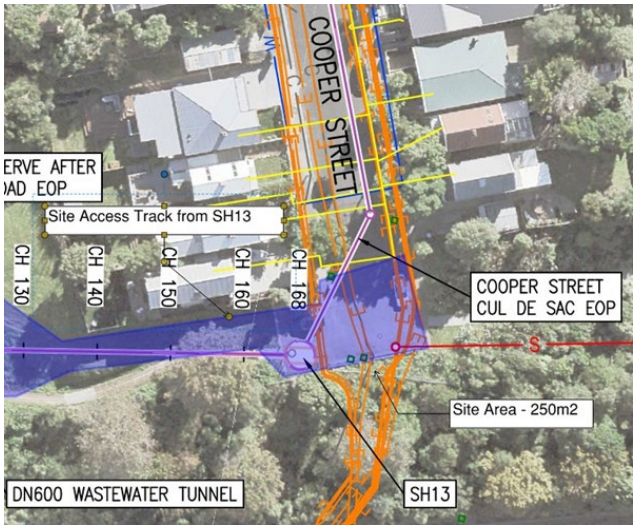

Figure 14 Working Area for SH13 and part access to SH14.

The erosion and sediment control measures to manage this activity include:

- Clean water diversion bunds on Cooper Street directing runoff into the existing catchpits.
- The existing catchpits within Cooper Street will be retained and or be relocated to ensure the drainage capacity in the low point is retained.
- Existing catchpits will be protected by silt socks or catchpit bags.
- The access track to SH14 will be constructed as cut and cover.

3.3.14 **Shaft 14**

Shaft 14 is located within the Arch Hill Reserve below the lower end of Commercial Road and is a jacking shaft. This area grassed and is moderately steep.

Between Shaft 13 and Shaft 14 an access track will be constructed. This will be constructed as a cut and cover operation ensuring that at the end of the day or before rain, whichever is first, all exposed areas will be stabilised with geotextile or aggregate.

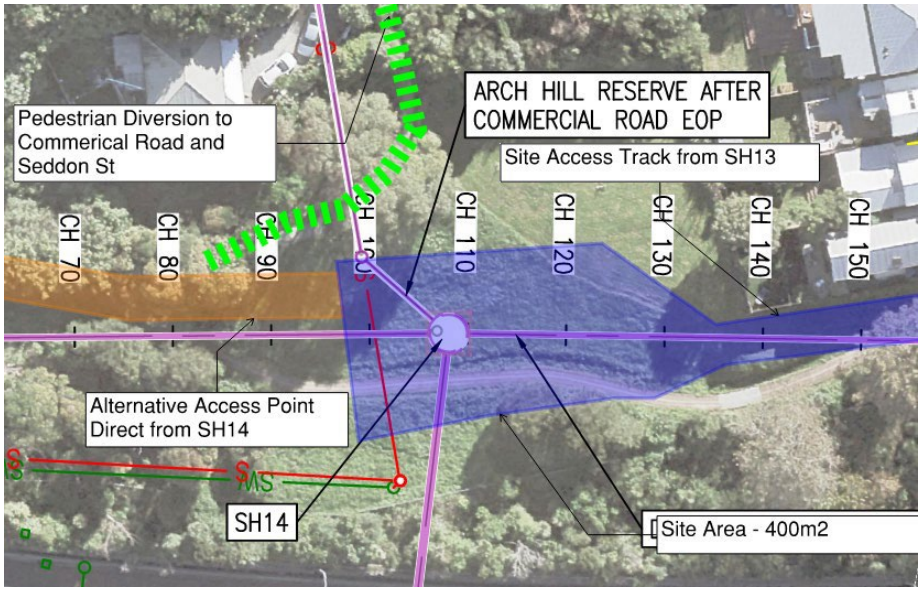

Figure 15 Working Area for SH14 and part access to SH13.

The erosion and sediment control measures to manage this activity include:

- Clean water diversion bunds on the upper (Commercial Road) side diverting flows around the shaft site.
- Super Silt Fence around the lower perimeter of the site.
- The access track from SH13 will be constructed as cut and cover.

3.3.15 **Shaft 15**

Shaft 15 is located within the Arch Hill Reserve to the west the lower end of Commercial Road and is a Reception Shaft. This area grassed and is relatively.

Access to the area is to be gained from State Highway 16 or from Shaft 14. This will be constructed as a cut and cover operation ensuring that at the end of the day or before rain, whichever is first, all exposed areas will be stabilised with geotextile or aggregate.

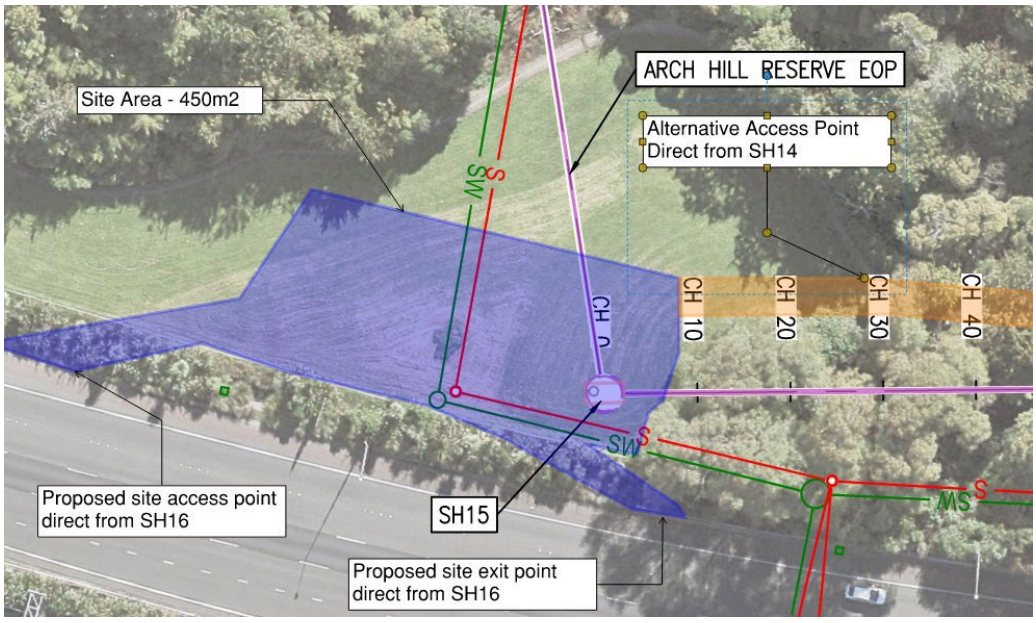

Figure 16 Working Area for SH15.

The erosion and sediment control measures to manage this activity include:

- Clean water diversion bunds on the upper (Commercial Road) side diverting flows around the shaft site.
- Super silt fence around the lower perimeter of the site.
- The access track to SH14 or from State Highway 16 will be constructed as cut and cover.

4 DEWATERING

As detailed previously the shaft excavations will require dewatering. All dewatering will be in accordance with the recommendations of the Groundwater Assessment Report.

Lamella clarifiers will be used for treatment during dewatering.

As detailed in section 4.2, where appropriate, chemical treatment will be utilised to improve the efficiency of these devices to meet the required discharge standard.

The acceptance criteria for dewatering, where the water can then be discharged to the stormwater network, is a clarity of no less than 100mm measured with a secchi disk, and a pH of between 5.5 & 8.5.

If dewatering at a site with identified contamination the dewatering control measures will be in accordance with the CLMP.

4.1 LAMELLA CLARIFIERS

The use of these Lamella Clarifiers will be as follows:

Sediment laden water is pumped into the device, Flocculant is added, and the water is fed through ports into the Lamella plate packs. Clean water moves up through the plate packs and overflows through a discharge lauder and is discharged under gravity to stormwater or trade waste depending

on the contamination status of the site. Solids consolidate within the unit into a thickened sludge and are collected and removed from site.

The device has the following features:

- Automated PAC continuous dosing system.
- Automated continuous monitoring of pH and turbidity at the outlet.
- Text message alarm system triggered by pH and turbidity monitoring results.
- Automated texting of results from monitoring.
- The density of the sludge is monitored and discharged at regular intervals into a contained area on site.

Note that during initial bench testing to determine flocculant does rates, the NTU which corresponds to a clarity of 100mm will be determined and will be set as the initial discharge standard. This will be reviewed as works progress and/or soil types change. This is initially set as an NTU of 50.

The procedure for operating the Lamella Clarifier is as follows:

- The unit is started up and water is pumped into the device from the excavation.
- Every fifteen minutes the turbidity and pH of the water is automatically monitored at the outlet and this data is sent to the Environmental Engineer at these intervals.
- The device operator will keep a record of when the plant was discharging.
- If turbidity rises above 40 NTU or the pH goes outside 6.0 – 8.0, a text message is automatically generated by the unit and sent to the plant operator.
- At all times at least one plant operator will be able to respond within 30 minutes of receiving the alert text message, this includes nighttime pumping.
- If the turbidity rises above 50 NTU or the pH falls outside the range 5.5-8.5 at the outlet, the unit will be manually shut down.
- A daily check sheet will be completed by the plant operator.

Any non-compliant discharges (turbidity greater than 50 NTU and/or pH outside 5.5-8.5) will be notified to the Auckland Council within 24 hours. The notification will include details on the nature and duration of the event.

The discharge from these devices will be to the existing reticulated stormwater network in compliance with any relevant network discharge consent(s) and/or Auckland Unitary Plan permitted activity standards. Where known contamination is present discharge will be to the wastewater network with a trade waste permit.

The accumulated sediment will be removed from the devices and disposed of with other excavated material, either directly off site or via the surge stockpile. Material from known contaminated sites shall be disposed of in line with the CLMP.

4.2 CHEMICAL TREATMENT – SEDIMENT REMOVAL

As an initial activity during the shaft excavations a sample of soil will be taken and tested for reactivity with various reagents to determine if chemical treatment will improve the efficiency of the Lamella Clarifiers.

This testing will be undertaken in accordance with Section F1.0 of GD05

4.3 CHEMICAL TREATMENT – PH BALANCING

Where pH has fallen outside of the required limits (5.5 – 8.5), this will be corrected in a similar manner to the dosing with PAC within the sediment retention tank:

- To achieve an increase in pH, Soda Ash (Sodium Carbonate) is to be used.

- To achieve a decrease in pH, Sodium Bisulphate will be used.
- To achieve a change of 1 pH unit, 30g of the appropriate chemical will be added for each 1000L of water. This is to be mixed fully and then left to settle for 1 hour. Note the 30g can be premixed in 10L of water to assist in mixing.
- After 1 hour if the pH level is still insufficient then a further dose at 25% (7.5g per 1000L) of the original rate and a further settlement period of 2-3 hours allowed before retesting.

If after 2 more doses (25% rate) the required pH is not achieved specialist advice is to be sought or the contaminated water is to be removed from site for disposal by vacuum trucks to an offsite licenced wastewater disposal facility.

5 REINSTATEMENT

As areas of the project are completed these areas will be reinstated to pre-construction details.

All areas within existing pavement areas will be reinstated to the pre-construction road surface.

6 MONITORING

The monitoring and inspection of the site, and in particular, erosion and sediment controls will be undertaken in five main stages.

- Pre-Construction Inspection.
- As-Built Inspection.
- Informal Random Inspections.
- Regular Recorded Inspection.
- Post-Storm inspections
- Final Inspection.

Pre-Construction Inspection

The pre-construction Inspection will be used to ensure that the controls detailed on the specific Erosion and sediment control plan are appropriate and will be effective. This inspection will also be used to show and confirm that the site foremen for the areas are fully aware of the requirements in these specific areas.

The pre-construction Inspection will be undertaken by the Environmental Advisor, the Project Engineer and the Superintendent.

As-Built Inspection

The as-built Inspection will be undertaken as soon as the controls detailed on the specific Erosion and Sediment Control Plan have been constructed. This inspection will verify that the controls have been constructed correctly and that all storage volumes etc. are correct.

The as-built Inspection will be undertaken by the Environmental Advisor or Project Engineer.

Note that in accordance with typical consent conditions it is expected that the consents will require the submission of as built certificates before the commencement of bulk earthworks.

Informal Random Inspection

The informal random Inspections will verify that the approved controls are installed correctly and that they are operating efficiently. Any maintenance issues will be immediately rectified. Any minor adjustments to the erosion and sediment control measures will be determined at this time.

The random inspections will be undertaken by the Environmental Advisor, the Project Engineer, the Superintendent or any manager onsite.

Regular Recorded Inspections

The regular recorded Inspections will be undertaken weekly to verify that any maintenance requirements are being carried out and that these requirements are being completed in an appropriate timeframe. These inspections will also provide an opportunity to fine tune any existing controls to improve their efficiency.

The Weekly Inspections will be undertaken by the Environmental Advisor, Site Engineer or Project Engineer.

Final Inspection

The final inspection will be undertaken on areas that have been stabilised to verify that the erosion and sediment controls can be removed.

The final inspection will be undertaken by the Environmental Advisor, the Project Engineer and the Superintendent.

Maintenance

The maintenance of the erosion and sediment controls will be undertaken as required to always ensure that the sediment and erosion controls in place remain effective in the prevention of adverse environmental effects.

Typically, the following timeframes will be followed:

- The removal of accumulated sediment within sediment retention devices will occur before the total storage volume of the device has been reduced by 50%.
- Any perimeter controls requiring maintenance will be repaired immediately after the maintenance issue is found.
- Internal controls such as contour drains etc. will be repaired prior to forecast rain.
- Any failure of controls as a result of, or during, rain events will be repaired as soon as is practical taking account the location, nature of the failure, ground conditions and weather conditions.

7 PROBLEM SOLVING

In the event that the installed erosion and sediment controls are performing at a standard less than anticipated by GD05, the following options for improvement will be considered:

1. Is the lack of performance due to a significant rainfall event?
    - Confirm that any reduction in performance is not due to a significant rainfall event in excess of the devices design criteria.
2. Is the lack of performance due to a structural failure?
    - Confirm that any reduction in performance is not due to a structural failure such as a rip or tear in a silt fence for instance.
3. Is the lack of performance due to inappropriate use?
    - Confirm that any reduction in performance is not due to 'human error', direct pumping to the outlet of a sediment control tank for instance.
4. Are the design assumptions correct?
    - Is the dewatering device suitable for the flow rate or has it changed?
    - Have the slopes of the contributing catchment changed due to site activities?
    - Have the overland flow paths changed due to site activities?

If the above issues do not highlight any specific non-compliance with the design principles of GD05, the options for improving the efficiency of the controls will include:

1. Can the exposed areas be reduced?
    - Can the exposed areas be reduced by staging?
    - Can the exposed areas be reduced by temporary stabilisation?
2. Can a 'higher level' of control be installed?
    - Where the compliant control is for instance a silt fence, with a typical control efficiency of 50% sediment retention, can a higher efficiency control such as a DEB (75%) be installed?
3. Can the works be accelerated to reduce the duration of discharge?
    - Can alternative construction methods, additional plant or materials be used to accelerate the works to reduce the duration of any actual or potential discharge?

8 RECORDS

The following records will be maintained for recording erosion and sediment control inspections:

- Weekly Inspection Check Sheets.
- Council Erosion and Sediment Control Inspection Reports (To be added as undertaken).