



WINSTONE
AGGREGATES

Part
B

Boffa Miskell



Appendix B12.8.11

Chemical Treatment Management Plan

Winstone Aggregates

Hunua Quarry



Chemical Treatment Management Plan

Hunua Quarry

1.0 Purpose and Objective

The purpose of this Chemical Treatment Management Plan (CTMP) is to implement procedures, monitoring, reporting and contingency plans to appropriately treat surface and ground water arising from the Symonds Hill working area of Hunua Quarry, prior to discharge.

The objective of the Chemical Treatment Management Plan is to ensure the safe and effective use of chemicals when used to treat discharges of surface and ground water from the Symonds Hill working area.

A copy of this management plan is to be retained on-site and to be available for use by the Quarry Manager or site personnel at all times.

2.0 Resource Consents and other Requirements

Auckland Council Earthworks and Discharge Permits

TO BE UPDATED UPON GRANTING OF CONSENTS

Annual Erosion and Sediment Control Management Plan

TO BE UPDATED UPON GRANTING OF CONSENTS

General Responsibilities

Winstone Aggregates has a general responsibility to implement all consent conditions and to abide by this, and other management plans for Hunua Quarry. Financial provision has been, and will continue to be made, by Winstone Aggregates to achieve the purpose and objective of this plan in a timely and orderly manner.

The success of this management plan relies heavily on appropriate actions by Winstone Aggregate personnel in the operation and maintenance of the chemical dosing system, and in the collecting, storage and reporting of discharge water monitoring information. Training will be given as required to all personnel involved in the following areas:

- Storage and handling of water treatment chemicals;
- Chemical treatment dosing procedures and operation;
- Maintenance of Rainfall Activated Dosing System;
- Batch dosing of discharge water ponds;
- Monitoring of discharge water quality;
- Record keeping and reporting of results; and
- Supervision of operation, maintenance, monitoring and reporting of chemical treatment.

Specialist technical assistance will be used as required to assist in the management, operation or review of the water treatment system.

3.0 Description of Water Treatment Operation

Chemical Treatment at Hunua Quarry

Chemical treatment of surface water will be completed using CHEMICLEAR 102, an EC-15P Poly Aluminium Chloride (PAC) inorganic macro molecule coagulant blended with an aqueous solution of a cationic homopolymer. The SDS sheet for CHEMICLEAR 102 is contained as Appendix 1.

CHEMICLEAR 102 is provided to site in 1080 kg IBC's which are placed directly next to each rain activated dosing system atop a concrete structure using the appropriate on-site machinery.

The chemical used for erosion and sediment control will be reviewed as required, and updates made to this management plan accordingly.

General Rain Activated Dosing System

All ponds that are treated using CHEMICLEAR 102 are treated using a rainfall activated dosing system known as a FlocBox (Appendix 2). Additional roof structures are attached as required in order to sufficiently dose the pond based on catchment area and required dosage. The specifications for each FlocBox are contained within the relevant technical document. The CHEMICLEAR102 is contained in 1080kg IBC's atop concrete structures near each FlocBox. Reviewing of each FlocBox will occur following each major rainfall event using the following methodology:

1. Empty rainfall tank
2. Top up chemical reservoir from 1080kg IBC of water treatment chemical
3. Position discharge tube to dose water treatment chemical to the surface water flow channel
4. Check chemical reservoir and rainfall tank weekly and after each significant rainfall event (greater than 50mm).

4.0 Water Treatment Dosing Procedure

Procedures for the Storage and Handling of CHEMICLEAR 102

- Do not eat, drink or smoke while handling the product
- Ensure disposable or rubber gloves and all other site-required PPE are worn
- Wash hand immediately after use
- Remove any contaminated clothing immediately and launder before reuse.

Dosing using Rain Activated Dosing Systems

Each FlocBox will be set up by a technical professional in order to conform with the technical report for each relevant pond.

Maintenance on FlocBoxes on site will be undertaken by appropriately trained on-site staff.

Batch Dosing of Discharge Pond

Batch dosing of discharge ponds may be required if the water quality within these ponds is not suitable to discharge or may adversely affect the receiving water environment.

Discharge from a pond being batch dosed will be ceased while batch dosing is occurring to limit adverse effects to the receiving water environment. The batch dosing methodology is as follows:

1. Raise and secure the pond decant above the water level in the pond. This is to limit any ongoing discharge while batch dosing is being undertaken.
2. Add 10litres of water treatment chemical to the water cart while filling with clean water.
3. Use the water cart's hose to spray the dilute water treatment chemical from the water cart onto the surface of both ponds. Stand so that the spray of the hose will be as parallel as possible to the pond side. This will create a swirling motion in the pond to get even mixing.
4. Once the surface of the discharge pond has a 100mm or greater layer of clear water, resume discharges by lowering the floating decant. If not, repeat the batch dosing procedure. If the top surface of the pond is still not clear, seek the advice of a technical advisor.
5. Thoroughly check that the discharge from the sediment pond is suitable for discharge.
6. Depending upon discharge water quality, this procedure may have to be repeated during prolonged rainfall events (every 25mm of rainfall).

Any batch dosing will be recorded using the Batch Dosing Record Sheet (Appendix 6).

5.0 Specific Water Treatment Sites

Hunua Quarry Gate Pond

The Hunua Quarry Gate Pond contains a water treatment process using a rainfall activated dosing system. The Hunua Quarry Gate Pond accepts water from areas of the stockyard and quarry entrance road and discharges directly into Hays Stream. The Hunua Quarry Gate Pond has the potential to pump back up to the Hunua Quarry Process Water Pond for operational use. A large amount of the catchment is covered in vegetation, and therefore has a lower sediment contribution than an uncovered area of the same volume.

The Hunua Quarry Gate Pond will be treated using a rainfall activated dosing system shown as the FlocBox 1.0 option in Appendix 4. No additional roofing structures will be added, as the FlocBox 1.0 option provides appropriate tray size for the catchment area.

The appropriate setup for the FlocBox 1.0 to dose at 31.0 ml/m³ is contained in Appendix 4.

Symonds Hill RL150m Sediment Retention Pond

The Symonds Hill RL150m Sediment Retention Pond (RL150m Pond) collects surface water from the areas of the haul road that provides access to the Symonds Hill Pit, as well as benches to the north east of the Symonds Hill Pit that are sequentially developed over the life of the pit. This pond discharges into Symonds Stream through a category 1 tributary. Accumulated sediment is periodically excavated from this pond as required.

The RL150m Pond will be treated using a FlocBox 0.50 with one additional roofing structure with a sizing of 0.940 m² due to the size of the catchment serviced by the RL150m Pond as discussed in the technical document in Appendix 4.

The dose of CHEMCLEAR 102 will be dosed at a rate of 62 ml/m³ as per the calculations shown in Appendix 4.

Symonds Hill RL110m Sediment Retention Pond

The Symonds Hill RL110m Sediment Retention Pond (RL110m Pond) collects surface water from the Symonds Hill Haul Road and the benches to the north of the Symonds Hill Pit Sump. The RL110m Pond has the ability to receive water from the Symonds Hill Pit Sump following groundwater or surface water inflows. The RL110m Pond discharges into Symonds Stream through a category 1 tributary. Accumulated sediment is periodically excavated from this pond as required.

The RL110m Pond will be treated using a FlocBox 0.5 with one additional roofing structure with a sizing of 0.940 m² as per the technical document in Appendix 4 due to the catchment size.

The dose of the CHEMICLEAR 102 at the RL110m Pond will be 40 ml/m³ as per the calculation in Appendix 4.

Additional Structures

Any additional structures constructed will have the

6.0 Monitoring of Discharge Water Quality

Pond water quality in the Hunua Quarry Gate Pond, RL150m Pond, RL110m Pond and Symonds Hill Pit Sump must be checked and sampled following 15mm of rainfall in any 7am to 7am period.

Hunua Quarry Gate Pond

1. Sample the discharge and receiving waters 10m upstream and 30m downstream of the discharge point when the pond is discharging following 25mm of rainfall in any 7am to 7am period.
2. Analyse samples for turbidity and suspended solids.

Symonds Hill RL150m Sediment Retention Pond

1. Sample the discharge and receiving waters 10m upstream and 30m downstream of the discharge point when the pond is discharging following 25mm of rainfall in any 7am to 7am period.
2. Analyse samples for turbidity and suspended solids.

Symonds Hill RL110m Sediment Retention Pond

1. Sample the discharge and receiving waters 10m upstream and 30m downstream of the discharge point when the pond is discharging following 15mm of rainfall in any 7am to 7am period.
2. Analyse samples for turbidity and suspended solids.

Any additional structure that is constructed will have the same monitoring mechanisms implemented.

7.0 Record Keeping and Reporting of Results

The results of sampling, observations and pumping records will be kept within the Environmental folder of the P:// drive on the Fletcher Building Ltd Intranet.

The monitoring record will be used to record the performance of the site discharge against discharge performance standards and will provide information to refine the treatment systems and water quality control.

Results obtained from water samples will be compared with visual observations, and any inconsistencies noted.

The results of water quality monitoring are reported to Auckland Council at quarterly intervals with an annual report, as well as an annual review of the AESCMP.

8.0 Spill Contingency Plan

The following procedures will be undertaken in the event of a spillage of water treatment chemical (CHEMCLEAR 102).

Small Spills:

Apply absorbent material such as crusher fines or Spillsorb and shovel into appropriate containers for mixing in with sediment excavated from the water treatment pond or managed fill accepted into the site. Traces should be hosed away with large amounts of water.

Large Spills:

Dam the spill with earth, sand, Spillsorb or absorbent socks to prevent it from entering water or drains. The bulk of the spill should be pumped into suitable containers for adding back to the dosing tank.

The remaining product which cannot be pumped should be treated as for Small Spills.

Following any spill:

- Immediately notify Hunua Quarry Manager, Environmental Advisor or the assigned deputy
- If water treatment chemical has been swallowed, do not make the casualty vomit. Refer to appended SDS (Appendix 1) for advice for specified response

Reporting of Spills:

- Report any incident involving spillage of water treatment chemical to the Hunua Quarry Manager, Environmental Advisor or the assigned deputy as soon as possible after the spill.
- The Hunua Quarry Manager, Environmental Advisor or the assigned deputy will report any spillage, which has, or is likely to cause contamination of surface or groundwater to Auckland Council as soon as possible after the event has been identified.
- Record all incidents in Radar.

Appendix 1

Design Details of Water Treatment System

Specific Design Details of Water Treatment System

The chemical treatment system for water runoff from the quarry working area consists of a surface drainage channel, rain activated water treatment chemical dosing equipment and discharge sediment retention pond.

The current elements of the water treatment system are described in detail below and shown diagrammatically on the attached flow chart. The actual location of these elements of the water treatment system may change with time as the quarry floor is excavated and changes are made to site infrastructure.

Water Treatment Chemical Dosing Equipment

The chemical treatment dosing system is a standard rainfall driven activated system (Figure 1) which has been developed specifically for Auckland earthworks sites and is compliant with the Auckland Council's Technical Publication GD05. The system uses a rainfall catchment tray to capture rainfall, with the size of the tray determined by the required chemical dose and the catchment area being treated.

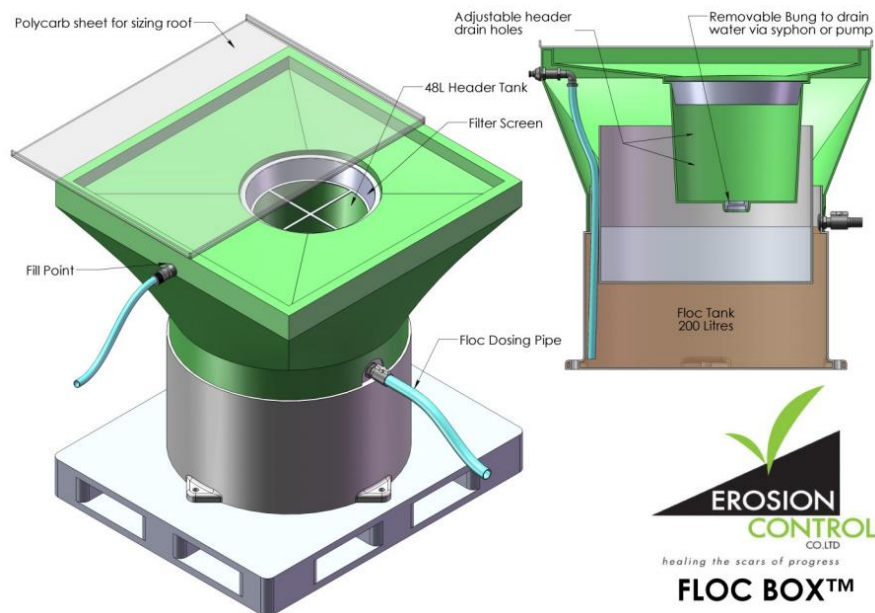


Figure 1: Rainfall Activated Dosing System (Erosion Control Co Ltd, 2010)

Rainwater caught by the catchment tray is piped to a header tank, and then discharged in a controlled manner to a displacement tank, which floats inside the larger storage tank containing PAC. The collected rainwater causes the chemical to dose to discharge through a small 3mm outlet pipe discharging to the stormwater inlet channel upstream of the forebay to the detention pond.

The header tank is designed to delay any chemical discharge during the initial minutes of rainfall under dry conditions, and for attenuation of the chemical flow during the early stages of a storm. The discharge is unrestricted during the peak storm period but is attenuated again after rain has ceased at the end of a storm.

The treatment systems will contain sufficient chemical to treat at least 200mm of rainfall on this site.

Floc socks or floc blocks may be used from time to time to treat discharge water flows. Floc socks or floc blocks would be placed in the surface water channels leading to the discharge water pond.

If required, batch dosing of discharge ponds will be undertaken using the site water cart using the procedure in Appendix 2.

Sediment Settling Ponds

RL150m Sediment Retention Pond

The RL150m Sediment Retention Pond will be located to the east of the current Symonds Hill works area and will discharge to Symonds Stream, via a small category 1 stream. The outlet from the pond will consist of a concrete riser and three floating decants connected to the riser. Accumulated sediment is periodically excavated from this pond.

A rainfall activated dosing system is used to treat rainfall run off entering the sediment pond. The initial flocculation trial has been completed, and the rain activated dosing system will be set up to perform as determined in 'Hunua Quarry RL150m Chemical Treatment Management Plan, 22 April 2021'.

Batch dosing will be used as required to treat discharge ponds when the water quality is not suitable to discharge.

RL110m Sediment Retention Pond

The RL110m Sediment Retention Pond is located on the western boundary of the Symonds Hill working area and discharges to the Symonds Stream, via a small category 1 stream. The outlet from this pond consists of a concrete riser and three floating decants connected to the riser. Accumulated sediment is periodically excavated from this pond.

A rainfall activated dosing system with one additional roof panel is used to treat rainfall run off entering the sediment pond as determined by a technical assessment.

Batch dosing will be used as required to treat discharge ponds when the water quality is not suitable to discharge.

Hunua Quarry Gate Pond

The Hunua Quarry Gate Pond is located at the far north western corner of the Hunua Quarry site, near the front gate and site access road to the Hunua Quarry site. The pond discharges to Hays Stream through a concrete riser with one floating decant connected to the riser.

Accumulated sediment is periodically excavated from both bodies of the pond. A rainfall activated dosing system is used to treat rainfall run off entering the sediment pond.

A rain activated dosing system will be used to treat water reporting to this pond. This system will be set up as part of the technical document that has been appended as part of Appendix 4.

Batch dosing will be used as required to treat discharge ponds when the water quality is not suitable to discharge.

Appendix 2

Water Treatment Chemical Dosing Procedure

Water Treatment Chemical Dosing Procedure

Contents

- 1.0 Water Treatment Chemical Storage and Handling
- 2.0 Water Treatment Chemical Dosing Tank
- 3.0 Maintenance of Valves and Lines
- 4.0 Batch Dosing of Discharge Ponds
- 5.0 Rainfall Activated Chemical Treatment
- 6.0 Monitoring of Discharge Water Quality
- 7.0 Record Keeping and Reporting of Results

1.0 Water Treatment Chemical Storage and Handling

The water treatment chemical CHEMICLEAR 102 used to treat water discharge from the site is supplied in a liquid form in 1080kg plastic IBC's which are placed directly next to the rain activated dosing system.

The chemical hazards associated with the coagulant and spill procedures are set out in the Spill Procedures.

Procedures for the Storage and Handling of Water Treatment Chemicals

No special measures are required in the general handling of water treatment chemicals.

- Do not eat, drink or smoke while handling this product;
- Ensure disposable or rubber gloves and safety glasses are worn;
- Wash hands after use; and
- Remove any contaminated clothing immediately and launder before reuse.

Notes

- IBC's of water treatment chemicals are stored near the rain activated dosing system atop a concrete structure and are suitably banded in order to ensure any spill is suitably contained.

2.0 Water Treatment Chemical Dosing Tank

Water treatment chemical for the sump pump is currently supplied in 1080kg plastic IBC's to service the rainfall activated dosing system. The IBC's are transported around site using a suitable vehicle.

3.0 Maintenance of Tanks, Lines and Valves

The water treatment chemical is dosed into the channel leading to the sediment pond through lines from the dosing tank. The line incorporates a valve to stop the flow of the water treatment chemical at the dosing tank's outlet. A tri valve system is used from the IBC to the rainfall activated dosing system, followed by a two valve system from the rainfall activated dosing system to the dosing point.

The lines must be checked for any signs of wearing or fatigue, cuts or nicks that may let in air on the suction side of the dosing pump and leak water treatment chemical on the discharge side of the pump. The valves must be in working order.

The following procedure is required to be undertaken whenever the rainfall activated dosing system is refilled.

Procedure

1. Check all lines for signs of wear, cuts or fatigue.
2. Ensure all connections are secure with no sign or evidence of water treatment chemical or air leaks.
3. Check all valves are operational and appropriately set.

4.0 Batch Dosing of Discharge Ponds

Batch dosing of discharge ponds may be required if the water quality within these ponds is not suitable to discharge and may adversely affect the receiving water quality should a discharge occur.

This requires mixing diluted water treatment chemical into the pond and allowing the pond to clear.

While batch dosing is being undertaken, all discharge from the pond should cease. This can be achieved by lifting the pond decant above the pond water level or by stopping pump discharges to the Symonds Stream from the Symonds Hill sediment pond.

The batch dosing record form must be completed.

Batch Dosing Procedure (Symonds Hill RL110m, RL150m and RL170m and Hunua Quarry Front Gate Sediment Ponds)

1. Raise and secure the pond decant above the water level in the pond. This is to limit any ongoing discharge while batch dosing is being undertaken.
2. Add 10litres of water treatment chemical to the water cart while filling with clean water.
3. Use the water cart's hose to spray the dilute water treatment chemical from the water cart onto the surface of both ponds. Stand so that the spray of the hose will be as parallel as possible to the pond side. This will create a swirling motion in the pond to get even mixing.
4. Once the surface of the discharge pond has a 100mm or greater layer of clear water, resume discharges by lowering the floating decant. If not, repeat the batch dosing procedure. If the top surface of the pond is still not clear, seek the advice of a technical advisor.
5. Thoroughly check that the discharge from the sediment pond is suitable for discharge.
6. Depending upon discharge water quality, this procedure may have to be repeated during prolonged rainfall events (every 25mm of rainfall).

5.0 Rainfall Activated Chemical Treatment

A rainfall activated dosing system has been located to chemically dose rainfall runoff prior to entry into the Symonds Hill RL170m, RL150m, RL110m and Hunua Quarry Gate Sediment Retention Pond.

The rainfall activated system relies on regular maintenance to remove excess rainwater and the topping up of the water treatment chemical.

Floc socks and/or floc blocks may be used to treat discharges. Floc socks or floc blocks will be placed in surface water flow channel upstream of the discharge water ponds.

Rainfall Activated Dosing Procedure

1. Empty rainfall tank

2. Top up chemical reservoir from 1080kg IBC of water treatment chemical
3. Position discharge tube to dose water treatment chemical to the surface water flow channel
4. Check chemical reservoir and rainfall tank weekly and after each significant rainfall event (greater than 50mm).

6.0 Monitoring of Discharge Water Quality

Pond water quality in the Symonds Hill RL110 sediment pond, Symonds Hill RL170m sediment pond, Hunua Quarry Gate pond and Hunua Pit's Ma's Pond must be checked following 15mm rainfall events and batched dosed as required to achieve an acceptable discharge water quality.

Symonds Hill RL110m Sediment Pond

1. Sample the discharge and receiving water whenever the pond is discharging following 15mm or more rainfall has been recorded in the previous 24 hours.
2. Test samples for turbidity, suspended solids and pH.

Symonds Hill RL150m Sediment Pond

1. Sample the discharge and receiving water whenever the pond is discharging following 15mm or more rainfall has been recorded in the previous 24 hours.
2. Test samples for turbidity, suspended solids and pH.

Hunua Quarry Gate Pond

1. Sample the discharge and receiving water whenever the pond is discharging following 15mm or more rainfall has been recorded in the previous 24 hours.
2. Test samples for turbidity, suspended solids and pH.

7.0

The establishment and maintenance of a record of monitoring results and observations is essential in the operation of the Symonds Hill sediment pond and treatment of all discharges prior to discharge.

The results of sampling, visual observations and pumping records will be kept within the Environmental folder of the P:\\ drive on the Fletcher Building intranet.

The monitoring record will be used to record the performance of the site in terms of discharge water quality and will provide information to refine or up-grade the treatment system and procedures.

Each result must, however, be checked for accuracy as it is entered into the monitoring record.

Checking will involve comparing the test results with visual observations noted on the sample record sheet. Re-testing or a comment may be required for unusual test results.

The results of the monitoring are reported to the Auckland Council at quarterly intervals with an annual assessment of erosion and sediment control measures contained within the AESCMP.

Procedure

A) Water Treatment Chemical Dosing Record Sheet

1. Attach the results of monitoring of discharges to the relevant Dosing Record Sheet
2. Retain a copy of the Dosing Record Sheet together with any monitoring results.

B) Rainfall Activated Chemical Treatment Record Sheet

1. Maintain a weekly log of inspections, volume of water treatment chemical used and maintenance undertaken.

C) Batch Dosing Record Sheet

1. Complete the Batch Dosing Record Sheet whenever batch dosing is performed.
2. Attach the results of monitoring of discharges to the relevant Batch Dosing Record Sheet
3. Maintain a computer record of batching details and monitoring results
4. Retain a copy of the Batch Dosing Record Sheet together with any monitoring results.

Material Safety Data Sheet

1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

PRODUCT NAME: CHEMICLEAR 102
OTHER NAMES: PAC blend

ADDITIONAL INFO: PAC/PolyDADMAC blend
Cationic polymer in aqueous solution

Typical use: Coagulant for water treatment.
NZ Supplier: Erosion Control Co Ltd, Silverdale, Auckland
Telephone: 09 426 8292
Fax: 09 426 8293
Emergency No: NZ Poisons Centre 0800 764 766
Email: info@erosioncontrol.co.nz

2. HAZARDS IDENTIFICATION

Not classified as a Dangerous Goods under NZS 5433:2012 Transport of Dangerous Goods on Land.

Classified as Hazardous according to criteria in the HS (Minimum Degrees of Hazard) Regulations 2001.

Signal Word – WARNING



Subclasses:

- 6.1 Category D Substances which are acutely toxic
- 6.3 Category A Substances irritating to the skin
- 6.4 Category A Substances irritating to the eye

Hazard Statements:

- H302 Harmful if swallowed
- H315 Causes skin irritation
- H319 Causes serious eye irritation
- H332 Harmful if inhaled

Prevention Statements

- P102 Keep out of reach of children
- P103 Read label before use

P104 Read Safety data sheet before use
P264 Wash hands and any exposed skin thoroughly after handling
P270 Do not eat, drink or smoke when using this product
P280 Wear protective clothing, gloves and eye/face protection

Response Statements

P101 If medical advice is needed, have product container or label at hand.
P301+P312 IF SWALLOWED: Call a poison centre or doctor/physician if you feel unwell.
P302+P352 IF ON SKIN: wash with plenty of soap and water.
P330 Rinse mouth.
P331 Do NOT induce vomiting.
P332+P313 If skin irritation occurs. Get medical advice/attention.
P362 Take off contaminated clothing and wash before re-use.
P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P337+P313 If eye irritation persists: Get medical advice/attention.

3. COMPOSITION/INFOMRATION ON INGREDIENTS

Ingredient	Concentration	CAS No.	Hazard Code
Polyaluminium chloride	≥ 20 %	1327-41-9	H302; H319; H315
Polydiallyldimethylammonium chloride (PolyDADMAC)	1-10 %	26062-79-3	
Water	≤ 80 %	7732-18-5	

4. FIRST AID MEASURES

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Remove contact lenses, if present. Get medical attention if eye irritation persists.

Skin: In case of contact, immediately flush skin with copious quantities of water for at least 15 minutes while removing contaminated clothing and shoes. If swelling, redness, blistering or irritation occurs seek medical assistance. Wash clothing before re-use.

Inhalation: Remove victim to fresh air. Remove any contaminated clothing and loosen remaining clothing. Allow patient to assume a comfortable position and keep warm. If not breathing, give artificial respiration. If breathing is difficult give oxygen. Call a doctor/physician if effects persist.

Ingestion: Do NOT induce vomiting. Rinse mouth out with water and get medical/attention immediately.

5. FIRE-FIGHTING MEASURES

Extinguishing media: Foam, dry powder, carbon dioxide and sand
Special protective equipment: As for all fires involving chemicals.
For firefighters: Chemical protection suit, suitable gloves and boots, and self-contained breathing apparatus.

Specific hazards arising from substance or mixture:

- Non-combustible material
- May decompose on heating emitting fumes including hydrogen chloride

6. ACCIDENTAL RELEASE MEASURES

Personal precautions Use personal protective equipment/effective to prevent skin & eye contact & inhalation of dust

De-contamination procedures Residues or small spillages shall be rubbed by cloth and washed with clean water & soap.

Environmental precautions Clear area of all unprotected personnel.
Absorb spills with sand, earth or non-combustible absorbent material, sweep up & collect in suitable containers for disposal.
If contamination of sewers or waterways occurs, advise local emergency services.

7. HANDLING AND STORAGE

Handling precautions: Wear PVC or other plastic material gloves/rubber gloves for hand protection and wear goggles for eye protection. Do not eat or drink whilst handling the product.

Package: CHEMICLEAR 101 comes as a liquid in either 20, 200 or 1000 L vessels.

Storage conditions Avoid wet, damp and humid conditions.
Keep in a dry, cool place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering measures to reduce exposure: Ensure adequate ventilation. Use local exhaust if misting occurs. Natural ventilation is adequate in absence of mists.
HTP(8h)=2mg/M3 (Al) Finland
TVL=2mg/M3 (Al) (TWA) USA
MAK=6(F)mg/M3 (Al) Germany

Personal protection equipment

Respiratory Protection: In case of insufficient ventilation wear suitable respiratory equipment.

Hand Protection: PVC or other plastic material gloves.

Eye Protection: Safety glasses with side-shields. Do not wear contact lenses.

Skin & body protection: Chemical resistant apron or protective suits if splashing or repeated contact with solution is likely.

Hygiene measures: Wash hands and face before breaks and immediately after handling the product. When using do not eat drink or smoke. Handle in accordance with good industrial hygiene and safety practice.

9. PHYSICAL AND CHEMICAL PROPERTIES

Form: Clear or pale yellow liquid

Al₂O₃: 7.0% min.

Water Insolubles: 0.5% max.

pH: 3.5-5.0 (10% aqueous solution)

Specific Gravity (sg) 1.15 @ 20°C

Boiling point: above 100°C

Freezing Point/Range (°C) -10-14°C (approx)

Decomposition Point >150°C

Flash Point Non-combustible

10. STABILITY AND REACTIVITY

Stability Stable at ambient temperatures

Materials to avoid Acids, strong alkalis, calcium hypochlorite, metals

Hazardous decomposition No decomposition if stored and applied as directed

11. TOXICOLOGICAL INFORMATION

No adverse health effects are expected if the product is handled in accordance with this safety Data sheet and the product label. Symptoms or effects may arise if the product is mishandled and overexposure occurs.

Acute toxicity:

-Oral: The product is not expected to be toxic

-Inhalation: The product is not expected to be toxic.

Irritation

- Skin: Prolonged skin contact may cause skin irritation.

- Eyes: May cause eye irritation.

Sensitization: No data available.

12. ECOLOGICAL INFORMATION

Low acute LC50 to fish, but not expected to cause long term adverse effects to aquatic environment as the product is quickly bound to naturally occurring dissolved organic carbon and particulate material.

LC50/96 hour/algae 1.5-2 mg/L (Al-Cl)

Toxicity to bacteria 12 mg/L (Al-Cl)

Lc50/48 hour/ daphnia 3.9 mg/L (Al-Cl)

13. DISPOSAL CONSIDERATIONS

Waste from residues/unused: Dispose of as special waste in compliance with local and national regulations.

Contaminated packaging: Dispose of as special waste in compliances with local and national regulations.

14. TRANSPORTATION INFORMATION

Road & Rail Transport:

Not classified as a Dangerous Good under NZS5433:2012 Transport of Dangerous Good on Land.

Marine Transport:

Not classified as Dangerous Goods by the International Maritime Dangerous Goods Code (IMDG Code) for Transport by Sea. Non-dangerous goods.

Air Transport:

Not classified as Dangerous Goods by the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by Air. Non-dangerous goods.

15. REGULATORY INFORMATION

The product is not a hazardous article and need not to be labeled according to EC-Directives as amended.

16. OTHER INFORMATION

Notes: The information contained in this safety data sheet is given in good faith. It is accurate to the best of our knowledge and belief and represents the most up to date information. The information given in this data sheet does not constitute or replace the user's own assessment of workplace risk as required by other health and safety legislation.

No liability will be accepted for injury, loss or damage resulting from failures to take consideration of information or advice contained in the SDS.

Appendix 3

Batch Dosing Record Sheet

Batch Dosing Record Sheet

Operator _____

Date _____

Pond Details

Pond Location

Reason for Turbidity

Batch Dosing Details

Initial Batch Dose

Water Treatment Chemical

Volume Added

Time of Adding

Result / Comments

Second Batch Dose

Volume Added

Time of Adding

Result / Comments

Additional Information

Appendix 4

Flocculation Trials

Winstone Aggregates Ltd
Symonds Hill
Hunua Quarry
Sediment Management Control Programme

October 2013

Prepared For: Keith Barber, Winstone Aggregates Ltd
Jon Tomsett, Erosion Control Ltd

Prepared By: Stephen Leech,
Consulting Engineer, Auckland

Aims:

- ❖ Evaluate performance of alternative coagulants on soil samples from Symonds Hill supplied by Winstone Aggregates Hunua Quarry & determine best performing
- ❖ Determine details for Sediment Control Programme using Rain Activated chemical dose system based on results from coagulant testing

Summary:

- A/** Erosion Control sediment control chemicals will produce water that can be discharged from ponds & meet consent rules
- B/** EC-PAC will settle clay slimes over 24 hrs
- C/** EC-PAC will produce water clarity suitable for discharge
- D/** EC-15 will produce water suitable for discharge within 20 mins compared to EC-PAC requiring 60mins to 24 hrs
- E/** EC-15 usage is significantly lower than EC-PAC to achieve same clarity result
- F/** Potential chemical cost savings of between 20-40% are possible with EC-15 compared to EC-PAC.
- G/** EC-15 settle the clay slimes significantly faster than EC-PAC
- H/** EC-15 give much denser or more compact flocs so less prone to wind mixing & easier pond de-watering
- I/** This work is done in accordance with ARC TP90 & TP227 guidelines

CHEMICAL TREATMENT MANAGEMENT PLAN FOR SYMONDS HILL STORMWATER RUNOFF

1. INTRODUCTION.

Coagulation treatment of the site runoff is proposed, using EC-15 dosing prior to the stormwater retention pond as indicated on the site plan provided. An automatic rainfall driven chemical dosing system will be installed to provide treatment into the inflow to the pond.

Stormwater runoff for this site is to be diverted directly to the retention pond.

The catchment for the retention pond is in three parts as indicated in the table below.

The design of this particular rainfall activated system is such that it can be adjusted to accommodate changes in catchment area by simply changing the open area of the roof. Please refer to the Appendix One, Roof Design for Rain Activated System for Winstone Aggregates, Hunua Quarry.

Parameter	unit	Data	Comment
Name			
Catchment	m ²	7,548	Blue area, unsure. Area used in calcs: 100%
	m ²	15,521	Red area, open & reports Area used in calcs: 100%
	m ²	23,197	Yellow area, unopen but proportion reports Area used in calcs: 40%
Catchment Area	m ²	32,350	Catchment area for calcs
Roof Length	m	2.4	
Roof Open Length	m	1.62	
Roof Cover Length	m	0.80	Refer to Appendix 1
Roof Area	m ²	1.55	Refer to Appendix 1 for design
Calc Roof Area	m ²	1.50	
EC-15 dose	Mg/l	48.0	Based on as received product
	Mls/m ³	40.0	Based on as received product

2. AUTOMATIC RAINFALL DRIVEN SYSTEM.

2.1 Introduction.

The proposed chemical treatment dosing system is a standard rainfall driven dosing system which has been developed specifically for Auckland earthworks sites, and is compliant with the Auckland Regional Council's Technical Publication TP90 'Flocculation Guidelines'. The system uses a rainfall catchment tray to capture rainfall, with the size of the tray determined by the required PAC dose and the catchment area being treated.

The PAC dose required to achieve satisfactory removal of suspended solids from stormwater depends on physical and chemical characteristics of the soil in suspension & retention pond design.

Rainwater caught by the catchment tray is piped to a header tank, and then discharged in a controlled manner to a displacement tank, which floats inside the larger storage tank containing PAC. The collected rainwater causes the PAC to dose to discharge through a small 3mm outlet pipe discharging to the stormwater inlet channel upstream of the forebay to the detention pond.

The header tank is designed to delay any PAC discharge during the initial minutes of rainfall under dry conditions, and for attenuation of the PAC flow during the early stages of a storm. The discharge is unrestricted during the peak storm period but is attenuated again after rain has ceased at the end of a storm.

Details of the header tank design and the attenuating upper and lower outlets and their locations are indicated in this report.

The treatment systems will contain sufficient chemical to treat at least 200mm of rainfall on this site.

2.2 Determination of dose required.

2.2.1 Sampling.

The chemical dose required to achieve satisfactory removal of suspended solids from disturbed earthworks or quarry stormwater runoff depends on both physical and chemical characteristics of the soil sample being tested.

A representative sample was supplied by Winstone Aggregates from typical materials in the catchments and mixed to give a representative catchment sample for the site suitable for testing.

A typical silt laden runoff solution was prepared from these samples for testing to determine the optimum dose in accordance with TP 90.

The stormwater sediment sample was 1.0 kgs of clay suspended in 20 litres of water & allowed to hydrate for a minimum of 24 hours before being used for testing. The testing was done on samples taken from the 20 litre sample.

2.2.2 Chemical Screening Methodology & Results:

The testing is based on standard water treatment testing procedures incorporating dosing of coagulants & polymers.

The testing is compliant with the Auckland Regional Council's Technical Publication TP90 'Flocculation Guidelines' & also considers TP 227 Flocculation Guidelines.

The soil samples were tested with diluted coagulants to achieve good mixing for testing purposes.

The testing was carried out on two soil samples supplied by EC Ltd to determine typical dose rates & if either PAC or alternative coagulants would settle the sediment & produce water suitable for discharge.

The chemical dose required in order to achieve satisfactory suspended solids removal is dependent on both physical & chemical properties of the sample.

Each sample was then assessed for clarity with the use of a Clarity Wedge*. The clarity of the supernatant was measured at 10, 20, 40 and 60 minute intervals and recorded.

The coagulants used were made down to 1% solutions for ease of use.

2.2.3 Results:

The results from the testing are shown in the following two graphs.

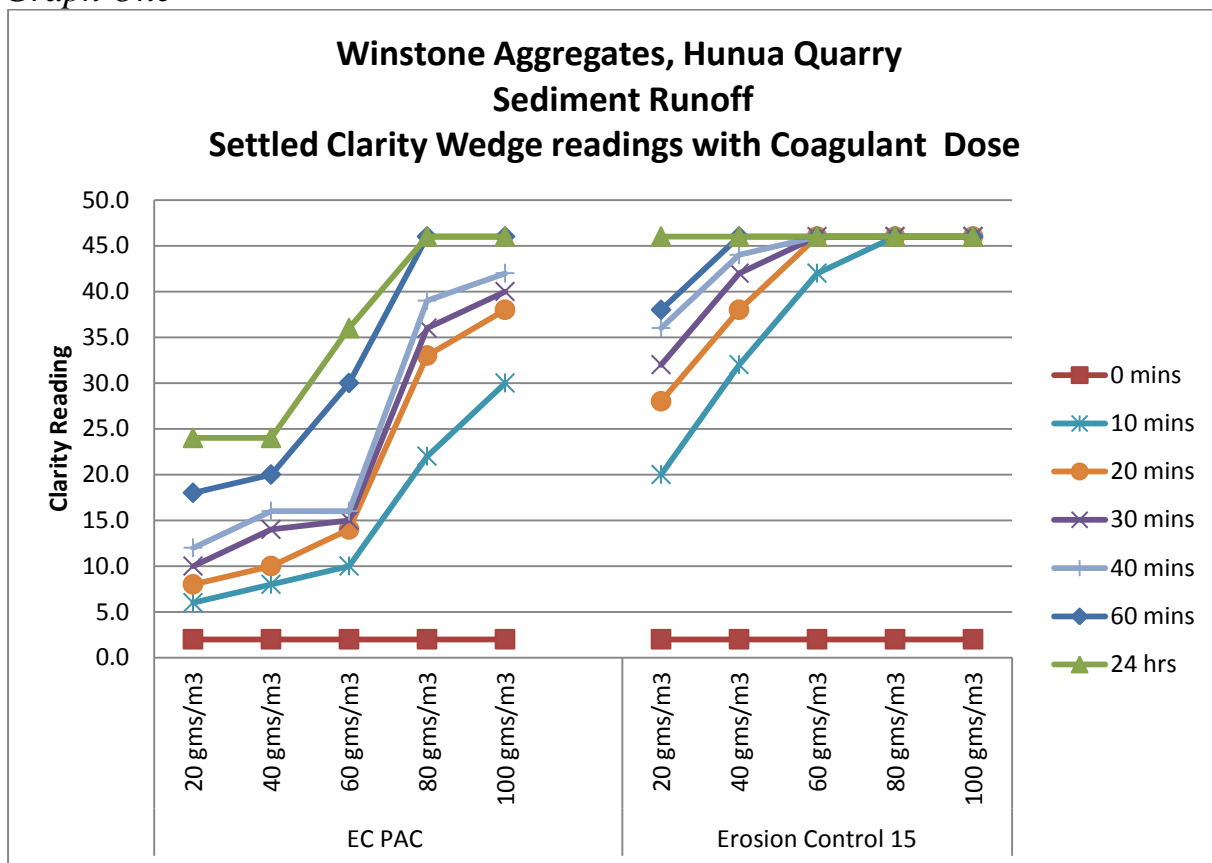
These results compare the Clarity Wedge Reading * of the supernatant at 0,10, 20, 30, 40 & 60 mins after coagulation began, as well as a reading after 24 hours settling.

The higher the clarity reading, the cleaner the supernatant is.

The Clarity reading for an untreated sample allowed to settle over 24 hours was 8, which is very low & visually very dirty compared to the chemically treated samples. Refer to *Graph Two* later for results.

* Clarity Wedge information can be provided if required

Graph One



Graph One, above, shows the Clarity readings for the soil sample supplied by Winstone Aggregates from Symonds Hill, treated with either EC-PAC or EC-15 sediment control products from Erosion Control.

The higher the curves the cleaner the water & the steeper the curve the faster the suspended solids settle, which are both important in sediment control programmes.

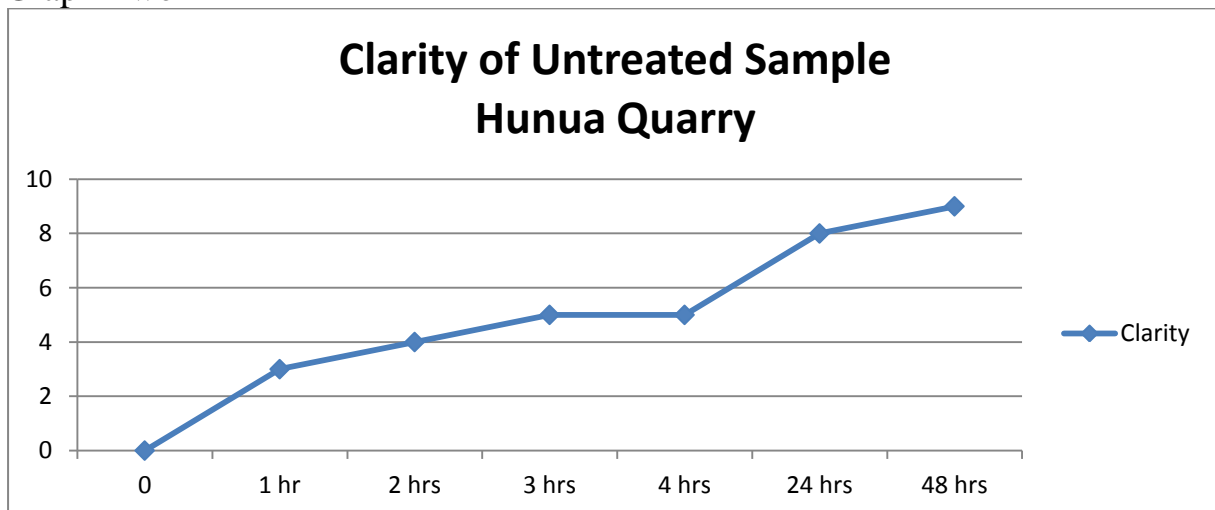
As can be seen in Graph One above, the two products evaluated showed they produce water that had good clarity (>40) after 60 minutes settling. What is different is that the EC-15 dose is significantly lower to achieve the same clarity reading compared to the EC-PAC dose on the lhs of the graph. The dosages are for EC-PAC at 80 gms/m³ vs 40 gms/m³ for EC-15.

If this performance is compared against the EC-PAC results where the dose required is 80 gms/m³, the EC-15 dose is 50% of the EC-PAC dose.

The EC-PAC dose response results are typical for Auckland soils, however the dose is high & will have an impact on the pH of the water being discharged. Also with such a high PAC dose there will be a significant amount of sediment produced & this will have an impact on the performance of the sediment pond, requiring regular cleaning or emptying to remove the sediment.

Graph Two, below, shows the soil sample clarity results for the untreated sample. As can be seen the sample does not settle & hence the clarity of the sample remains very poor, compared to the treated samples, even after 48 hours settling. By comparison the treated sample had a clarity of +46 after 60 minutes compared to the untreated sample clarity of 3 at the same time.

Graph Two



2.2.4 Result Conclusions

Property	EC-PAC	EC-15	Comment
Settling Rate	good	better	
Impact on pH	reduces	No affect	Check discharge pH requirements
Turbidity	Meets guidelines	Meets guidelines	low
Dose Rate	80 ppm	40 ppm	Lower dose
Dose Rate	80 mls/m ³	40 mls/m ³	Lower Dose
Ease of dosing	good	good	same
Environmental	ok	better	
		Preferred option	

2.2.5 Design Parameters

The Optimum Dosing Rate

Coagulant	Dose rate	Final pH	Chemistry	Comment
PAC	80.0 ppm	4.6	aluminium	Industry standard
EC-15	40.0 ppm	5.2	Blended Organic coagulant	alternative

This result requires a Shed Roof Area of **1.55 Sq/M**

The Header Tank Lower 3mm Ø outlet will be set at the **12.5Lt** capacity level.

The Upper 10mm Ø outlet will be set at the **26L** capacity level.

The Header Tank minimum size for pond one shed is 50L

2.3 Area of rainwater catchment tray required.

The rainwater catchment tray size is determined from the dose rate and the potential total opened work catchment area draining to the ponds. If the catchment area draining to any of the ponds 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 up-stand over the lower end of the tray, thereby allowing the rain which falls on the plywood to run to waste.

This is effectively altering the roof area that collects rain & is therefore controlling the area inside the up-stand around the edge of the tray.

Refer to Appendix 1.

2.4 Stormwater channel and dosing injection point.

Where practical, every attempt should be made to concentrate all the in-flow into a single channel at least 6 metres upstream of the sediment pond it is entering. This is so the injected chemical is evenly mixed prior to entry to the fore-bay/pond required to be dosed.

The chemical needs to be added into the stormwater pond inlet channel before it reaches the area of ponded water in the forebay (or the pond) to allow for thorough mixing of the coagulant into the storm water to ensure good sedimentation results.

The dosing injection point should be staked in place at a location where the coagulant will fall or enter into the stormwater flow during periods of low flow. The stormwater can be diverted using “socks” available from Erosion Control. The end of the dosing tube should be only a few centimetres above the stormwater channel to ensure that the chemical falls into the stormwater, and is not blown around during periods of strong wind.

2.5. Monitoring and Maintenance requirements.

The monitoring of the Flocculation system will be undertaken by the Site Foreman with regular checks being made by the Engineer to ensure compliance.

The monitoring will be undertaken each day following rain & at least once per week if no rain.

All results are to be recorded as per Table Two.

2.5.1 Routine monitoring and maintenance.

Instructions for routine monitoring and maintenance of the chemical treatment system are summarised in Table 2.

A copy of this table will be placed in the chemical treatment shed inside a waterproof zip lock bag.

Routine weekly attendance should be undertaken for monitoring and recording of each pond and the shed status.

The clarity of the water in the retention ponds will be monitored using the black disc method. This will consist of a 50-80mm diameter black painted disc attached to the bottom of a 1 metre long wooden ruler with a centimetre scale starting at the end to which the disc is attached. The disc is lowered vertically into the water near the pond outlet until it disappears, and is then moved slowly towards the surface until it is just visible. The depth of reappearance in mm is recorded as the clarity of the water.

After moderate or heavy rain the dosing points should be checked to ensure that the Coagulant is being delivered into the stormwater flow during low flow conditions.

The integrity of the catchment tray, particularly the seal between the tray and the Up-stand should be checked monthly on each shed to ensure all rainfall is captured & sent into the top tank.

The catchment tray should also be checked & cleaned of any debris that has built-up on the roof to ensure it does not overflow & therefore under dose.

2.5.2 Contingency Management.

A plan must be put in place to manage contingent events in accordance with site environmental management plans. Contingencies could include poor performance of the treatment system, vandalism, stormwater damage or effects of other influences on stormwater quality.

If the treated water any of the ponds is consistently very clear to depths greater than 100mm, it could indicate overdosing, and the possibility of a lowered pH which can present a risk to receiving waters, as a result of elevated free aluminium concentration in the discharge if pac is used. If the treated water is consistently clear, the pH of the water in any pond should be retested.

Contingencies such as poor treatment performance or consistently very clear treated water should be dealt with by consultation with the appropriate organisation or its representative.

After rain, draining the header tank is required at least on the 3rd day and 6th day following rain, and possibly more frequently if the treated water in the pond is consistently clear.

A treatment chemical spill contingency plan is provided in Section 2.9 below.

2.6 Record keeping and Reporting to monitoring council or its representative.

A copy of the weekly monitoring records will be available on file and a regular monthly summary sheet provided to council or its representative.

The integrity of the treatment system will be checked weekly during both dry and wet weather. This check will include a quick check of the plumbing, a check that the header tank hoses are clear, and a check of the dosing point to ensure that the chemical would drop into the stormwater flow from the site.

We can provide the Weekly monitoring visit records as well as other monitoring & these can be compiled into a monthly summary report.

2.7 Storage of chemical on site.

Bulk EC- PAC is supplied by the manufacturer in 200L polyethylene drums will be kept in secure storage if on the site. PAC drums will be stored on end with the screw caps uppermost.

Top up of PAC chemical will be made weekly as part of the regular inspection regime.

Empty PAC drums will be washed out with water, and the wash water poured onto dry soil well away from any watercourse. Drums will be disposed of to a drum recycling company.

2.8 Procedure for transportation of PAC or alternative flocculation chemicals.

The transport of Flocculation chemicals to & from the project will be undertaken by commercial carriers in accordance with current Hazardous Goods, Traffic & Transport

regulation. They will normally deliver the chemical to site in 20 litre containers 200 litre drums and/or 1,000 litre IBC's. PAC weighs about 250kg in 200 litre drums and is most easily moved within the site in a loader bucket.

The use of these or any other chemical must be done in accordance with the Site Health & Safety Plan.

2.9 Chemical spill contingency plan.

If there is a spill of PAC onto the ground it will be immediately contained using earth bunds to prevent it entering water. The spilt PAC should be recovered if possible and placed in polyethylene containers. If the spilt PAC cannot be recovered, it should be mixed with a volume of soil equal to at least ten times the volume of spilt PAC, and buried in dry soil.

If there is a spill of PAC into pond water, discharge from the pond to natural water should be prevented. Contact the Council or its representative for advice on appropriate action.

If there is a spill of PAC or other chemical into flowing water:

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

should be identified and advised. Contact the Council or its representative qualified

to advise on appropriate action

2.10. Chain of responsibility for monitoring and maintaining the chemical treatment systems on site.

The earthworks contractor shall have primary responsibility for maintenance and monitoring the effectiveness of the chemical treatment system on the site.

A service may be subcontracted to Erosion Control or its agents to provide regular monitoring of the ponds, servicing of the sheds and assembly of the monitoring reports if required.

2.11 Training of person responsible for monitoring and maintenance of chemical treatment systems.

Erosion Control or its agents can provide regular monitoring and servicing of the Flocculation system or can undertake regular training of site personnel to carry out the routine monitoring and maintenance of the chemical treatment system, and the required record keeping.

TABLE 2.

INSTRUCTIONS FOR MAINTENANCE OF FLOCCULATION CHEMICAL TREATMENT SYSTEMS FOR EARTHWORKS STORMWATER.

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 RESERVOIR.

The 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 chemical 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 dosing does not have an unacceptable effect.

PERIODIC SYSTEM CHECKS.

Check that the rainfall catchment tray is not leaking - especially along the lower or back 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 with leaves or other foreign debris.

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.

% Header full.

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 chemical volume added. 1 drum PAC = 200L, 9cm in PAC
200L drum = 20L. Can be calculated from change in water level in
displacement tank where 1cm change = 4 litres of PAC.

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

Key Data Sheet
Winstone Aggregates
Symonds Hill, Hunua Quarry
Floc Management System.

Dosing Shed & Site Testing Information

Report & Test: October 2013

Clients Name: **Winstone Aggregates Ltd**

Location of Ponds: Symonds Hill, Hunua Quarry

Catchment Area: $7,548m^2 + 15,521m^2 + 23,197m^2 @ 40\%$
3.235 ha effective for rainfall calcs

The Optimum Dosing Rate is: 80.0 mls/m³ for EC-PAC
 40.0 mls/m³ for EC-15

Parameter Name	unit		Comment
Catchment	m ²	7,548	Blue Area (100% reporting)
Catchment	m ²	15,521	Red Area (100% reporting)
Catchment	m ²	23,197	Yellow Area (40% reporting)
Catchment	ha	3.235	Effective catchment for these calcs
Roof length	m	2.40	Standard plywood sheet (1200x2400)
Roof Area	m ²	1.55	
Roof Open Length	m	1.620	Measured from high end of roof
Roof Cover length	m	0.80	This is the ply cover on roof
Calc Roof Area*	m ²	1.50	
EC-PAC dose*	mg/l	5.20	As Al ₂ O ₃
	mls/m ³	80.0	As received
EC-15 dose	mg/l	2.10	As Al ₂ O ₃
	mls/m ³	40.0	As received

Appendix One

Rain Activated Shed Roof Design:

This Rain Activated shed is designed to accommodate changes in the catchment area.

This is achieved by having a full sized rain catchment tray made from standard H3 exterior 1200x2400 sheet of ply, with the edge upstand to be 100x50 H3 timber on its edge.

The upstand on the tray, at the drain end should form a “V” shape at the lower end to bring the water into the outlet to the header tank. This “V” avoids potential issues that can arise from water sitting in the tray when the shed & tray are not level. The drain to the header tank should be through the ply wood base, approximately 50 mm from the edge & sealed with a suitable sealer to prevent leaks.

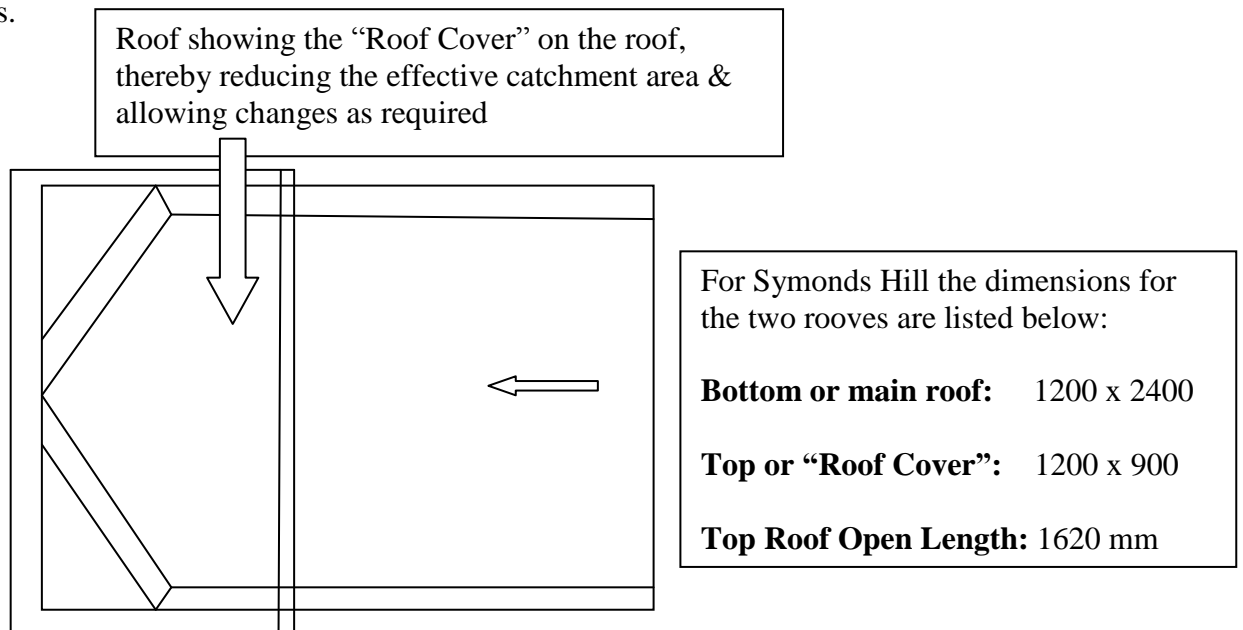
The grade for the Catchment Tray should be approximately 10:1 (H:V), toward the discharge point.

Modification to be able to adjust Roof Area:

The Rain Activated system is designed around one catchment area & if the catchment area changes then roof design / area needs to be adjusted accordingly.

This can be done easily by having a second ply roof which is screwed to the 100x50 edge & covers on a part of the roof, leaving exposed the required roof area to collect the rainfall.

The second roof MUST be screwed over the lower part of the roof so any rain will fall off the second roof & not enter the catchment roof area. There should be a piece of 50x50 screwed across the front of the second roof to reduce rain being driven into the catchment tray when there is heavy rain or high winds.



**Winstone Aggregates Ltd,
Hunua Quarry.**

Attention: Cameron Russell, Environmental Advisor,
Hunua Quarry

Subject: Quarry Access Road Sediment Pond Testing

Cameron,

Please find below the results from the two water samples collected from the Access Road sediment pond at the Hunua Quarry on 7 September 2020.

The testing was done to confirm the suitability of the current floc used in the quarry on the sediment that is entering the road sediment pond from the catchment above and along the road.

Two water samples were taken for testing from the catchment, one from the small pit on the left hand side of the road and the other from the road side (right hand side) as there was water flowing due to recent rain.



Water Sample from Road side pit (LHS)



Water Sample from Road side pit (RHS)

Test Results

Both water samples were tested with Chemclear 102 (formally EC15) which is the current floc used in the quarry to determine if the floc would improve the clarity of the water in the pond by settling out the sediment.

The test results are shown in the two tables below.

<i>Table 1</i> <i>Water Sample 1</i>		Clarity Results (mm)			
Left Hand Side Road Pit		Chemclear 102 Dose Rate (mls/m ³)			
		<i>Organic Blend</i>			
as recd	blank	31.0	62.0	94.0	125
as Al ₂ O ₃	0.0	2.0	4.0	6.0	8.0
Settling Time (mins)					
0	0.00	0.0	0.0	0.0	0.0
5	0.00	0.0	0.0	10	25
10	0.00	20.0	25.0	25	30
20	10.0	60.0	80.0	80	>100
30	10.0	95.0	>100	>100	>100
60	10.0	>100.0	> 100	>100	>100
120	10.0				
Coagulation	none	good	Very good	<i>overdosed</i>	<i>overdosed</i>
pH@ 2 hrs	7.73	7.60	7.47	7.27	7.05
Turbidity (NTU)	>1000	38.8	23.6	19.2	28.5
Dose	<i>x</i>	<i>Very Good</i>	<i>Very good</i>	<i>Very good</i>	<i>overdosed</i>
		recommended			

The dose that gives the required clarity to meet Auckland Council GD05 guidelines for sediment ponds is highlighted in blue in table 1 above.

As can be seen the clarity is >100mm in 30-60 minutes settling and the pH is within Auckland Council range of 5.50 – 8.50 for a sediment pond treated with coagulant.

Therefore this result (Table 1) shows that Chemclear 102 would meet the requirements for both settling out sediment and producing water of a suitable clarity for discharge.

<i>Table 2</i> <i>Water Sample 2</i>		Clarity Results (mm)			
Right Hand Side Road Pit Sample		Chemclear 102 Dose Rate (mls/m ³)			
		<i>Organic Blend</i>			
as recd	blank	31.0	62.0	94.0	125
as Al ₂ O ₃	0.0	2.0	4.0	6.0	8.0
Settling Time (mins)					
0	0.00	0.0	0.0	0.0	0.0
5	0.00	0.0	10.0	10	25
10	0.00	35.0	35.0	35	35
20	10.0	65.0	80.0	80	>100
30	10.0	>100.0	>100	>100	>100
60	10.0	>100.0	> 100	>100	>100
120	10.0				
Coagulation	none	good	Very good	<i>overdosed</i>	<i>overdosed</i>
pH@ 2 hrs	7.55	7.35	7.27	7.13	6.85
Turbidity (NTU)	>1000	42.8	28.6	16.2	25.5
Dose	<i>x</i>	<i>Very Good</i>	<i>Very good</i>	<i>Very good</i>	<i>overdosed</i>
		recommended			

The results for the pond sample show that a dose of 31 mls/m³ will give the required clarity and has minimal impact on the final pH.

The results from this work indicate that Chemclear 102 will give required results and will maintain water within Auckland Council GD05 guidelines.

Rain Activated Dose System:

Based on the results from the Chemclear 102 testing and the catchment area (2.29 ha) that reports to the sediment pond the Rain Activated Dose System can be calculated that will meet the Auckland Council guidelines for rain activated dose systems.

The calculations are shown in Table 3 on page 4 for the rain activated dose system indicates that a system with a 0.86 m² catchment tray would be suitable for this application.

Table Three

Designation				
Site Name	Hunua Quarry, Access Road Pond			
Site Address	Hunua Quarry, Access Road Pond			
Sample No.	S1		Date	9/10/2020
Plan Ref	Hunua Site Drawing			
Pond Type	SRP	Floc Shed Setup Data		
Shed Name	SRP 1	FLOC SHED	FlocBox 1.0	FlocBox 2.0
Catchment Area	ha	2.29	2.29	2.29
Product	C102			
Dose Rate	gms/m3	31.00	31.00	31.00
	mg/l	2.00	2.00	2.00
Catchment Tray	m2/ha	0.375	0.375	0.375
1.0 Litre Chemical Treats	m3 of stormwater	32.258	32.258	32.258
Shed Roof				
Tray Size	m2	0.859	0.859	0.859
Extension Roof	m2		-0.141	-1.391
Header Tank Ø	0.4			
Low flow / 3mm orifice	Height (mm)	39.00	82.00	43.4
	Volume (litres)	10.31	10.31	10.31
High Flow/10mm orifice	Height (mm)	78.01	164.01	86.7
	Volume (litres)	20.61	20.61	20.61
Header Tank Min Height	mm	128.01	x	x
Rainfall to Treat	mm		232.9	465.8

Summary:

- Chemclear 102 dosed at 31 mls/m³ would settle the sediment in the pond and have water with a clarity of >100mm after 30-60 minutes settling.
- A rain activated dose system will be suitable for this application, as per details in Table Three above.

Any questions do not hesitate to contact me to discuss

Stephen Leech BE,

Water Quality Engineer/Consultant

Mobile: 027 777 3 222

Email: sandeleech@gmail.com



Hunua Quarry, RL 150 SRP

Chemical Treatment Management Plan

22 April 2021
Revision 00

For: Cameron Russell, Environmental Advisor, Hunua Quarry

Prepared By: Stephen Leech, BE
Reel Blue Environmental
Ph 027-777-3-222
Email: sandeleech@gmail.com

22 April 2021

Chemical Treatment Management Plan

Reel Blue Environmental has been engaged by Winstone Aggregates, Hunua Quarry to complete the testing for the new sediment pond (RL150 Sediment Pond) treatment options for treating the run-off to maintain water quality from any discharge from this pond, as per Auckland Council GD05 requirements.

Therefore the requirement to prepare this CTMP for the Hunua Quarry, to meet any consent conditions relating to chemical treatment of stormwater discharges from site.

This CTMP provides details on the treatment methodology for the sediment control & treatment for the stormwater run-off from the earthworks and stripping operation. The detail provided in this report is based on information provided by Winstone Aggregates & has not been independently verified by Reel Blue Environmental.

This Chemical Treatment Management Plan (CTMP) includes detail on the monitoring & operation of a Rain Activated flocculation treatment system which is required to increase the efficiency of the Sediment Retention Pond (SRP).

This work has been done in accordance with the revised Auckland Council GD05/2016/update 2018, Erosion & Sediment control guidelines for land-disturbing activities in the Auckland region, of which the sect F2.1.6 is shown below.

F2.1.6 Limitations

The following limitations apply to treatment:

- pH must be tested as part of the bench testing methodology and should be used as a control baseline. Whatever flocculant is being used must not change that baseline from a pH beyond +/-1 and must not fall outside of the range of 5.5 – 8.5, as measured from the primary spillway
- Treatment should cease when the above pH limits cannot be met (when using PAC)
- Treatment requires a high degree of monitoring and maintenance (refer Section F2.2)
- Spills of reagents can have significant adverse effects on the receiving environment
- In significant rainfall events (>15 mm in 24 hours), the rate of use needs to be carefully monitored so that the system does not run out of reagent.

Due to the above limitations, treatment should only be implemented under the supervision of a suitably experienced and qualified professional.

Revision Table

Date	Revision	Reason

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CHEMICAL TREATMENT MANAGEMENT PLAN (CTMP) FOR SITE STORMWATER RUNOFF

1.0 INTRODUCTION.

Coagulation & flocculation treatment of site stormwater runoff is proposed, dosing via rainfall activated dose system into the inflow of the new RL150 stormwater sediment retention pond (1 SRP proposed) at Winstone Aggregates Hunua Quarry or manual batch dosing if required, due to water clarity results in the SRP.

Chemiclear102 is recommended as the treatment material (floc) for this site, based on these test results from the soil samples collected & tested from this site. The testing compared Chemiclear102 dosages on the samples and results included clarity readings & final water pH, after 30-60 minutes settling as per GD05 requirements. The pH results for the treated samples are within the range (6.50-7.40 pH) and this is within the range recommended by Auckland Council (pH 5.50 - 8.50) for stormwater sediment pond discharges, if treated with flocculent.

The runoff sediment is from an area used to dispose of overburden from the quarry operations and also some cleanfill that is brought in for disposal.

The dose required for the individual samples is shown in the table below. All individual samples achieved good settling & clarity results in 30/60 minutes with clarities of >100mm achieved.

Stormwater runoff for this site is to be diverted directly to the Sediment retention pond or two DEB's as detailed below.

1.1 Site Catchment Details:

Sample Designation	Catchment		Chemical	Dose
	Label	Area		
Pond Catchments				As received (mg/L)
RL 150 SRP	RL 150 SRP	1.96 ha max	Chemiclear102	62.0

*Please note we have estimated the catchment area from discussions on site and details supplied
The dose rates shown above are from Reel Blue Environmental testing on the samples collected from site.
The dose rate recommended here is based on individual sample testing.*

2.0 AUTOMATIC RAINFALL DRIVEN SYSTEM.

2.1 Introduction:

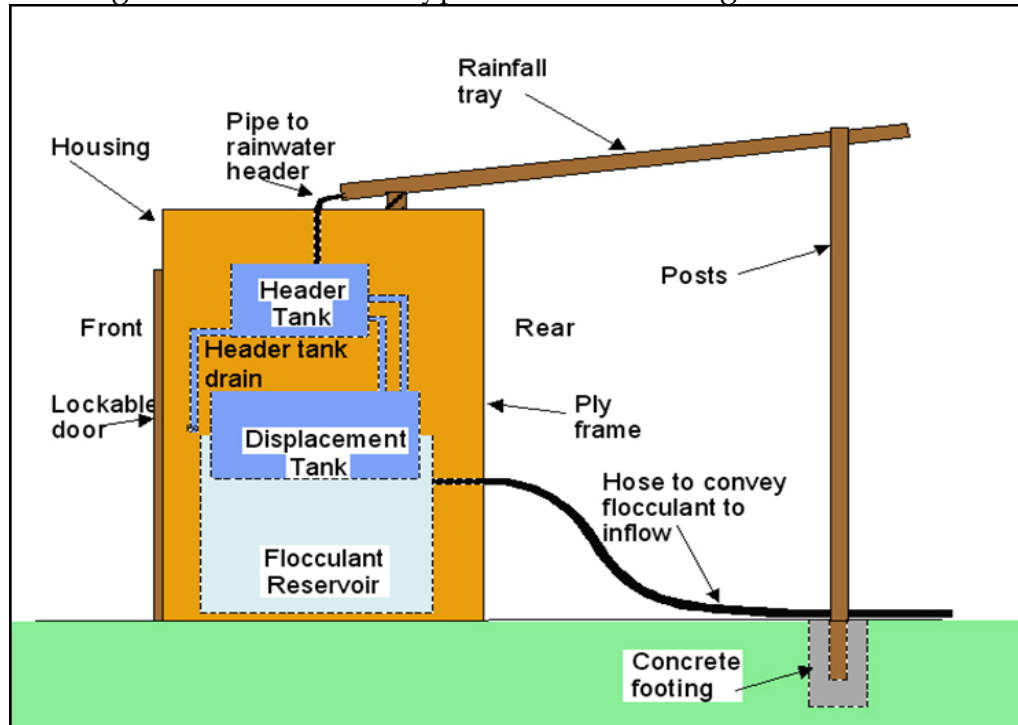
Sediment Retention Pond Dosing

The proposed chemical treatment dosing system for the RL150 sediment retention pond (SRP) is the standard rainfall activated dosing system, which has been developed specifically for earthworks sites, and is compliant with the Auckland Regional Council's Technical Publications TP90 & TP 227, 'Flocculation Guidelines' & the new revision of GD05 guidelines (GD05/2018). The system utilises a rainfall catchment tray to capture rainfall, with the size of the tray determined by the required coagulant dose and the catchment area being treated.

The chemical dose required to achieve satisfactory removal of suspended solids from stormwater depends on both physical and chemical characteristics of the soil in suspension & retention pond design & is based on these test results.

Rainwater caught by the rainfall catchment tray is piped into a header tank, discharging in a controlled manner to a displacement tank, which is floating inside a larger storage tank containing coagulant. The collected rainwater displaces the coagulant & causes it to discharge through a small outlet pipe discharging into the stormwater inlet channel upstream of the forebay to the detention pond.

The diagram below shows a typical floc shed configuration.



The header tank is designed to delay dosing during the initial rainfall, especially under dry conditions & for attenuation of the coagulant flow during the early stages of a storm event. The discharge is unrestricted during the peak storm period but is attenuated again after rain has ceased at the end of a storm event.

Details of the Rainwater Activated system design and the attenuating tanks are detailed in this report elsewhere. (p 22)

The treatment systems will typically contain sufficient chemical to treat approximately 200mm of rainfall from each catchment.

The method proposed for the rain activated dosing method is a floccbox for the SRP.

2.2 Determination of dose required.

2.2.1 Sampling.

The chemical dose required to achieve satisfactory removal of suspended solids from disturbed earthworks stormwater runoff depends on both physical and chemical characteristics of the soil sample being tested.

Three (3) soil samples were collected from site, from the catchment area & mixed with water to give typical representative stormwater sediment runoff samples for coagulant testing, as per GD05 guidelines. The soil samples are representative of the typical types of soils to be encountered in the earthworks phase of this development. Water samples were also taken from the ponds for comparative testing also.

The GD05 guidelines are included below for completeness.

Appendix F1.2 Step 2: Making the soil slurry

- 1) Weigh out 1 kg of the soil sample.
- 2) Add the soil to 1 L of water and mix into a slurry. Break up any clumps by hand.
- 3) Add 19 L of rainwater to make a total volume of 20 L.
- 4) Stir the soil/water mixture for three minutes to ensure an even suspension of sediment in the water. Ideally this should achieve a turbidity range of between 2000 – 3000 NTU. Note, this will depend on soil type; for example, with sandy soils a lower turbidity range might be expected.

Sample Designation	Catchment	Sample Description	Sample Solution Appearance
Sample 1	1.960 ha	Fractured rock/overburden	Dark tan/yellow suspension
Sample 2		Mixed overburden/clays	Light orange/tan suspension
Sample 3		Run-off sediments	Orange suspension

2.2.2 Bench Testing Methodology

Flocculant testing was conducted following the new GD05/2018 guidelines:

- Appendix F1.0 Bench Testing Methodology
- Appendix F1.3 Step 3: Setting up the bench test jars
- Appendix F1.6 Step 6: Interpreting test results

A jar stirrer was used to complete the testing at dose rates typical for similar Auckland soils & results for each sample are shown in the results tables below.

The samples were dosed simultaneously in 1 litre jars at the different dose rates & included a blank control sample, to compare the use of chemical aided flocculation on the sediment & final water clarity.

The coagulant solutions were diluted 100 to 1 for testing purposes.

The clarity of the samples was recorded at 5, 10, 20, 30 & 60 minute intervals. Clarity (in mm) was measured by lowering a 30mm Secchi disc into the sample and when no longer visible, raising the disc to the point where it becomes visible again. This depth is the clarity, read to nearest 5 mm.

The sample was also tested with a Hach turbidity meter to obtain a turbidity reading (NTU) as a reference. For reference, 1.0 NTU is drinking water quality.

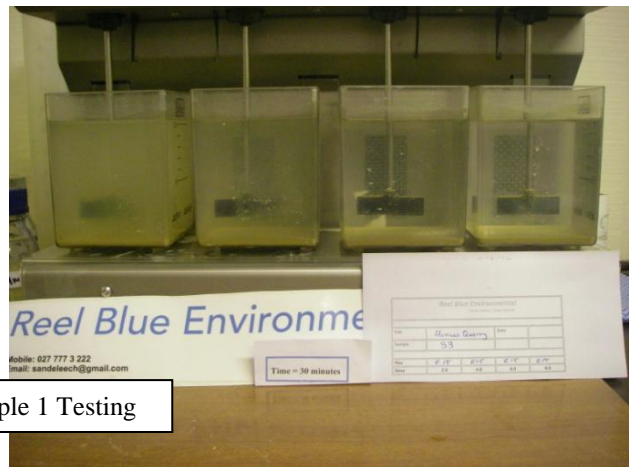
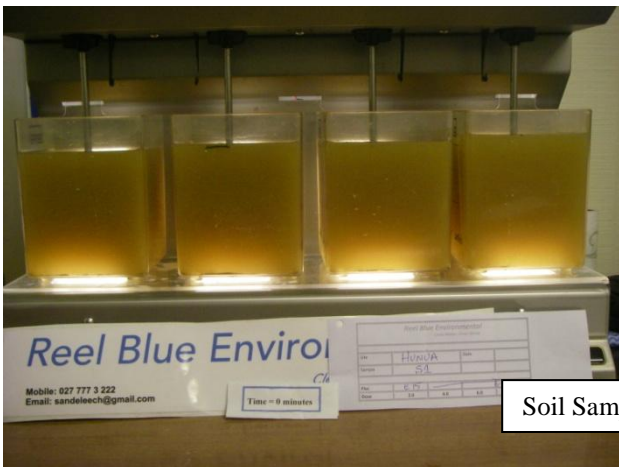
pH was also recorded for each sample after 2 hours.

2.2.3 Results Summary from bench tests.

The results from the bench testing gave low dosages to obtain very good coagulation & settling from all samples as shown in summary below.

Property	Chemiclear102	Comments
Chemistry	Aluminium blend	
Settling Rate	good	Important
Effect on pH	Reduces slightly	Check discharge pH requirements
Clarity	>100 mm	
Turbidity	Meets/exceeds guidelines	Very good
Dose Rate	62 mls/m3	As supplied
Blank pH	6.95	Combined
Final pH	6.85	pH within Auckland Council guidelines
Ease of dosing	good	same
Environmental	Very good	
Overall	Very good results recommend	

Soil Samples from Site



Soil Sample 1 Testing

2.2.4 Test Results

The test results in the tables below are from soil samples from site when tested with Chemiclear102.

Sample 1 Results

<i>Soil Sample 1</i>		Clarity Results (mm)			
		Chemiclear102 Dose Rate (mls/m ³)			
as recd	blank	31.0	62.0	94.0	125.0
Settling Time (mins)					
0	0.00	0.00	0.00	0.00	0.00
5	0.00	25	25	25	30
10	0.00	45	45	50	65
20	10.0	85	85	85	>100
30	10.0	105	>100	>100	
60	10.0	>100	>100		
120	10.0				
Coagulation	none	good	good	Very good	Very good
pH@ 2 hrs	6.95	6.92	6.88	6.85	6.80
Turbidity*(NTU)	>1000	26.8	14.2	10.7	16.5
Dose	<i>x</i>	<i>recommended</i>	<i>Very good</i>	<i>Over dosed</i>	<i>Over dosed</i>

Note:

The dose highlighted in blue is recommended dose for this sample, based on these test results.

*The turbidity after 60 minutes settling.

As can be seen in Table 1 above, the dose required to achieve the >100mm clarity after 60 minutes on Sample 1 is 31 mls/m³ of Chemiclear 102.

The 31mls/m³ results with Chemiclear 102 are good and gave good flocculation while at the same time giving very good settling rates, with the required clarity being achieved in 30-60 minutes settling time. The result for the 62 mls/m³ dose are slightly better however the required clarity is still achieved after 30 minutes compared to 31mls/m³, however this dose may be a slight overdose, so we would recommend the lower dose be used. Also the higher dosages have more impact on lowering the pH.

The impact on sample pH is such that it is within Auckland Council guideline values and within the ± 1.0 pH unit now required by GD05/2018 (sect F2.1.6 Limitations).

Sample 2 Results

<i>Soil Sample 2</i>		Clarity Results (mm)			
		Chemiclear102 Dose Rate (mls/m ³)			
as recd	blank	31.0	62.0	94.0	125.0
Settling Time (mins)					
0	0.00	0.00	0.00	0.00	0.00
5	0.00	10	10	20	30
10	0.00	25	35	40	55
20	10.0	35	60	65	80
30	10.0	45	90	>100	>100
60	10.0	45	>100		
120					
Coagulation	none	poor	adequate	good	good
pH@ 2 hrs	6.65	6.55	6.50	6.45	6.45
Turbidity*(NTU)	>1000	355	56.6	17.9	7.7
Dose	x	Underdosed	adequate	Very good	overdosed

Note:

The dose highlighted in blue is the recommended dose for this sample.

*The turbidity result after 60 minutes settling.

As can be seen in Table Two above, Chemiclear 102 achieved the required clarity at a dose rate of 62 mls/m³ compared to the 31 mls.m³ for Sample 1.

The clarity is >100mm with a dose of 62mls/m³ after 60 minutes. The clarity continued to improve with settling time, which is very good & suggests that the clarity would (possibly) continue to improve with increased time.

The higher dosages indicated possible over-dosing although there was minimal impact on the final pH.

The pH of the blank and treated sample (62 mls/m³) are within guideline range and within ±1.0 pH.

<i>Soil Sample 3</i>		Clarity Results (mm)			
Mixed sediments		Chemiclear102 Dose Rate (mls/m³)			
as recd	blank	31.0	62.0	94.0	125.0
Settling Time (mins)					
0	0.00	0.0	0.0	0.0	0.0
5	0.00	20	20	20	20
10	0.00	20	60	75	75
20	10.0	40	80	>100	>100
30	10.0	65	>100	>100	>100
60	10.0	65	>100		
120	10.0				
Coagulation	none	poor	Very good	<i>Very good</i>	<i>Very good</i>
pH@ 2 hrs	7.75	7.63	7.54	7.49	7.45
Turbidity*(NTU)	>1000	136	42.6	15.2	11.1
Dose	<i>x</i>	<i>Slightly Under dosed</i>	<i>Very good</i>	<i>Very good</i>	<i>Over dosed</i>

Note:

The dose highlighted in blue is the recommended dose for this sample.

*The turbidity result after 60 minutes settling.

The results for the sediment sample (Sample #3) are in line with the other samples tested for dose rate and pH results.

2.2.5 Testing Results Summary

As can be seen, the clarity results obtained from the testing show that Chemiclear 102 will give the required clarity of >100mm, with a dose of 31.0- 62.0 mls/m³ after 30-60 minutes settling, on both samples, which are highlighted in blue for each sample in the results tables (p8-10).

The dose rates are typical for quarry run-off and the Chemiclear 102 dose produced the required clarity after 30-60 minutes settling, although the dose has depressed the pH of the samples slightly, refer results tables for actual results, the change is within the ±1.0 range required. Auckland Council guidelines F2.1.6 require that the pH must be within ±1.0 and if the pH of the discharge is below pH 5.50, treatment should cease as there can be impact on the aquatic life in the receiving environment, so due care is always required

with the discharge from SRP's, although the sample results are all within the guideline range. If low pH is cause for concern then it can be adjusted if required using lime or soda ash.

Sample	Dose Rate	Floc	Base pH	Final pH	Δ	Within ± 1.0 pH
1	31.0	Chemiclear102	6.95	6.92	0.03	Yes
2	62.0	Chemiclear102	6.65	6.50	0.15	Yes
3	62.0	Chemiclear102	7.75	7.54	0.21	Yes

2.2.6 Test Result Recommendations

- I. Use Chemiclear 102 for sediment flocculation RL150 pond
- II. The recommended dose is 62mls/m³ as received
- III. This is 1.0 litre will treat 16.125 m³ of stormwater depending on required dose

3.0 Area of rainwater catchment tray required & Shed details

The rainwater catchment tray size for the SRP is determined from the dose rate and the potential total opened work catchment area draining to the ponds. If the catchment area draining to the ponds is changed, then the catchment tray size should also be changed accordingly. Reduction of the tray size is easily achieved by placing a piece of plywood on top of the up-stand over the lower end of the tray, thereby allowing the rain which falls on the plywood to run to waste or removing the tray altogether.

The details for the floc shed sizing are contained in the Appendix for this CTMP, p 22.

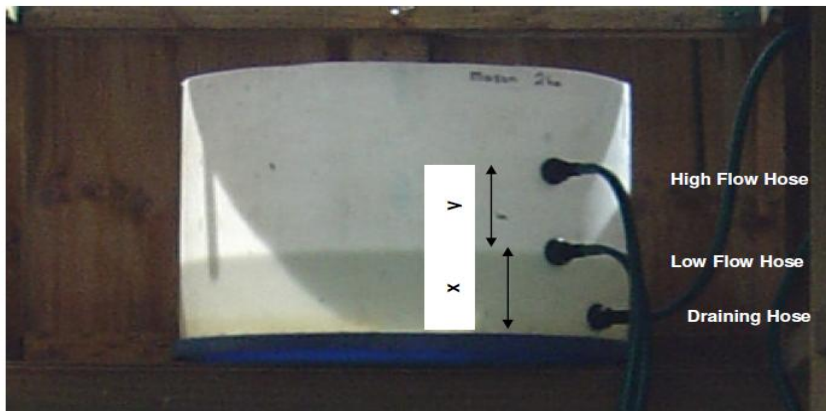
3.1 Header Tank Outlet Spacing

The volume between the drain (lowest) header tank outlet & the first dosing outlet is equal to 12mm of rainfall on the catchment tray & the volume between the first & second outlets is for an equivalent amount.

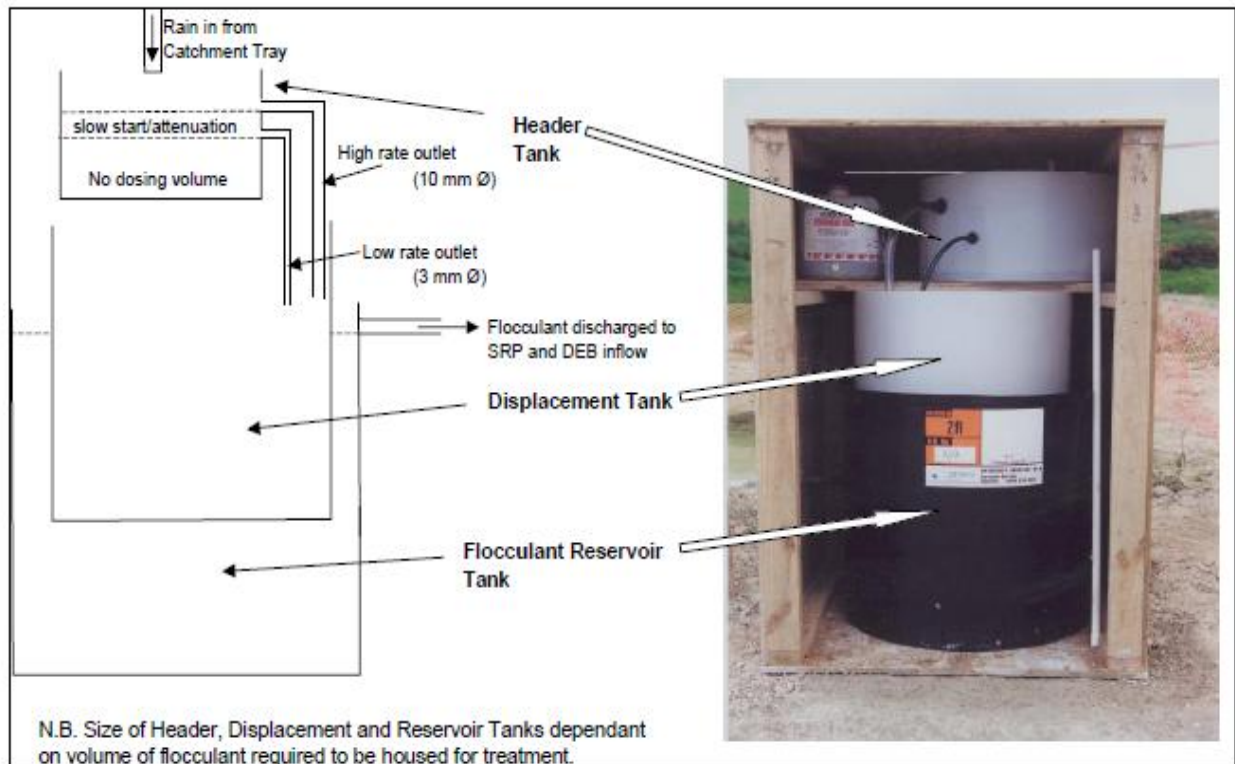
The volume of water in each section is shown in the table on p18. As can be seen the volumes are ok due to the catchment & dose rate. The heights given for the discharge points are based on using a 200 litre plastic drum as the header tank for the floc shed or alternatively for a floc box.

Ensure there is a drain point & hose installed at the lowest point in the header tank to allow the header tank to be drained as required as per this CTMP.

Header tank design for the floc shed is detailed in the Data sheet, page 18
 Note: Volume is into a clean dry tank & Volume Two is TOTAL Volume.



Discharge	Distance	Orifice Sizing		Notes
Low Rate Outlet	x	3 mm	Lower outlet	Measured from bottom
High Rate Outlet	y	10 mm	Higher outlet	



4.0 Sediment Retention Pond Dosing

Where practical, every attempt should be made to concentrate all of the **inflow into a single channel** at least 5 metres upstream of the fore-bay/pond it is entering. This is so the injected flocculation chemical is evenly mixed prior to entry to the forebay/pond required to be dosed. The intention is that the dosing will be done where the stormwater passes through a culvert, which will give good mixing of the floc into the stormwater. It is important to make sure the dose line is secure and will not move around in the wind.

The Chemiclear 102 needs to be added into the sediment retention pond (SRP) inlet channel before it reaches the area of ponded water in the forebay or the pond or ponds to allow for thorough mixing of the coagulant into the storm water to ensure good suspended solids removal.

4.2 Batch Dosing Procedure for Sediment Retention Ponds (SRPs)

This procedure will be used for batch dosing a SRP that is required to be treated due to poor water quality.

The trigger level for batch dosing the SRP will be 100mm clarity, i.e. when the clarity in the SRP falls below 100mm batch dosing will be undertaken according to the following procedures.

Prior to forecast rain (or if it is raining while staff are on site) the decants will be blocked either with a pre installed valve or crimped section of lay flat hose connected to the outlet of the decant or simply raising the decants to full height. This has the effect of stopping the SRP/DEB from discharging unless through the riser or over the emergency spillway due to heavy rain.

Following rainfall, the clarity will be checked & if less than 100mm chemical will be added to the SRPs by spraying it on the surface to evenly disperse it over the surface. The SRP water pH should also be checked & recorded at this time.

If the clarity is less than 100mm there is two options:

a/ Leave the SRP for a further 24 hours (preferred option) to determine if the clarity will improve, with more settling time

b/ Dose the SRP with floc at 100% of the original dose rate to ensure overdosing does not occur. (refer table p23 for batch dosing quantities)

If the clarity is less than 100mm & floc has been added to the SRP do so by spraying on to the surface to evenly disperse the floc over the entire surface. The floc should be diluted 50/50 with clean water to improve the mixing in the pond & final clarity results.

Once the SRPs have been treated with Chemiclear 102, settlement of suspended solids will typically begin to occur within 2-4 hours. The treated SRP should be left for 12-24

hours before testing & if the pH is within the range 5.5-8.5 & clarity is greater than 100 mm the decants can be opened & the SRPs drained as required.

If the clarity is less than 100mm there is two options, leave SRPs for further 24 hours (again preferred option) or dose the SRPs again with chemical at 50% of original level, refer table p22. Again the suspended solids will begin to settle after 2-4 hours but should be left for 12-24 hours before testing is done on the pond.

If the pH falls outside the range of 5.5-8.5 Auckland Council or the environmental specialist needs to be contacted to determine appropriate action to manage the out of spec water. The actions could include off-site removal of the impounded water or adding additional chemicals to correct the pH prior to discharge. (refer section 4.4, p16)

Batch dosing of the SRPs will be undertaken by the Project Foreman or Project Manager

4.3 pH monitoring of Water in SRP's/DEB's.

The pH of the SRP's must be monitored to ensure the pH remains within the Auckland Council TP90/GD05 guidelines of 5.50 – 8.00.

If the pH is outside this range there is the potential to effect aquatic life due to either effects of pH shock or the point where it is toxic to fish.

The toxicity of aluminium corresponds with its bioavailability or occurrence in its dissolved form. This is influenced by pH, such that in acidic conditions (low pH) aluminium is mainly present in its dissolved form. The greatest risk to aquatic communities therefore corresponds with discharges from SRP's/DEB's which have a relatively high aluminium concentration & relatively low pH.

The dose rate used at this site is at the high end of dosages typically used in Auckland for the settlement of sediment, however the pH is within the guidelines.

Therefore if the pH falls outside the range of 5.50-8.50 appropriate action must be taken to manage the out of spec water.

The actions could include:

- Not discharging till pH is within guideline range
- adding additional chemicals to correct the pH.
- off-site removal of the impounded water
- Using water on-site for wash down or dust suppression

4.4 pH Adjusting of Water in SRP's /DEB's

The simplest way of control of the pH is to not discharge the water until the pH comes within the recommended range. However this is often not practical, especially if further rain is predicted & therefore other methods must be considered.

The most commonly used method is to dose the pond with a product that will raise the pH (alkalinity) of the water so that the addition of the UltraClear™ 205 has little or no impact on final pH.

Lime is the most common product to use in this application & is available in a number of forms, all of which can be used to batch dose the SRP & therefore raise the pH if required.

The lime can either be added into the forebay or pond depending on which has low pH. Bags of lime can also be secured onto the forebay spillway as a way of continuously adding lime to correct pH if required.

Alternatively the use of a *Flock-it pH builder sock (from Reel Blue Environmental)* placed into the entrance way of the forebay of the SRP is a method of raising the pH of the incoming water & ensuring the pH is within the guidelines, rather than having to batch dose the pond afterwards.

5.0 Monitoring and Maintenance requirements.

The monitoring of the Flocculation system will be undertaken by the Site Foreman with regular checks being made by the Engineer to ensure compliance.

The monitoring will be undertaken each day following rain & at least once per week if no rain.

All results are to be recorded as per Table Two.

5.1 Routine monitoring and maintenance for SRP.

Instructions for routine monitoring and maintenance of the chemical treatment system are summarised in Table 2, p20.

A copy of this table will be placed in the chemical treatment shed inside a waterproof zip lock bag.

Routine weekly attendance should be undertaken for monitoring and recording of each pond and the shed status.

A service may be subcontracted to Reel Blue Environmental or its agents to provide regular monitoring of the ponds, servicing of the sheds and assembly of the monitoring reports if required.

The clarity of the water in the retention ponds will be monitored using the black disc method. This will consist of a 50-80mm diameter black painted disc attached to the bottom of a 1 metre long wooden ruler with a centimetre scale starting at the end to which the disc is attached. The disc is lowered vertically into the water near the pond outlet until it disappears, and is then moved slowly towards the surface until it is just visible. The depth of reappearance in mm is recorded as the clarity of the water.

After moderate or heavy rain the dosing points should be checked to ensure that the coagulant is being delivered into the stormwater flow during low flow conditions.

The integrity of the catchment tray, particularly the seal between the tray and the Up-stand should be checked monthly on each shed to ensure all rainfall is captured & sent into the top header tank.

The catchment tray should also be checked & cleaned of any debris that has built-up on the roof to ensure it does not overflow & therefore under dose.

5.2 Contingency Management.

A plan must be put in place to manage contingent events in accordance with site environmental management plans. Contingencies could include poor performance of the treatment system, vandalism, stormwater damage or effects of other influences on stormwater quality.

If the treated water any of the ponds is consistently very clear to depths greater than 100mm, it could indicate overdosing, and the possibility of a lowered pH which can present a risk to receiving waters, as a result of elevated free aluminium concentration in the discharge if Chemiclear 102 is used. If the treated water is consistently clear, the pH of the water in any pond should be retested.

Contingencies such as poor treatment performance or consistently very clear treated water should be dealt with by consultation with the appropriate organisation or its representative.

After rain, draining the header tank is required at least on the 3rd day and 6th day following rain, and possibly more frequently if the treated water in the pond is consistently clear.

A treatment chemical spill contingency plan is provided in Section 9.0 below, p 18.

6.0 Record keeping and Reporting to monitoring council or its representative.

A copy of the weekly monitoring records will be available on file and a regular monthly summary sheet provided to council or its representative.

The integrity of the treatment system will be checked weekly during both dry and wet weather. This check will include a quick check of the plumbing, a check that the header tank hoses are clear, and a check of the dosing point to ensure that the chemical would drop into the stormwater flow from the site.

We can provide the Weekly monitoring visit records as well as other monitoring & these can be compiled into a monthly summary report.

7.0 Storage of chemical on site.

Bulk Chemiclear 102 supplied by the manufacturer in 200L polyethylene drums will be kept in secure storage if on the site. Drums will be stored on end with the screw caps uppermost.

Top up of Chemiclear 102 chemical will be made weekly as part of the regular inspection regime.

Empty Chemiclear 102 drums will be washed out with water, and the wash water poured onto dry soil well away from any watercourse. Drums will be disposed of to a drum recycling company.

8.0 Procedure for transportation of Chemiclear 102 or alternative flocculation chemicals.

The transport of Flocculation chemicals to & from the project will be undertaken by commercial carriers in accordance with current Hazardous Goods, Traffic & Transport regulation. They will normally deliver the chemical to site in 20 litre containers 200 litre drums and/or 1,000 litre IBC's. Chemiclear 102 weighs about 250kg in 200 litre drums and is most easily moved within the site in a loader bucket.

The use of these or any other chemical must be done in accordance with the Site Health & Safety Plan.

9.0 Chemical spill contingency plan.

If there is a spill of Chemiclear 102 onto the ground it will be immediately contained using earth bunds to prevent it entering water. The spilt Chemiclear 102 should be recovered if possible and placed in polyethylene containers. If the spilt Chemiclear 102 cannot be recovered, it should be mixed with a volume of soil equal to at least ten times the volume of spilt Chemiclear 102, and buried in dry soil.

If there is a spill of Chemiclear 102 into pond water, discharge from the pond to natural water should be prevented. Contact the Council or its representative for advice on appropriate action.

If there is a spill of Chemiclear 102 or other chemical into flowing water:

1. The Council should be advised immediately.
2. The volume of the spill should be recorded.
3. If possible the water and spilt Chemiclear 102 should be pumped into a bund or pond until all the spilt Chemiclear 102 has been removed from the watercourse.
4. If the Chemiclear 102 cannot be removed from the watercourse any downstream users should be identified and advised. Contact the Regional Council or its representative qualified to advise on appropriate action.

10.0 Chain of responsibility for monitoring and maintaining the chemical treatment systems on site.

The earthworks contractor shall have primary responsibility for maintenance and monitoring the effectiveness of the chemical treatment system on the site.

A service may be subcontracted to provide regular monitoring of the ponds, servicing of the sheds and assembly of the monitoring reports if required.

11.0 Training of person responsible for monitoring and maintenance of chemical treatment systems.

We can provide regular monitoring and servicing of the Flocculation system or can undertake regular training of site personnel to carry out the routine monitoring and maintenance of the chemical treatment system, and the required record keeping.

12.0 Responsibility

While all care has been taken in preparing this CTMP, it is based on the information provided & samples collected & results may vary during the course of working this development.

It is the responsibility of the contractor to ensure compliance with all aspects of the appropriate regulations.

Reel Blue Environmental would recommend that soil testing be repeated every 6 months during the development to ensure dosing & shed design are providing best results, as soil type may change through the development phase & this will impact on the performance of the controls.

This information is not to be used for any other purpose without prior consultation and the written consent of Reel Blue Environmental and no liability is accepted for the misuse of any information contained in this report

13.0 Limitations

This report has been prepared by Reel Blue Environmental on the basis of information provided by Winstone Aggregates.

Reel Blue Environmental has not independently verified the information & has relied on it being accurate & sufficient for use in preparing this report. RBE accepts no responsibility for errors or omissions in the provided information.

These calculations & report have been prepared by RBE on instructions from Winstone Aggregates for the work at the Hunua Quarry site & should only be used for this application. If the report is used for a different purpose or it is used or relied upon for other purposes, any such use will be solely at their own risk.

TABLE 2.

Instructions for Maintenance of Flocculation Chemical Treatment Systems for Earthworks Stormwater.

REDUCING THE HEADER TANK WATER VOLUME.

The header tank is used to avoid dosing during the initial stages of rainfall when typically 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 RESERVOIR.

The 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 chemical 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 to ensure that dosing does not have an unacceptable effect on water pH.

PERIODIC SYSTEM CHECKS.

Check that the rainfall catchment tray is not leaking – especially along the lower or back 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 with leaves or other foreign debris.

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.

% Header full.

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 chemical volume added.

1 drum of UltraClear™ 205 = 200L, 9cm in plastic 200L drum = 20L.

Can be calculated from change in water level in displacement tank where 1cm change = 4 litres of UltraClear™ 205.

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

Key Data Sheets:

Catchment Overburden Pond

Rain Activated Systems:

Designation				
Site Name	RL 150 SRP			
Site Address	Hunua Quarry			
Sample No.	mixed		Date	22/04/2021
Plan Ref	Winstone Aggregates			
Pond Type	SRP	Floc Shed Setup Data		
Shed Name	RL 150 SRP	FLOC SHED	FlocBox 0.50	FlocBox 1.0
Catchment Area	ha	1.92	1.92	1.92
Product	Chemiclear 102			
Dose Rate	gms/m3	62.00	62.00	62.00
	mg/l	0.00	0.00	0.00
Catchment Tray	m2/ha	0.75	0.75	0.75
1.0 Litre Chemical Treats	m3 of stormwater	16.129	16.129	16.129
Shed Roof				
Tray Size	m2	1.440	1.440	1.440
Extension Roof	m2		0.940	0.440
FB1.0 Header Tank Ø	0.4			
Low flow / 3mm orifice	Height (mm)	65.40	244.46	137.5
	Volume (litres)	17.28	17.28	17.28
High Flow/10mm orifice	Height (mm)	130.81	488.92	275.0
	Volume (litres)	34.56	34.56	34.56
Header Tank Min Height	mm	180.81	x	x
Rainfall to Treat	mm		69.4	138.9

Rain Activated Chemical Shed Details

General Details

The general components of the flocculation system include a rainfall catchment tray, header tank, displacement tank & chemical reservoir tank

Rainfall from the catchment tray drains into the header tank. The header tank provides storage capacity to avoid dosing during the initial rainfall following a dry period & to attenuate dosing at the beginning & end of a rainstorm event. The header tank provides zero chemical discharge until a pre-determined amount of rain has fallen, usually 12mm, to allow for initial infiltration & saturation of dry ground before runoff occurs. It also provides a slow start to the dosing to allow for the response time of runoff flowing off site at the beginning of a storm & a period of dosing after rain has stopped.

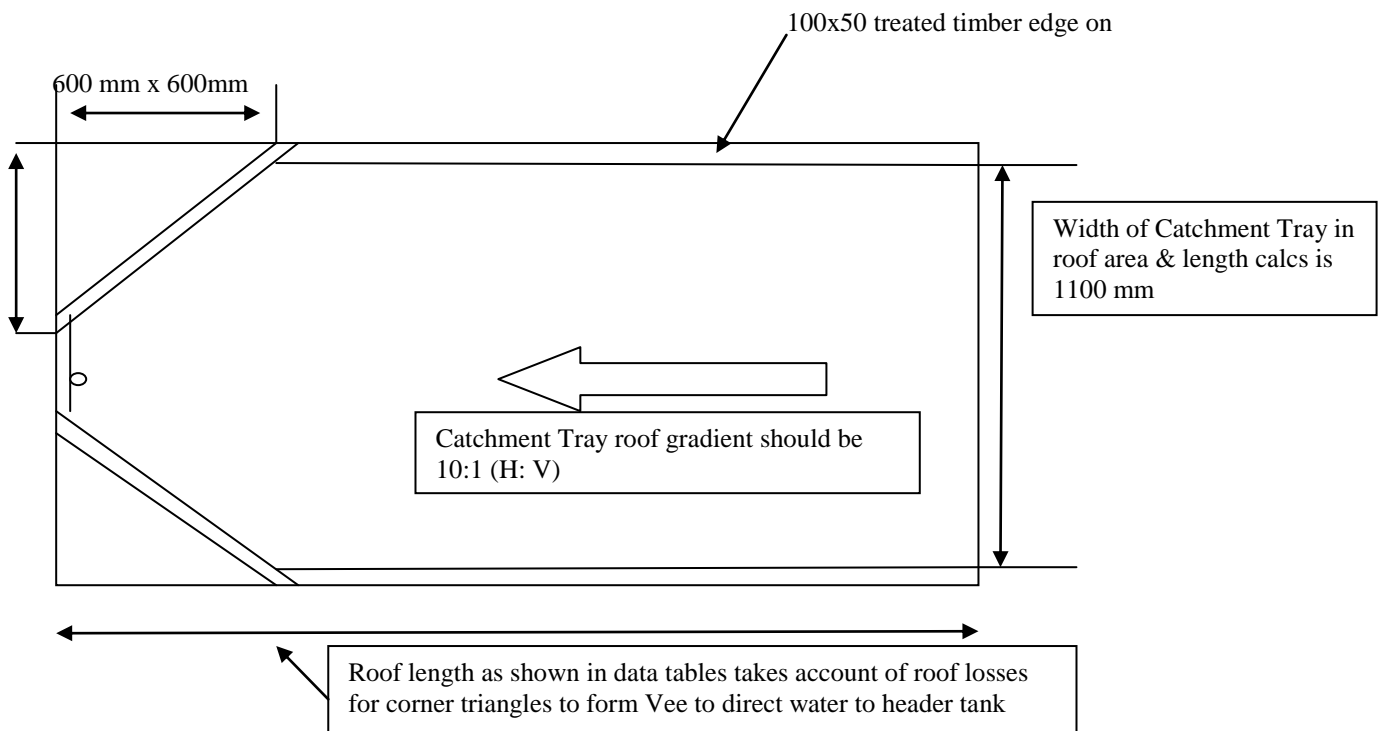
From the header tank the rainwater discharges to the displacement tank which floats in the chemical reservoir. As the displacement tank fills with rainwater, coagulant is displaced out through the outlet in the reservoir & flows by gravity to the dose point.

Catchment Tray Design considerations

The rainwater catchment tray size is determined by catchment area & chemical dose required to achieve good settlement.

Design

- Roof is made from standard 1200x2400 12 mm CD plywood,
- Any joins in the roof need to be sealed
- Grade for roof tray should be 10:1 approximately to ensure good water flow
- The edge upstands should be made from treated 100x50 timber on its edge
- The roof design length shown in FMP's accounts for the area lost at the bottom of the roof to form the Vee. The area is assumed to be triangles of 600x600mm, as per drawing below.
- Also accounted is area lost to the 100x50 edge timber



Appendix 5

Spill Contingency Plan

Spill Contingency Plan

The water treatment chemical currently used at Hunua Quarry is CHEMICLEAR 102, an EC-15P, which is a Poly Aluminum Chloride (PAC) inorganic macro molecule coagulant blended with an aqueous solution of a cationic homopolymer. Safety Data Sheets and general information sheets for these products are attached.

The IBCs of CHEMICLEAR 102 are stored near each of the rain activated dosing systems atop a concrete structure.

The following procedures will be undertaken in the event of a spillage of water treatment chemicals.

Small Spills – apply absorbent material such as crusher fines or spillsorb and shovel into suitable containers for mixing in with the sediment excavated from the water treatment ponds. Traces should be hosed away with large amount of water.

Large Spills – dam the spill with earth, sand, spillsorb or spill socks and prevent it from entering water or drains. The bulk of the spill should be pumped into suitable containers for adding back to the dosing tank.

The remaining product which cannot be pumped should be treated as for small spills.

Following a spill:

- Immediately notify the Hunua Quarry Site Manager, Environmental Advisor or the assigned deputy.
- If water treatment chemical has been swallowed, do not make casualty vomit. Refer to the appended Safety Data Sheet for advice of what to do and take the specified action.

Reporting of Spills

- Report any incident involving spillage of water treatment chemical to the Hunua Quarry Site Manager or the assigned deputy as soon as possible.
- The Hunua Quarry Manager or the assigned deputy will report any spillage, which has, or is likely to cause contamination of surface or ground water to the Auckland Council as soon as possible after the event is identified.
- Record all incidents in RADAR.