Tomarata Sands LTD
306 Pebble Brook Road
Wainui

Chemical Treatment Management Plan (CTMP)

Prepared by Erosion Control Co. Ltd

10th November 2022

Contents

1. Introduction

Erosion Control Co Ltd have been engaged by Tomarata Sands LTD to prepare a Chemical Treatment Management Plan for the site located at 306 Pebble Brook Road, Wainui.

- The report outlines bench test results using water treatment chemicals including coagulants and flocculants.
- The dosing methodology and system for this site.
- Responsibilities for the management, monitoring, maintenance, and reporting of chemical dosing.
- A spill contingency plan.

Bench testing conducted in this plan is to the standards of Auckland Council GD05 Earthwork, Erosion and Sediment Control guide and ASTM standard D2035-13.

The design and implementation of the proposed CTMP will be in accordance with the Auckland Council GD05 and TP227 guidelines.

2. Bench Testing

Bench testing has been carried out using soil samples deemed to best represent the site once the land has been stripped of topsoil. The soil samples were mixed in a 20 L bucket with rainwater. The runoff sample was then added to six 1 L jars and treatment chemicals added at the following concentrations:

	Jar 1	Jar 2	Jar 3	Jar 4	Jar 5	Jar 6
CHEMICAL Chemiclear 100	BLANK	Chemiclear 100	Chemiclear 100	Chemiclear 100	Chemiclear 100	Chemiclear 100
Product Concentration (ml/m^3)	0	31	62	93	124	155

- Clarity was then recorded after 5 minutes, 10 minutes and 30 minutes to identify optimum dose rates to meet and achieve best discharge requirements.
- Final pH is also recorded to ensure council guidelines are met.

3. Test Results and Discussion

CATCHMENT SAMPLE: Results of Chemiclear 100 on the Soil Sample after 60 minutes settling.

Catchment Sample Dosed with Chemiclear 100 - Water Clarity & pH

Chemical	Aluminium Dose (ppm)	Product Dose (ml/m^3)	Clarity (mm) 5 Mins	Clarity (mm) 30 Mins	Clarity (mm) 60 Mins	Final pH	Final Turbidity (NTU)	Notes
Blank	0	0	<60	<60	<60	7.1	800 +	
Chemiclear 100	2	31	<60	<60	<60	7.1	800 +	
Chemiclear 100	4	62	<60	<60	<60	7.1	800 +	
Chemiclear 100	6	93	<60	<80	<80	7.0	453	
Chemiclear 100	8	124	<60	>100	>100	6.9	29.0	Recommended
Chemiclear 100	10	155	<60	>100	>100	6.9	18.5	

Chemiclear 100 (Polyaluminium Chloride PAC) is the recommended chemical for this application based on testing of the received soil. The recommended dosage for the site is shown below.

Chemical	Dose Rate	Volume water treated by 1 litre of chemical
Chemiclear 100	8 ppm (as Al) 124ml/m^3 (as product)	8.06 m^3

4. Floc Box Set up Calculations

Site: 306 Pebble Brook Road, Wainui.

Catchment & Area	Product	Floc Box Size	Catchment Tray area	Header Tank Low Flow Hole (∅3 mm)*	Header Tank High Flow Hole (∅10 mm)*	Estimated rainfall before chemical refilling
DEB 1 5,000 m^2 (0.5 ha)	Chemiclear 100 8 ppm (as Al) 124 ml/m^3 (as product)	200 L	0.75 m^2	Volume to Hole 9.0 L Hole Height 62 mm	Volume to Hole 18.0 L Hole Height 124 mm	267 mm
DEB 2 2,900 m^2 (0.29 ha)	Chemiclear 100 8 ppm (as Al) 124 ml/m^3 (as product)	75 L	0.44 m^2	Volume to Hole 5.2 L Hole Height 76 mm	Volume to Hole 10.4 L Hole Height 153 mm	172 mm
DEB 3 750 m^2 (0.075 ha)	Chemiclear 100 8 ppm (as Al) 124 ml/m^3 (as product))	75 L	0.11 m^2	Volume to Hole 1.4 L Hole Height 20 mm	Volume to Hole 2.7 L Hole Height 40 mm	667 mm
DEB 4 3,300 m^2 (0.33 ha)	Chemiclear 100 8 ppm (as Al) 124 ml/m^3 (as product)	75 L	0.50 m^2	Volume to Hole 5.9 L Hole Height 87 mm	Volume to Hole 11.9 L Hole Height 174 mm	152 mm

*Low and high flow heights in mm are based on the recommended Floc Box header tank.

The catchment tray area is determined by the chemical dose rate and the area of exposed earthworks within the catchment. If the area of catchment or exposed area changes then the catchment tray and header tank need to be adjusted accordingly.
Stabilisation processes such as hay mulching will also greatly reduce the volume of sediment laden water and should be accounted for with the variation of catchment tray and header tank.

The header tank is designed to allow for 12 mm of rain to fall before chemical dosing is initiated. This is deemed to best represent the volume of rain required to initiate overland flow and runoff tracking to the sediment pond.
In periods of high intensity rainfall, the header tank will back up to the high flow which will increase the volume of chemical being dose. This will then ultimately track down to the low flow as rainfall decreases or stops. This ensures that dosing continues after the rainfall event has ended allowing for the time lag for surface flow in the catchment to travel to the sediment pond.

The Auckland Council erosion and sediment control guidelines recommend the management of storage water in the header tank as follows:

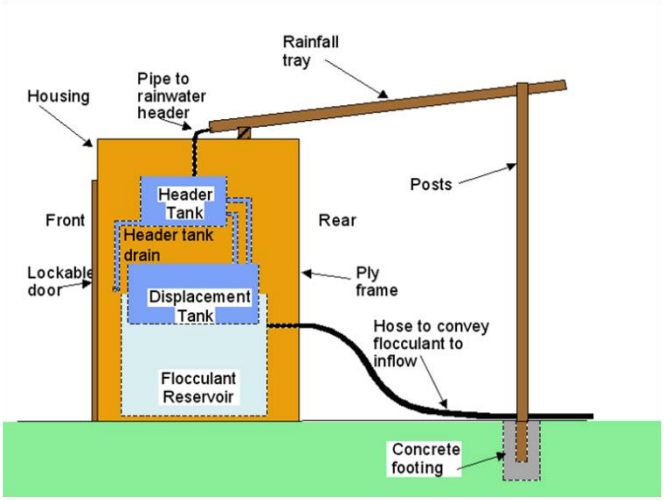
- After 3 days without rain – remove 50%
- After 6 days without rain – remove 100%

Ultimately, the volume of water stored in the sediment retention pond (SRP) and the clarity of the stored water should be considered when managing header tank volumes and further dosing requirements.

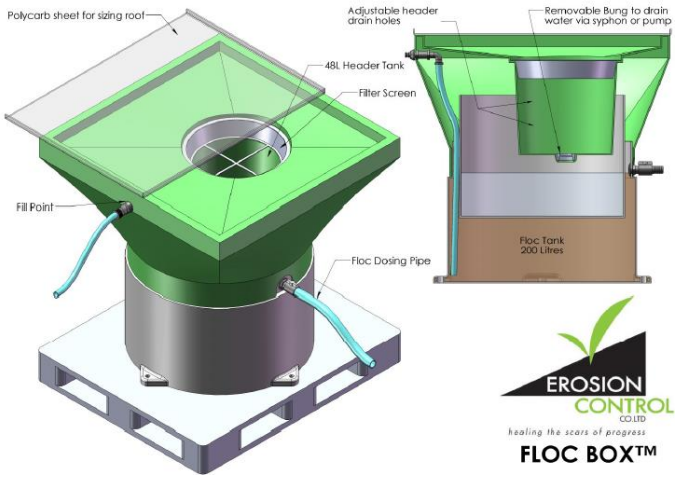
While all care has been taken in the testing and preparation of this chemical treatment management plan, Erosion Control cannot guarantee that the same results will be achieved in the sediment retention ponds. The scale up of the test results are affected by many parameters that can alter the dose rate and results.

The results and plan presented above should not be replicated or changed without prior approval from Erosion Control Co.

5. The GD05 Rainfall Activated Dosing System



The traditional rainfall activated dosing system utilizes a catchment tray with the trays size being determined by the applicable dose rate and catchment size of the area. Rainfall is captured on the roof and is collect in a header tank. The rainwater then drains into a displacement tank which floats inside the chemical tank. Chemical displaced by the increased weight of the displacement tank is transferred via a dosing hose to the channel leading to the forebay of the sediment pond. The header tank is designed to capture and hold the first 12 mm of rainfall during dry conditions preventing dosing when no runoff is occurring and to release the water into the displacement tank at a controlled rate.



The Floc Box is a rainfall activated dosing system which has been streamlined to allow easier and more efficient installation and maintenance. The units come in 75, 200 and 400 L versions and have adjustable catchment trays allowing for rainfall capture from 0.25 – 5.0 m^2. Units can be supplied with catchment trays and header tanks pre-sized for site catchments and correct dose rates as outlined in the CTMP.

6. Set Up and Installation

The rainfall activated dosing device should be set up on a level area so that the dosing point can be located 5-10 m metres up the entrance channel prior to the fore bay.

Consideration should be given to the ease of access for maintenance, storage of chemical drums and any further earthworks activity that needs to be carried out around the location. Once the unit is set up in situ the chemical storage tank should be filled until chemical visibly discharges from the dosing hose.

The positioning of “filter socks” or similar provide helps ensure a concentrated flow at the dose point to promote chemical mixing and ensures dosing into runoff during lower flows. Consideration should also be given to lining the channel at this point to avoid scouring of the channel floor. The dose point should not become submerged during heavy rainfall.

7. Batch Dosing of SRPs & Decanting Earth Bunds

Batch dosing should not be used as the primary dosing option but can be used to treat water prior to the installation of a rainfall activated system or when adequate clarity of >100 mm (see later notes on monitoring) has not been achieved. **It is important to note that pH should be measured and recorded both prior to and after batch dosing to ensure that it stays within 5.5 and 8.5 as set in the GD05 guidelines**.

To ensure optimal results from batch dosing it is necessary to ensure as even distribution as possible across the pond surface. Applying via a sprayer around the edges of the pond is the preferred methodology. Alternatively, the CHEMICLEAR 100 can be diluted in 1 L increments in a 20 L bucked and thrown onto the pond surface with an effort to achieve as much distribution as possible.
Clarity should begin to improve within the first 1-2 hours after dosing with maximum effect over 24 hrs.
Clarity, volume of chemical added, and pH should be recorded 24 hrs after each application.

Once clarity >100 mm has been achieved then the water can be discharged so long as pH is within the limits set above.

Recommended Batch Dosing

Number of SRPs / DEBs 4

Chemiclear 100 should be dosed at 124 ml per m^3 of DEB volume.

The chemical volume should be calculated using an estimate of the actual SRP/DEB volume on the day of batch dosing. Actual SRP/DEB volume is a variable.

Chemical	CHEMICLEAR 100
Dose Rate (ml/m^3)	124.00

8. Monitoring and Maintenance

8.1. Monitoring and Maintenance requirements

The monitoring of the chemical dose system will be undertaken by the site foreman with regular checks being made by the site engineer to ensure compliance.
Monitoring of the system will be undertaken each day following rain and at least once per week if no rain.
All monitoring results are to be recorded, with an example provided in table 2.

8.2. Routine monitoring and maintenance

Instructions for routine monitoring and maintenance of the chemical treatment system will be summarised in a table, a copy of which should be placed in the chemical treatment box inside a waterproof zip lock bag.
Routine weekly attendance should be undertaken for monitoring and recording of each pond and the rainfall activated dosing system status. This can be undertaken by Erosion Control Co.
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 m 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 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 chemical is being delivered into the stormwater flow during low flow conditions.

8.3. 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 in any of the ponds is consistently very clear to depths >100 mm it could indicate overdosing and the possibility of a lowered pH which can present a risk to the receiving waters as a result of elevated free aluminium concentration in the discharge. If the treated water is consistently clear, the pH of the water in 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.
The header tank should be drained by half after 3 days of no rain and emptied after 6 days of no rain.
A treatment chemical spill contingency plan is provided.

8.4. Record keeping and reporting to monitoring council or its representative

A copy of the monitoring records will be available on file and updated as required.
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.

Erosion Control can provide the weekly monitoring visit records as well as other monitoring and these can be compiled into a monthly summary report.

8.5. Storage of chemical on site

Bulk chemical supplied by the manufacturer in 200 L polyethylene drums will be kept in secure storage if on the site. Chemical drums will be stored on end with the screw caps uppermost.
Topping up of chemical will be made weekly as part of the regular inspection regime.
Empty drums should be washed out with water, and the wash water poured onto dry soil well away from any watercourse. Drums will be properly disposed of.

8.6. Procedure for transportation of PAC or alternative flocculation chemicals

The transport of water treatment chemicals to and from the project will be undertaken by commercial carriers in accordance with current Hazardous Goods, Traffic & Transport regulation. PAC weighs about 250 kg in 200 L drums and is most easily moved within the site in a loader bucket. Drum lifting chains can be supplied by Erosion Control Co if required. The use of these or any other chemical must be done in accordance with the site Health & Safety Plan.

8.7. Chemical spill contingency plan

If there is a spill of PAC or alternative water treatment chemical onto the ground, it will be immediately contained using earth bunds to prevent it from 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 or alternative flocculation chemicals 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 regional council should be advised immediately.
2. If possible, the water and the split PAC should be pumped into a bund or pond until all the split PAC has been removed from the watercourse.
3. If the PAC cannot be removed from the watercourse any downstream users should be identified and advised. Contact the Local Council or its representative qualified to advise on appropriate action.

8.8. 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 Co to provide regular monitoring of the ponds, servicing of the Floc Boxes and assembly of the monitoring reports if required.

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

Erosion Control Co 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.

8.10. Responsibility

While all care has been taken in preparing this CTMP, it is based on the information provided by the contractor and results may vary during the course of this development.

It is the responsibility of the contractor to ensure compliance with all aspects of the appropriate regulations pertaining to these works.
Erosion Control Co would recommend that testing be repeated every 6 months during the development to ensure dosing and Floc Box design are providing best results, as soil type may change through the development phase.
This information is not to be used for any other purpose, without prior consultation and the written consent from Erosion Control Ltd and no liability is accepted for misuse of this information.

8.11. Instructions for Maintenance of Flocculation Chemical Treatment Systems

8.11.1. Reducing the header tank 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.
After 3 days without rain – reduce volume to 50%
After 6 days without rain – reduce volume to empty (level at lowest outlet)

8.11.2. Refilling the reservoir:

The reservoir tank should be refilled when the displacement tank is half full, or sooner if heavy rain is predicted. The level of chemical in the device needs to be sufficient to treat a 100-year event should one occur. Refilling is done by first emptying the displacement tank and then refilling the reservoir tank until the chemical level is at the lower edge of the outlet.

8.11.3. Observation of water quality in pond:

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

8.11.4. Periodic system checks:

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.

8.11.5. 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 1-100% 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).

9. Floc Box setup confirmation

Contractor			
Site			
Installed by			
Chemical Recommended			
Dose rate			
Catchment	Area (ha)	Recommendation	Check
DEB 1	0.50		
DEB 2	0.29		
DEB 2	0.075		
DEB 2	0.33		
I …… hereby state that the above methodology has been followed and prepared in accordance with the chemical treatment management plan.			
Signature:		Date:	

10. Appendix

CATCHMENT SAMPLE: Test Results of **Chemiclear 100** after 5 minutes settling

CATCHMENT SAMPLE: Test Results of **Chemiclear 100** after 30 minutes settling

CATCHMENT SAMPLE: Test Results of **Chemiclear 210** after 5 minutes settling

CATCHMENT SAMPLE: Test Results of **Chemiclear 210** after 30 minutes settling

CATCHMENT SAMPLE: Test Results of **Chemiclear 210** after 60 minutes settling

CATCHMENT SAMPLE: Test Results of **Chemiclear 101** after 5 minutes settling

CATCHMENT SAMPLE: Test Results of **Chemiclear 101** after 30 minutes settling

CATCHMENT SAMPLE: Test Results of **Chemiclear 101** after 60 minutes settling

11. Floc box Inspection and Test Record

Storm water PAC chemical treatment system monitoring and maintenance record

Location: 306 Pebble Brook Road, Wainui	Catchment Area:
Client: Tomarata Sands LTD	Dose Rate: 8ppm (124 ml/m^3) CC100
Date Shed Installed:	Roof Tray area:

Inspected Test Date	Test by :	Raw Inflow pH	Pond Surface pH	Pond Outflow pH	Pond Water Depth	Pond Clarity Depth	Site condition comments and PAC top-up records