Sediment and Erosion Management Plan

Calliope Limestone Operation

Operated by Graymont (Calliope) Pty Ltd

Rev	Date	Prepared By	Comments
1	19/07/11	W. Speirs (SKM)	First draft
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1. Introduction

Graymont (Calliope) Pty Ltd owns and operates the Calliope Limestone Operation (CLO), which is located approximately 30km south of Gladstone, and 10km southeast of the township of Calliope in Central Queensland.

1.1. Background

The Erosion Sediment Management Plan (ESMP) aims to meet the conditions highlighted in the Environmental Authority Permit for site. Further, the ESMP aims to address issues relevant to the management and control of sediment and erosion on site. The ESMP is designed to provide consistency with the Environmental Management Plan (EMP) and regulatory requirements.

The nature of any open mining operation results in the disturbance of the natural ground cover through excavation, stockpiling and machine/vehicle movements. The purpose of the Erosion Sediment Management Plan (ESMP) is to prevent and/or manage sediment movement resulting from any land disturbance from water entering the receiving environment, as is relevant to the current mining operations.
There are a number of control measures that can be implemented on a site to reduce the risk of erosion and sediment movements off-site.

This plan outlines those techniques which best suit the operations of this site. The '*Best Practice Erosion and Sediment Control* (IECA 2008)' guideline has been used to design the required erosion and sediment control devices.

The magnitude of erosion problems experienced by a mine site, are similar to other construction type activities. They are proportional to the area of the site that is exposed / disturbed and the duration to which the area remains in this condition. As the duration of mining operations is generally longer than an average civil project, the implementation of a correct strategy is important. Focus is generally placed on site design, staged rehabilitation and minimising erosion, as opposed to temporary structures.

The management of these long periods of disturbance, and long operation of many erosion and sediment controls, requires a stronger emphasis on some management principles particularly:

- Erosion control, as a pollution prevention strategy,
- Runoff separation by diverting 'clean' stormwater runoff around the site or away from operational areas, and
- Management and maintenance of long-term controls.

1.1.1. Objectives

The objectives of this SEMP are as follows:

- To ensure the safety and health of personnel on the CLO;
- To comply with the relevant guidelines;
- To preserve the integrity and structure of the bunds and dam walls; and
- To maintain the current biodiversity on the CLO.
- To provide protection of receiving environment by eliminating or minimising the impacts of sediment laden water discharges from operations on the surrounding environment and meet community expectations regarding water quality. This can be done by:
    - Identifying, separating and controlling clean, dirty and contaminated water areas onsite;
    - Implementing appropriate erosion and sediment control techniques to suit the mining operations;
    - Ensuring the on-going maintenance and function of the implemented erosion and sediment controls.

These objectives will provide the framework for evaluating the successfulness of the SEMP.

1.1.2. Authority / Legislative Details

Environmentally Relevant Activities (ERAs) are activities that will or have the potential to release contaminants into the environment that may cause environmental harm. It is a requirement of the Environmental Protection Act 1994 (EP Act) and the Environmental Protection Regulation 2008 (EP Regs) that anyone who conducts an ERA must possess an environmental authority.

The project is approved as a resource activity under Chapter 5, Section 195 of the *Environmental Protection Act 1994* (EP Act). Under Section 608 of the EP Act.

Two Environmental Authority Permits are effective for this site:

- EA EPML00969013 for all mining leases, and
- EA EPPR00881913 (original permit # SPCE04023712 issued under the Sustainable Planning Act 2009) which covers all of the land held by Graymont including Mining leases and Freehold land.

The Environmental Authority EPML00969013 imposes specific conditions for the management of environmental impacts related to sediment and erosion:

- C14 Stormwater and water sediment controls
  An erosion and sediment control plan must be developed by an appropriately qualified person and implemented for all stages of the mining activities on the site to minimise erosion and the release of sediment to receiving waters and contamination of stormwater.

Environmental authority EPPR00881913 imposes specific conditions for the management of environmental impacts related to sediment and erosion:

- C1 Topsoil must be:
  a) removed, where practicable, from areas to be significantly disturbed prior to the commencement of extraction activities
  b) stockpiled in a manner that will preserve its biological and chemical integrity

c) used for onsite rehabilitation purposes revegetated when stockpiled, and prior to final use at end of quarry life, to minimise or prevent erosion.

- C5 Maintenance of rehabilitated areas must take place to ensure:
  a) erosion control measures remain effective;

- G4 Erosion protection measures and sediment control measures must be implemented and maintained to minimise:
  a) erosion of soils in areas disturbed by the activity;
  b) the release of sediment to any waters.

1.1.3. Guidelines

For the purpose of designing any required erosion and sediment control facilities, the '*Best Practice Erosion and Sediment Control* (IECA 2008)' guideline will be utilised.

1.1.4. Related Documents

Environmental Management Plan
Water Management Plan
Land and Rehabilitation Plan
Waste Management Plan
Ground Control Management Plan
Erosion and Sediment Control Management Plan

1.1.5. Project Ownership

The tenement mining leases are in the name of Graymont (Calliope) Pty Ltd.

1.2. Site Description

1.2.1. Site Topography, Geology, and Soils

The topography of the land is slightly undulating land that rises approximately 30m above the surface water level of Lake Awoonga Dam.

The site covers approximately 700ha, with approximately 685ha owned by Graymont Pty Ltd. The remainder is owned by the Gladstone Area Water Board (GAWB), who also own contiguous landholdings outside the operations area. With the exception of mining and quarrying activities, the land is put to no active use or is used for rural grazing activities.

The Taragoola limestone deposit comprises a large ore-body of steeply dipping, north-south, striking limestone. The limestone is fine grained to crystalline, light-grey with cream inclusions, very-high strength, fresh to slightly weathered, moderately-jointed to massive. Discontinuities are sharp and generally clean.

Dissolution of the upper surface has created some minor karst features; predominantly a slightly irregular surface, dilated joint apertures, small caverns, and shafts. These features are most obvious to a depth of ≈20m below surface. These features are likely to have negligible detrimental influences on the performances of the walls.

The limestone is overlain by red-brown clayey sand. The cover ranges in thickness from 0.5m to 5m. Where thickest, it contains boulders of limestone up to 1m diameter. Stripping of the upper bench involves stockpiling clean soil north of the pit for future use in rehabilitation and sending bouldery soil to the waste rock dump.

Basaltic to andesitic mafic volcanics have intruded around the site. The most obviously regions are centred north of the pit at 321000E 7333000N and south of the pit at 321500E 7333000N. There have not been many significant intrusions into the section of the ore body being mined; most notable are those on the north and south walls.

1.2.2. Hydrology and Water Storage

The CLO is bound by Lake Awoonga to the east, south and west. Lake Awoonga forms the drinking water supply dam from the surrounding catchment area for the GAWB. To the west of the site is a significant bund wall adjacent to Pit 3 and Pit 4. The water body adjacent to the bund wall is known as Raggote Creek, which is a tributary that flows into Lake Awoonga.

The eastern side of Pit 4 has another bund wall to prevent inundation of the mine site. GAWB has plans to increase the height of this bund wall in anticipation of raising the water level within Lake Awoonga.

Groundwater at the site is hosted by limestone as a variably connected, in places karstic aquifer.
The operation site has three main water storage areas:

- Pit 1 – a non-operational mining pit final void that is backfilled;
- Pit 2 - a water storage used for the supply of water to the wash plant; and
- Pit 3 - a final void pit used for water storage and stormwater capacity during periods of high rainfall. The final land use plan is to keep Pit 3 as a water storage dam for the local community.

2. Relevant Activities

2.1. Project Overview

The CLO conducts limestone mining and extraction to produce a range of agricultural and industrial limestone products for sale. Waste rock is also removed and either stockpiled on site or crushed for use as aggregate in a variety of applications such as road base construction.

Mining activities include topsoil stripping and removal of clay rich overburden and waste rock followed by extraction of limestone ore of appropriate grade and chemical properties suitable for quicklime, hydrate production and other end uses. Suitable limestone ore is then crushed, screened, and washed on site before being transported to customers off site for further downstream processing. Extractive activities are also conducted on site where limestone of different grades and suitable physical properties follow a similar process to mining for the production of road base and aggregates etc.

2.2. Environmental Values

Mining activities of the CLO are conducted within the catchment area for Lake Awoonga. The discharge of sediment laden water from the mining operation into the receiving environment has the potential to impact upon the environmental values of Raggote Creek and Lake Awoonga. Lake Awoonga is a freshwater dam which serves as the drinking water supply for the wider Gladstone Region. Implementation of appropriate erosion and sediment control measures is considered important in the protection of this receiving water body. Water quality is monitored at Monitoring Point C1 and F1 (downstream of sediment dam) to ensure the total suspended solids do not exceed a maximum 100 mg/L (and be less than 110% of the upstream reading at Monitoring Point C2).

2.3. Sources

Potential sources of pollutants relevant to erosion and sediment control include:

- Land clearing
- Topsoil and overburden stripping and stockpiling
- Shot rock loading
- Raw material hauling and tipping
- Crushing and Screening
- Conveying
- Stockpiling
- Rail loading (when being utilised)
- Wind acting on stockpiles and exposed areas

A risk assessment of these activities is provided in Table 1.

Table 1: Activities causing Sediment and Erosion risk

Activity	Location	Hazard	Risk	Likelihood	Consequence	Risk Rating
Blasting	On site	Generation of dust impacting local residences and surrounding land uses. Dust deposition affecting water quality	Complaints from local residences and surrounding land owners. Negative impacts on water quality. Graymont required to conduct complaint-based monitoring.	Unlikely	Moderate	6 - Medium
Movement and handling	On site			Unlikely	Moderate	6 - Medium
Crushing and screening	On site			Unlikely	Moderate	6 – Medium
Transportation of product	On site, Taragoola Road, near rail loading facility	Windblown dust generation impacting local residences and surrounding land uses. Dust deposition affecting water quality		Unlikely	Moderate	6 - Medium
Stockpiling	On site			Unlikely	Moderate	6 - Medium

2.3.1. Extraction

Open cut mining and quarrying are similar operations employing straight forward open cut mining/quarrying methods utilising a dedicated truck and excavator fleet. Vegetation, comprising mostly pasture grass, is removed together with an upper soil layer and stockpiled or used as a final surface layer on spoil embankments to facilitate revegetation. Underlying the surface soil/ clay layer is a clayey limestone strata. This layer is excavated by earthmoving equipment, usually following drill and blast. This material is either spoiled or, if appropriate, stockpiled for later separation of clay and limestone by a heavy duty rock screener.

Underlying the clayey limestone layer is dominantly homogeneous limestone which is drilled, blasted and loaded out by an excavator serviced by a number of ridged dump trucks. A second excavator is on site as a backup for the open cut operations. Drilling and blasting has been conducted at a rate of approximately one blast per week.

2.3.2. Material Handling

Material is hauled either to the Run-Of-Mine (ROM) pad for crushing, or to the stockpiles for screening or designated spoil dumps. Both a wet and dry plant are utilised. Via the ‘wet’ plant, material is washed with reclaimed water from Pit 2 whilst being crushed and screened into various sizes before being washed again. The washed, sized material is then stockpiled before being exported by truck to customers. Water discharged from this process is collected in a settling pond system before entering the wash plant dam.

The ‘dry’ plant sees material first screened by mobile rock screeners to separate oversized material and soils and scalping from the product. The material is then sent through the various crushers and stockpiled according to size.

2.3.3. Transport

Approximately 1.0 million tonnes per annum of limestone products are transported from site by road. The project used to also transport via rail, however this activity is not currently occurring at the project. All limestone products at the CLO site are loaded by wheeled loader into B-double road trucks. The trucks travel north on graded and paved roads to the town of Calliope where they connect to the Dawson Highway.

3. Control Measures

3.1. Planning and Design Strategy

The effectiveness of erosion and sediment controls during the operational and rehabilitation stages can be optimised through effective mine and quarry planning and design. Suitable strategies applicable to the CLO include:

- Designing any drainage systems operating for the life of the mine or quarry so that they do not cause erosion or increase sediment transport. This may involve scour protection of open drains and energy dissipaters located at drain outlets;
- Diverting runoff around the mine or quarry site where possible, to minimise external runoff flowing to operational areas;
- Separately considering sediment-contaminated stormwater from other sources of polluted water such as mine water, or runoff from stockpiles of coal or other mined or quarried product.
- Providing source controls to minimise the sediment load in stormwater, as well as “end of line” controls such as sediment basins to provide water quality improvement prior to offsite discharge
- The streams should be either separated to optimise their treatment prior to discharge or combined as part of an integrated water management strategy.
- Considering stormwater reuse as part of the overall water management strategy for the site to avoid or reduce discharge of polluted water. There are commonly a range of non-potable water uses on a mine or quarry site such as dust suppression and irrigation of revegetation areas. This may be more cost-effective than treatment of polluted runoff and will also reduce consumption from other water.

3.2. Operational Strategy

Whilst it is acknowledged that activities will vary throughout the life of a mine, it should also be accepted that erosion and sediment control measures will also evolve to suite. Erosion and sediment control strategies for mines should normally comprise the following:

- Minimisation of extent and duration of disturbed areas draining to waterways, and prompt revegetation of non-operational disturbed areas (using temporary revegetation if required);
- Ensuring both temporary earthworks and permanent land-shaping provide a landform whichminimises erosion hazard;
- Prompt stabilisation and rehabilitation of land following land-shaping (both temporary and permanent);
- Design of temporary surface-water collection, conveyance and disposal systems in a manner which minimises erosion.
- Ensuring dirty water catchments have appropriately designed and operated sediment basins at their downstream extremities

Where possible, stormwater should be diverted around any active or rehabilitated mine or quarry area. This will minimise both the flow rate and volume of runoff to be handled by on-site water management facilities and enable them to perform more effectively. Runoff from stable rehabilitated areas should also be diverted away from operational areas.

The site supervisor is responsible for maintaining erosion control due to mining operation, stockpiling, maintenance of roads, drains, sediment pits, and as a result of natural stormwater run-off or unseasonal high rainfall events. Sediment control devices such as silt fencing, bunding, berms, diversions and silt pits should be used to collect sediment from flowing outside of the mining lease area.

Stormwater drains, channels and diversions should be used to separate clean stormwater due to rainfall away from disturbed land areas. Disturbed or plant water should not be allowed to contaminate or mix with clean stormwater flow or storage.

3.2.1. Drainage and Diversions

Earth bunds and diversion drains are maintained around the perimeter of the site, particularly on the upslope of excavations, to prevent surface water entering these excavations and mixing clean with dirty water.

The majority of the disturbed catchments within the mining operation are controlled using appropriate drainage and a number of bund diversions. Runoff from the disturbed areas within the mining operation collects in one of the drainage channels. These drainage channels are then directed into either Pits 2, 3 or 4.

There are some bunds located around the site which prevent runoff from disturbed areas entering the receiving environment. In these locations, the bunds act to redirect runoff from disturbed areas back into one of the pits. Pit 3 is the only pit which has an external catchment. The farm dam catchment would have previously drained into Lake Awoonga. However, with the creation of the levee between Lake Awoonga and the mine, this catchment had no outlet. Waters from this catchment may rise and subsequently overtop into Pit 3 during high rainfall events. The only catchment which is not directed to a pit is the sediment basin catchment.

3.2.2. Sediment Basin

The basin located at the C1 discharge point has been sized for using the method for a C-type basin outlined in '*Best Practice Erosion and Sediment Control'* (IECA, 2008).

The following assumptions were made in the calculations in the absence of physical data:

- runoff for the Q-3 month (0.5 x 1 year ARI) was applied;
- approximately 90% of the sediment is larger than 0.05 mm diameter;
- bulk density of limestone used was 28 kN/m^3; and
- the Revised Universal Soil Loss Equation (RULSE) was used to estimate soil loss.
- Clean out frequency of basin is once per year.

The existing sediment basin located upstream of Release Point C2 presents the only possible uncontrolled release point from the site. The basin located at the C2 discharge point has been sized using the CALM method as outlined in 'Soil Erosion and Sediment Control – Engineering Guidelines for Queensland Construction Sites' (IEAUST, 1996).

The following assumptions were made in the calculations in the absence of physical data:

- the run-off co-efficient for the 1 in 10 year AEP event was 70%;
- approximately 70% of the sediment is larger than 0.2mm diameter;
- bulk density of limestone used was 28 kN/m3; and

The Revised Universal Soil Loss Equation (RULSE) was used to estimate soil loss.

The minimum required dimensions for the sediment basin above the discharge point C2 include:

- Dimensions Sediment Pond Surface Area (m2) 23.1
- Length (m) 8.3 Width (m) 2.8 Depth (m) 0.75
- Volume (m3) 17.2

The existing basin has measurements in excess of these recommendations, particularly if the 'Y-drain' which conveys water towards the final basin is included. However, it was observed that the sediment basin had become very full with deposited sediments, and it is recommended that it is cleaned out to provide the appropriate depth as soon as possible.

Releases of pumped void water to natural drainage system will be in accordance with water quality standards, monitoring locations and frequencies as nominated by EA conditions.

3.3. Minimising Land Disturbance

- Land disturbance will be restricted to that which is essential for mining purposes
- Disturbed land will be rehabilitated / revegetated as soon as is practicable to minimise erosionand sediment transport

3.4. Spill and Pollutant Containment

- Spill control equipment is stocked at specific locations around the site for spill response.
- Vehicles to be well maintained to avoid fuel and oil leakages
- Re-fuelling of trucks on site to take place away from drainage lines and in isolated/bunded areas to minimise the risk of environmental contamination and contain spills. Refueling will follow Refuelling Procedures
- Vehicle washdown to be carried out in a designated area so that washings (including concrete washings) will not enter waterways or storm drains
- Fuels, oils and chemicals required for construction and operation to be appropriately stored. Storage in open areas will be bunded to ensure any spills are contained
- Any spillages to be immediately contained and absorbed with a suitable material and disposed in an approved manner.
- Staff to be appropriately trained in procedures for the management of fuel and chemical spills and the location and use of spill kits

3.5. Emergencies

- In the event of imminent flooding, plant and equipment will be moved to the highest accessible points as per 4GN-P21- 12 Flood Emergency Plan
- If leaks are detected or an earthquake felt, 4GN-P21- 13 - Bund Wall Failure Emergency Plan will be implemented.
- If a contaminant release is observed this will be notified to the relevant authority immediately in line with the notification requirements of the EA.

3.6. Water Management and Reuse

To the extent practicable, all water pumped from mining/quarrying operational areas (except for water used for dust suppression) will be directed to the recycle water storage near the processing plant.

Water captured on site is used for dust suppression on haul roads, working benches, hardstands and stockpile areas. Water is applied at a controlled rate to prevent runoff. Water is also used for dust suppression at plant locations and for certain product washing, vehicle washdown, product moisture content control and product transportation. Excess water from product washing activities is directed to settling ponds essentially operating in a closed-circuit configuration.

Water entering Pit 1 and Pit 2 is not pumped offsite, but used for onsite purposes as follows:

- cool fog dust suppression units installed at the Hazemag Feeder and Main Screen House collection bays;
- washing down machinery at the wash down area;
- filling radiators;
- use in the main wash plant;
- dust suppression;
- mixing of wet road bases; and,
- hosing down and cleaning under conveyers.

The nature of this site lends itself to developing effective control measures to minimise the risk of sediment laden waters entering the receiving environment. Where the entrainment of sediments occur in surface water flows, sediment control measures will be necessary to prevent discharge from this site. The site currently does not have any external catchments entering disturbed parts of the sites. The majority of areas that are disturbed have been designed to flow back into the mining voids through appropriate drainage and bunds. A sediment dam is currently in

place to capture and treat runoff collected from the Process Area of the site. Waters from here discharges to Monitoring Point C1.

Table 2: Implementation of Erosion and Sediment Controls

Controls	Timing/ Frequency	Evidence of Implementation
Management of Air-Borne Dust on site	Ongoing	Review and audit of airborne dust emissions on site.
Vehicle operations on site follow Traffic Management Plan (speed, routes)	Ongoing	Review and audit of airborne dust emissions on site.
Deploy water carts to all unsealed roads to reduce the generation of dust from these areas	When required during dry days	Vehicle log detailing number of tank refills
Dust suppression devices installed on operating plant/crushers	When in use	Equipment equipped with dust collectors. Site supervisor daily inspection.
All trucks containing product must not leave the site without trailer covers	Ongoing	Weighbridge operator to report all instances of loads not securely covers to site supervisor.
Stockpiles to be located as far as practicable from residential areas	Ongoing	Site supervisor inspection report and environmental site audit report
Activities which have the potential to cause significant dust emissions should be modified or cease operation under adverse (high wind) weather conditions where sensitive receptors may be impacted.	When required	Start checklist includes details of weather conditions
Continuous visual surveillance of dust emissions to ensure effectiveness of control measures	Ongoing	Report any issue of excessive dust emissions into ORACLE incident and event reporting program
Mobile plant will be maintained to manufacturer's specifications to comply with dust and pollution emission control	Ongoing	Inspections to be recorded on vehicle pre-start inspection sheet
A continuous improvement program is actively undertaken on site to ensure that best work practices are implemented to avoid/or minimise generation of dust.	Ongoing	Regular internal audits of work practices, processes, and environmental objectives. Any corrective actions addressed in the audit are to be entered into ORACLE.
Installation of screens and windbreaks around areas of potential dust emissions	When required	Job start cards and JRAs are undertaken before commencing work to identify the need for screens or wind breaks to avoid excessive dust in work area.
Planting of trees and windbreaks to reduce wind corridors and create barriers to minimise dust emissions on site	As part of rehabilitation plan, or as part of continuous improvement process	Evidence of revegetation in areas that reduce dust emissions. Revegetation of areas will be reported in the Annual Return and Financial Assurance Audit report.

4. Monitoring

For the CLO, Graymont must ensure that a competent person conducts all monitoring where monitoring is a requirement of the relevant project permits.

Table 3 presents the routine monitoring conducted on site to meet OHS and environmental requirements.

Table 3: Care and Maintenance monitoring requirments

Management Issue	Timing/Frequency	Description of Monitoring	Monitoring Method
Erosion and Sediment	Quarterly	Visual inspection of sedimentation pond to ensure basin is free of weeds	Inspection by site supervisor
Erosion and Sediment	When required	Regular cleaning and removal of sediment from sediment collection devices, pits and dams	Following inspection report
Erosion and Sediment	Quarterly	Visual inspection of sediment control fencing to ensure its effectiveness	Inspection by site supervisor
Erosion and Sediment	Quarterly	Rehabilitated areas shall be monitored periodically to check for the possible onset of soil erosion	Inspection by site supervisor

Table 4: Monitoring Requirements when site is operational

Description of monitoring	Timing/ Frequency	Parameters	Monitoring method
Ambient air quality monitoring for TSP at monitoring sites N, SE, SW, and S.	Monthly	TSP (g/m2/month)	Dust deposition gauges using AS/NZS 3580
Monitoring of onsite weather conditions	Continuous	Rainfall, wind speed, wind direction	Onsite weather station
Visual inspection of wind speed and direction	Daily	Wind speed, wind direction	Beaufort wind scale and onsite weather vane. Observations documented in the onsite weather log
Visual inspection of dust suppression devices on equipment as part of prestart checklist	During activities	Device is correctly fitted	Inspections noted in vehicle prestart check logbook. Any defects are tagged out and/or reported to supervisor.
Visual inspection of dust emissions from the primary crushing and screening plant	Daily	Visible dust	Any defects are tagged out and/or reported to supervisor.
Visual inspection of dust emissions from drilling and blasting activities	During activities	Visible dust	Non-compliance with dust emissions will be entered into the incident and corrective action reporting: ORACLE
Visual inspection of dust control measures to ensure correct operation	During activities	Visible dust	Non-compliance with dust emissions will be entered into the incident and corrective action reporting, ORACLE
Site audit of operations by Graymont Advisory team	2 yearly	Audit checklist	Environmental audit procedure. Audit forms to be filed and any actions arising from audit will be entered into ORACLE

4.1. F1 Release Point

Controlled releases are permitted from release point F1. The discharge from F1 is released at a rate of approximately 200 litres per second (the pump capacity). The discharges from F1 are released directly into a rock lined channel. The gravel reduced the velocity and thereby reduces the risk of soil erosion and scour directly below the release point. Further downstream, the discharged water exhibits a laminar flow regime, at which point it enters Lake Awoonga.

The impacts of the mining operation on downstream water quality will be minimised by ensuring any release from the site do not exceed the criteria specified in the EA conditions as outlined below in Table 5.

Table 5: Water Quality Release Criteria

Quality Characteristic	Release Limits	Monitoring Frequency
Electrical conductivity (µS/cm)	900	Weekly during discharge
pH (pH unit)	6.5 (minimum) 8.5 (maximum)	Weekly during discharge
Total Suspended Solids (mg/L)	100 (maximum) Or when measured at C1, F2 or F1 not more than 110% of value at monitoring point C2	Weekly during discharge

4.2. Rail Lay Down Area

Approximately 1.5 km to the west of the CLO is the train lay down area, where pre-washed 40 mm stone is stock piled prior to loading on the trains. The lay down area currently consists of a number of stockpiles of pre-washed 40 mm stone, truck manoeuvring area, drainages and bunds. The truck manoeuvring area is covered in the 40 mm stone as to prevent dirt contamination of the stockpile when loading onto the trains occurs. This will limit the amount of erosion occurring from this surface.

To ensure the on-going compliance with the erosion and sediment control objectives the following is recommended:

- Develop a monitoring program of runoff and / or creek flows to ensure suspended solids are within the identified limits;
- Ensure cover of 40mm stone over truck manoeuvring area is maintained;
- Ensure bunding around lay down area is maintained; and
- Place dumped rock over drains flowing to waterway where scour has or may occur.

4.3. Inspection Requirements

Inspection and reporting requirements associated with the operation of erosion and sediment control measures is important in ensuring their on-going performance. An “Erosion and Sediment Control Inspection Checklist” is provided in **Appendix A**. Notifications of non-compliance will specify the type(s) of non-compliance, the corrective actions needed and a time schedule for achieving compliance.

Normally, routine inspections of the site will be performed on a monthly basis and after heavy rainfall events. A record of device failure / non-compliance and corrective actions taken to prevent recurrence will be maintained.

4.4. Maintenance Requirements

The erosion and sediment control devices will be maintained on a regular basis as directed by the Environmental Manager. Defective devices will be repaired or replaced as required. Maintenance may include replacing structures that are not functioning properly.

4.5. Targets and KPIs

This ESCP aims to minimise and where possible eliminate the potential impact erosion and sediment discharge from the site to the receiving environment. The targets and key performance indicators are outlined below in Table 6.

Table 6: KPIs

Target	Key Performance Indicator
To minimise the impact of construction and operational activities on erosion and the sedimentation of disturbed land, watercourses and water bodies	• Water quality readings in relation to Erosion and Sediment Control are not exceeded at Monitoring Point C1 and F1. • Disturbance is restricted to those areas identified as at risk • Surface water discharges from disturbed areas are captured by sediment control systems or directed to pit. • No active erosion is observable in stabalised areas. • There is no increase in erosion/siltation in downstream watercourses. • The water quality in downstream watercourses and water bodies is within acceptable limits.
To minimise the loss of soil from areas disturbed by mining activities	

5. Reporting

For the CLO, Graymont is required to record, compile and keep for a minimum of five years all monitoring results and make available for inspection all or any of these records upon request.

Table 7 presents the routine monitoring conducted on site to meet reporting requirements.

Table 7: Environmental management responsibilities

Management Issue	Frequency of Reporting	Description	Responsible Authority
Air Quality	Monthly	Dust deposition gauge results	Graymont central monitoring and reporting database
Air Quality	Quarterly	Air emission related environmental incidents	Corporate EHS team

Description of reporting	Frequency of reporting	Reporting tool	Reporting to:
Dust deposition gauge results	Monthly	Monitoring data form	Graymont central monitoring and reporting database
Air emission complaints	Quarterly	ORACLE	Corporate EHS team
Air emission related environmental incidents	Quarterly	ORACLE	Corporate EHS team
Complaint Based Dust Monitoring Report	Within 14 days of complaint	Written advice	Administering Authority
Complaint Based Odour Monitoring Report	Within 14 days of complaint	Written advice	Administering Authority

6. Audit and Review

6.1. Environmental Auditing

Graymont (Australia) PTY LTD is required to carry out third-party audit of the site's compliance with the conditions of the Development Approval. The audit is scheduled every 2 years as per condition A10 of the Environmental Authority (EPPR00881913).

An internal environmental audit program is in place for the existing mining operation at CLO. These audits are used to monitor environmental performance of operations against the risks identified and commitments made within this EM Plan.

6.2. Sediment and Erosion Control Management Plan Review

This Plan will be reviewed every two years. The review shall be conducted with the QSE Coordinator, Environmental Advisor, and the Operations Manager. The Regional Manager and Environment and Sustainability Manager may also review the Plan depending on the perceived risk of site operations.

The review will involve the review of all monitoring data, complaints and incidents and comparing this data and information to mandatory limits and internal KPI's.

Procedural changes or a review of targets and/or KPI's should be employed if targets are not met. Should it become necessary to revise the information and/or control measures described in this Plan because the measures are not adequate or in order to more effectively prevent erosion and sediment control or storm water pollution at the site, the Plan will be amended.

Environmental Inspection Reports (EIRs) will include details about the observations, the responsible party, and when the situation will be mitigated. Findings will be entered into an Action Tracking database maintained by the Environmental Manager or Environment Safety & Health Manager, and the status of open actions will be tracked.

7. Recommendations

Following the review and on-going planning of erosion and sediment control techniques employed on the site the following is recommended to ensure protection of the receiving environment in relation to sediment transport on the site:

1) Ensure drains and bunds around pits are maintained to ensure contaminated runoff is directed into pits, and not release from site.

2) Upgrade sediment basin to comply with the dimensions outlined in **Section 3.5.3**;

3) Ensure the rock lined drain is maintained to manage scour at release point F1; and

4) Ensure monitoring at the prescribed monitoring points C1, C2, F1 and F2 is maintain in order to demonstrate on-going compliance with the requirements of the EA conditions.

To ensure the on-going compliance of the erosion and sediment control objectives at the train lay down area it is recommended:

- Develop a monitoring program of runoff and / or creek flows to ensure suspended solids are within the identified limits;
- Ensure cover of 40mm stone over truck manoeuvring area is maintained;
- Ensure bunding around lay down area is maintained;
- Place dumped rock over drains flowing to waterway where scour has or may occur.

APPENDIX A: Erosion and Sediment Control Checklist

APPENDIX B: Sediment Basin Calculations

APPENDIX C: Site Images

EROSION & SEDIMENT CONTROL CHECKLIST

TYPE OF INSPECTION:

ROUTINE [ ]
RAINFALL EVENT (BEFORE) [ ]
RAINFALL EVENT (AFTER) [ ] _____ (CM of rain/time period)
INTERMITTENT DEWATERING [ ]

AREA INSPECTED: _____

INSPECTED BY: _____ **DATE:** _____

		Is Condition Acceptable?			
	INSPECTION ITEMS	**YES**	**NO**	**N/A**	**Comments**
1	Is there any evidence that sediment is leaving the site? If yes, specify.				
2	Is there any evidence of erosion on cut or fill slopes, temporary soil stockpiles? If yes, specify.				
3	Does the sediment basin require repair or clean-out to maintain proper function? If yes, identify.				
4	Do any of the drains throughout the site suffer scouring, require repair or clean-out to maintain proper function? If yes, identify.				
5	Do any of the bund diversions throughout the site suffer scouring, require repair or clean-out to maintain proper function If yes, identify.				
6	Do any of the areas in which vegetative stabilisation measures are being taken show signs of bare spots, insufficient growth or germination? If yes, identify locations and specify remedial action (e.g., fertilisation, seeding, mulching, maintenance).				
7	Are onsite traffic, parking, equipment laydown, supply and waste storage restricted to those areas specifically designated for those purposes?				
8	Is there any evidence of sediment, debris or mud track-out on adjacent public roads?				

Note: Attach additional sheets if needed to identify plans for corrective actions, and if action will be delayed due to site conditions (*e.g.*, inaccessible to equipment) or safety issues - expected date of implementation, who is to perform work, and other specifics.

Project No: QE06585
Date: 19/07/2012
By: Brendon Bolt

CALM Method

RULSE

Step 1	Area				A	166.7184		
	Stockpile 1	1.734	ha					
	Vegetated	1.967	ha		R	4217.73	I(2,6hr)	13.9 mm/hr
	Road	3.494	ha		K	0.027		
	Total	7.195	ha		LS	1.22		
					P	1.2		
					C	1		
	ARI	3	month					
	Tc	17	min					
	I1	66	mm/hr					
	C3month	0.558		ASSUMED				
	Q3month	0.368024	m^3/s					
Step 2	Sieve Analysis	90	%	>	0.05 mm	ASSUMED		
Step 3	Settling Velocity from table C1.1	0.05	Fine Sand	707	m^2/m^3/	Surface Area Required for basin		
	Initial Estimate of basin surface area	260.04	m^2					
Step 4	Settling Depth							
		3 :	1	Basin L:W				
		27.93 :	9.31					
	Depth	0.139652	, if depth is less than 0.6m, adopt 0.6m					
	Adopted Settling Depth	0.6						
	Settling Volume	156.0221						
Step 5	RUSLE							
	A	166.7						
	b.d.	20.0	kn/m^3	ASSUMED				
	b.d.	2.0	t/m^3					
	2-month Sediment Loss	100.0						
	Sediment volume/yr	285.7	m^3/yr					
	90% capture volume	257.2	m^3/yr					
Step 6	Optimise Basin Size							
	Volume of Sediment Storage	257.2	m^3					
	Length	36.0	m					
	Width	12.0	m					
	Area	432.0	m^2					
	Depth	0.6	m					
	Storage Volume	259.2	m^3					
	Total Volume	518.4						
	Is Size Adequate	**OK**						

- **Figure 13: Discharge Point F1.**

- **Figure 14: Downstream of discharge point F1**

- **Figure 15: Sediment Dam at discharge point C1**

- **Figure 16: Directly downstream of discharge point C1**

- **Figure 17: Further downstream of discharge point C1**