ENVIRONMENTAL IMPACT STATEMENT

SEDIMENT AND EROSION CONTROL PROGRAM

APPENDIX W
Erosion and Sediment Control Program

BORAL Gold Coast Quarry, Reedy Creek

B12119CR001

April 2013
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G.C.C.C. EROSION HAZARD ASSESSMENT (EHA)
<table>
<thead>
<tr>
<th>Revision</th>
<th>Date</th>
<th>Description</th>
<th>Author</th>
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<td>C</td>
<td>15/04/13</td>
<td>Final</td>
<td>DL</td>
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<td>TC</td>
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<td>AR</td>
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</table>
# GLOSSARY OF TERMS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>AHD</td>
<td>Australian Height Datum</td>
</tr>
<tr>
<td>Boral</td>
<td>Boral Resources (QLD) Pty Limited</td>
</tr>
<tr>
<td>DERM</td>
<td>Department of Environment and Resource Management</td>
</tr>
<tr>
<td>EPA</td>
<td>Environmental Protection Agency</td>
</tr>
<tr>
<td>ESCP</td>
<td>Erosion and Sediment Control Program</td>
</tr>
<tr>
<td>IECA</td>
<td>International Erosion Control Association</td>
</tr>
<tr>
<td>IFD</td>
<td>Intensity Frequency Duration</td>
</tr>
<tr>
<td>m</td>
<td>Metres</td>
</tr>
<tr>
<td>NATA</td>
<td>National Association of Testing Authorities</td>
</tr>
<tr>
<td>Overburden</td>
<td>Low value quarry material, including soil/overburden and weathered rock</td>
</tr>
<tr>
<td>pH</td>
<td>Measure of acidic or basicity</td>
</tr>
<tr>
<td>Plant</td>
<td>Boral crushing plant</td>
</tr>
<tr>
<td>Product</td>
<td>High value quarry material assumed deeper than 12m below the existing surface</td>
</tr>
<tr>
<td>QLD</td>
<td>Queensland</td>
</tr>
<tr>
<td>RL</td>
<td>Reduced Level</td>
</tr>
<tr>
<td>ROM</td>
<td>Run of Mine</td>
</tr>
<tr>
<td>Site</td>
<td>Lot 105 on SP144215</td>
</tr>
<tr>
<td>SMP</td>
<td>Stormwater Management Plan</td>
</tr>
<tr>
<td>t</td>
<td>Tonne</td>
</tr>
<tr>
<td>ToR</td>
<td>Terms of Reference</td>
</tr>
<tr>
<td>TPZ</td>
<td>Tree Protection Zone</td>
</tr>
<tr>
<td>TSS</td>
<td>Total Suspended Solids</td>
</tr>
<tr>
<td>Turbidity</td>
<td>A measure of water clarity</td>
</tr>
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EXECUTIVE SUMMARY

The Erosion and Sediment Control Program (ESCP) forms part of the Environmental Impact Assessment (EIS) for a new extractive industry operation (quarry), proposed by Boral Resources (Qld) Pty Limited, on a greenfield site at Old Coach Road, Reedy Creek, Gold Coast.

The contents of this report have been prepared in response to the Terms of Reference for the EIS related to ‘Topography, geology and soils’ issued by the Queensland Government for the quarry project.

This ESCP has been prepared in accordance with the EIS Term of Reference, which requires consideration of the environment in which the quarry will be constructed, including topography, potential for intense rainfall events, soils, and receiving waters. The ESCP also addresses the sediment and erosion control requirements which are specified in the Gold Coast City Council Planning Scheme 3 (Part 7) – Division 3 Constraint Codes – Chapter 14 “Sediment and Erosion Control”. Implementation measures specified in this report are in accordance with the International Erosion Control Association, Best Practice Erosion and Sediment Control.

Erosion hazard potential has been assessed using Gold Coast City Council’s Erosion Hazard Assessment form EHA and the site has received a score of 30, indicating a ‘high risk’ potential for erosion hazard to the receiving environment.

This report describes the erosion and sediment control program for the site and provides strategies to prevent and control erosion with regards to the relevant standards. It describes the function and capacity of erosion and sediment control structures, which are to be located close to the source, that are required to minimise soil erosion and the potential for transport of sediment downstream adversely affecting downstream water quality.

Detailed Erosion and Sediment Control Layout Plans have been produced and are included in the report.
1.0 INTRODUCTION

This Erosion and Sediment Program (ESCP) has been commissioned by Boral Resources (Qld) Pty Limited to support an Environmental Impact Statement (EIS) for the establishment of a new extractive industry facility (quarry) on Old Coach Road, Reedy Creek. The site is described at Lot 105 on SP144215.

This ESCP is a conceptual template document that will be subject to revision and issue when an Operational Works submission is provided to the local authority. It provides details of the erosion and sediment control measures which can be implemented during the Establishment stage (phases, E2 and E3) and Development Stage (phase D1) of the proposed Gold Coast Quarry.

The measures outlined in the ESCP will be implemented until the permanent controls are established, after which the Lambert & Rehbein Stormwater Management Plan (April 2013) will take precedence.

All Erosion and Sediment Control measures shall comply with the State Planning Policy 4/10 Healthy Waters (Chapter 4 – Development Assessment), legislation of the Environmental Protection Act 2012, and the Environmental Protection (Water) Policy. Erosion hazard potential has been assessed using Gold Coast City Council’s Erosion Hazard Assessment form EHA (refer to Appendix D) in accordance with the relevant supporting notes. Lot 105 has received a score of 30, indicating a ‘high risk’ potential for erosion hazard to the receiving environment.

This report addresses the sediment and erosion control requirements which are specified in the Gold Coast City Council Planning Scheme 3 (Part 7) – Division 3 Constraint Codes – Chapter 14 “Sediment and Erosion Control”. Implementation measures specified in this report are in accordance with the International Erosion Control Association, Best Practice Erosion and Sediment Control.

This report aims to control erosion and limit sediment transportation from site and therefore minimise impact on receiving waterways. The contents of this report should be read in conjunction with: BMT WBM’s Water Resources and Floodplain Management Report (April 2013) and Lambert & Rehbein Stormwater Management Plan (April 2013).

1.1 TERMS OF REFERENCE

This report addresses Part B, Section 4.2.3, ‘Topography, geology and soils’ of the Terms of Reference issued for the quarry project:

Discuss methods proposed to prevent or control erosion with regard to:

• the guideline EPA Best Practice Urban Stormwater Management: Erosion and Sediment Control (Environment Protection Agency 2008b)

• Best Practice Erosion and Sediment Control (Witheridge & International Erosion Control Australia 2009)

• preventing soil loss in order to maintain land capability/suitability

• preventing degradation of local waterways or wetlands.
2.0 PROJECT DESCRIPTION

Boral is proposing to establish a new extractive industry operation on a greenfield site, Lot 105 on SP144215 at Old Coach Road, Reedy Creek as shown in Figure 1, below.

Figure 1 - Location Map
The project is necessary to compensate for the scheduled winding down of Boral's existing West Burleigh Quarry (the location of this quarry is detailed in Figure 1), which has sufficient reserves for only a further 6.5 to 9 years of production (depending on market conditions). Given the lead times that are involved (in gaining development and environmental approvals; establishing the operation and completing preliminary site works in order to enable full scale production), it has been necessary for Boral to commence the relevant approval processes to ensure that an adequate, uninterrupted and efficient supply of construction materials remains available for critical infrastructure and construction projects in the Gold Coast region.

The Gold Coast Quarry will represent an investment of $140-$160million (2012$\textsuperscript{1}$ dollars) by Boral into the economy of the Gold Coast region and is projected to provide continuity of employment for approximately 100 staff across Boral’s integrated quarrying, asphalt, concrete and transport operations. An estimated total of 246 full-time equivalent (FTE) person-years will be directly required for the development and on-site construction of the project. The flow-on benefits of this employment would generate further employment opportunities for the wider Gold Coast region and Queensland, resulting in a total of approximately 480 and 490 full-time equivalent person-years, respectively. Once operational, the proposed Gold Coast Quarry would directly generate 24 FTE positions. The flow-on benefits of this employment would support about 65 FTE positions in Queensland, with 62 positions generated in the Gold Coast. The proposed Gold Coast Quarry would provide a net increase in employment opportunities and help continue quarrying industry jobs within the area once the West Burleigh Quarry resources are exhausted.

The site of the proposed Gold Coast Quarry contains the last and largest known deposit of meta-greywacke quarry rock resources on the southern Gold Coast. Meta-greywacke is of extremely high strength and forms the excavated and processed quarry product. The meta-greywacke resource is located within a deposit that is favourably surrounded by ridgelines (reducing amenity impacts) and has the benefit of having substantial vegetated buffers on land owned by Boral. In developing this proposal, Boral has attempted to balance the need to secure this hard rock resource with the social and environmental factors associated with extractive industry development. After taking into account a range of environmental constraints and providing appropriate separation buffers during the detailed design process for the proposed quarry footprint, it has been estimated that a total of 79 million tonnes of measured, indicated and inferred quarry resources have been delineated on the site (within the optimised pit shell and including the area to be developed for the plant and associated infrastructure). Boral has voluntarily sterilised a significant proportion of the resource which is known to occur on the site in order to achieve an appropriate balance between environmental, economic and community interests.

\[1\] Based on the value of the Australian dollar during 2012
The proposed development will operate as a quarry for the extraction and processing of hard rock primarily for use in concrete, asphalt, drainage materials, road base, bricks/blocks, pavers, pipes and landscape supplies. Investigations indicate that the quality and consistency of the resource at the site is of equal or better quality than the meta-greywacke deposit situated at Boral’s existing West Burleigh Quarry, providing an opportunity to completely replace the current quarry operations at Boral’s existing West Burleigh Quarry due to the diminishing supply of consented resources at that site. The proposed Gold Coast Quarry has the potential to supply the Gold Coast region with high grade construction materials for at least 40 years whilst maintaining continuity of employment across Boral’s integrated quarrying, asphalt, concrete and transport operations.

The greenfield site will be fully developed and operated in accordance with recognised industry best practice. Initial development requires the removal of significant overburden over the first few years of site development, including the introduction of mobile crushing plants to develop the site and value the excavated material. Boral estimates that approximately 5 million tonnes of materials (all types) will be removed from the site to allow the site infrastructure and fixed plant to be built.

Overall, the proposed Gold Coast Quarry’s processing plants and supporting heavy mobile equipment (HME) will comprise:

**Mobile Crushing Plants**
- Proprietary modular trains from recognised (best practice) manufacturers such as Sandvik or Metso. The 3-stage road base train consists of a Primary Jaw, Secondary and Tertiary Cone Crushers complete with screens, conveyors and stockpiling conveyors.
- The second train (for aggregates production) will be the same or similar to the first and may include a vertical shaft impactor (VSI) to improve aggregate quality for use in higher specification applications. Each train will be targeting to achieve a minimum of 300 tonnes per hour of aggregate or base course materials. The estimated capital cost of each train is $6 million (2012 dollars).

**Fixed Plant**
- The plant will be designed as a modern, ‘fit for purpose’ crushing plant which will target the production of aggregates. It is estimated that the production rate will be between 750 - 900 tonnes per hour to achieve an annual production of 2 million tonnes. The estimated cost of the plant is $75 million with a construction timeframe of 18-24 months.

**Mobile Fleet**
- There will be two distinct fleets, firstly a development fleet which will service the site development and stripping works, through to load and haul service for the mobile crushing trains. The second fleet will be sized to service the 750-900 tonne per hour fixed plant. Over the course of the establishment and operation of the project (refer to Table...
1.2), there will be a range of equipment on the site for various periods of time. This equipment includes, amongst others, the following:

- Excavators;
- Graders;
- Front-end Loaders;
- Bulldozers;
- Compactors;
- Articulated Dump Trucks;
- Water Trucks;
- Haulage Trucks; and
- Cranes.

The quarrying process commences with a survey of the rock face and bench to be developed (by drilling and blasting). Laser survey equipment defines the rock mass, and an optimised blast hole pattern is designed and drilled. As production requirements demand, the drilled “shot” is then charged with bulk explosives (from Boral’s key supply partner, Orica), and fired, in accordance with the site blasting model and procedures.

Once the rock has been blasted, fragmented rock will be loaded from the pit floor onto haul trucks, whereas any larger rock fragments (“oversize”) will typically be broken by a rock breaker before loading. The load and haul fleet will generally be operated continuously during the operating hours of the quarry, in order to maintain continuity of supply for processing.

The primary stage of processing involves the use of a jaw crusher and vibratory screens, with crushed product being held in an interim stockpile called a “surge pile”. From this stage, material will be conveyed to several downstream stages of crushing and screening equipment. After processing, the material will be conveyed to individual product stockpiles. The processing plant, including primary and secondary crushers (and screening to separate dust and aggregates) will be located within the plant and infrastructure area, near the individual product stockpiles.

The quarry materials are then either loaded directly by a front end loader (‘sales loader’) from the stockpiles, or via overhead storage bins at the plant (under typical conditions), to road haulage trucks. The road haulage trucks then proceed across the weighbridge and through the wheel wash before exiting the site to deliver quarry materials to the market.

Section 2.0 of the EIS document provides a more detailed description of the various components of the project.
2.1 STAGES OF DEVELOPMENT

The site will be developed in a sequence of discrete stages, each of which will involve a series of phases:

- Site establishment (E), development (D), and construction (C) stages (featuring a number of intermediate phases);
- Quarry operation stage (Q) (featuring a number of phases) associated with the development of the quarry pit itself; and
- Rehabilitation and decommissioning of the site once the operations have concluded.

The timing and rate of progression through the stages associated with the pit development will be defined by market conditions and demand. It is not appropriate to specify timeframes for the development of each respective phase of the project at this early point, but the quarry will have an operational life of at least 40 years.

During the establishment, development and construction stages, the proposed Gold Coast Quarry will operate with mobile plant(s), and be replaced with a permanent fixed plant as soon as practicable after the plant site infrastructure area and initial pit have been established (estimated to occur between 5 to 6 years of the development approval).

The staging plans for the project, as prepared by Lambert & Rehbein, detail how the development of the quarry is intended to progress. **Table 1** below provides a general overview of the works undertaken as part of each phase of the development stage.
Quarry Development Stages

<table>
<thead>
<tr>
<th>PHASE</th>
<th>WORKS UNDERTAKEN</th>
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<tbody>
<tr>
<td><strong>E1</strong></td>
<td>The external access road and associated intersection (from Old Coach Road) will be constructed.</td>
</tr>
</tbody>
</table>
| **E2** | A portion of the access road, as it enters the site from the intersection constructed as part of Phase E1, will be constructed and sealed (with bitumen).  
Earthworks (cut) associated with the development of the internal road network are undertaken, specifically for the construction of:  
- the internal road that will ultimately link to the plant facility and ROM pads; and  
- the access and maintenance road extending to the dam.  
Temporary weighbridge and wheel wash area will be developed.  
The water storage dam embankment wall (requiring 89,300 tonnes of fill) and associated spillway will be constructed.  
Overall, a total of approximately 230,000 tonnes of overburden will be removed from the site as a result of the development of this phase. |
| **E3** | The extent of the internal access road created in Phase E2 will be sealed with bitumen.  
The temporary weighbridges and wheel wash areas will be removed and replaced by the permanent facilities.  
The construction of the facilities pad will be commenced, while the sedimentation pond will also be developed.  
The temporary buildings associated with the (construction) facilities pad will also be constructed.  
Filling works will be completed in an existing gully so as to facilitate the future pad area for the plant equipment.  
Overall, a total of approximately 260,000 tonnes of overburden will be removed from the site as a result of the development of this phase.  
The extent of filling completed as part of this phase equates to 115,900 tonnes. |
<table>
<thead>
<tr>
<th>PHASE</th>
<th>WORKS UNDERTAKEN</th>
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</table>
| D1    | • Earthworks associated with the construction of the plant pad will be continuing. These earthworks will be performed in a 'receding rim' fashion in order to minimise impacts on nearby sensitive receptors.  
• By this time the quarry dam and sedimentation pond will be operational.  
• Overall, a total of approximately 770,000 tonnes of overburden will be removed from the site as a result of the development of this phase.  
• Furthermore, approximately 280,000 tonnes of quarry product extracted from the site will be utilised and sold as marketable material. |
| D2    | • Earthworks associated with the construction of the plant pad will be continuing.  
• Overall, a total of approximately 750,000 tonnes of overburden will be removed from the site as a result of the development of this phase.  
• Furthermore, approximately 560,000 tonnes of quarry product extracted from the site will be utilised and sold as marketable material. |
| D3    | • Earthworks associated with the construction of the plant pad will be continuing.  
• The ROM pad and ROM ramp will be created, and a small amount of fill will be required to develop this area (24,890 tonne).  
• Overall, a total of approximately 745,000 of overburden will be removed from the site as a result of the development of this phase.  
• Furthermore, approximately 560,000 tonnes of quarry product extracted from the site will be utilised and sold as marketable material. |
| D4    | • Earthworks associated with the construction of the plant pad will be completed.  
• The final 'floor level' for the plant area equates to RL 34.0m AHD.  
• The final 'floor level' for the ROM pad equates to RL 50m AHD.  
• The stockpile area for the storing of materials will be cleared of its overburden.  
• The stockpile area rock (suitable for product) will be left in place for processing at a more economic rate once the permanent plant has been established.  
• Overall, a total of approximately 215,000 tonnes of overburden will be removed from the site as a result of the development of this phase.  
• Furthermore, approximately 540,000 tonnes of quarry product that can be utilised and sold is extracted. |
### CONSTRUCTION PHASE

<table>
<thead>
<tr>
<th>PHASE</th>
<th>WORKS UNDERTAKEN</th>
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</table>
| C1    | • The construction / erection of the crushing plant will be commenced.  
       | • All permanent buildings (e.g. site office, employee facilities, workshop etc.) are constructed.  
       | • Earthworks associated with the removal of overburden are commenced with respect to extending into the area that will ultimately become the quarry pit. |
| C2    | • The construction / erection of the crushing plant will be completed.  
       | • Earthworks associated with the removal of overburden will be continuing with respect to extending into the area that will ultimately become the quarry pit. |

### QUARRY OPERATION PHASE

<table>
<thead>
<tr>
<th>PHASE</th>
<th>WORKS UNDERTAKEN</th>
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</table>
| Q1    | • Earthworks associated with Pit Stage 1 will be undertaken.  
       | • The base levels for Pit Stage 1 will range between RL 78.0m AHD (western end of the pit area) and RL 66.0m AHD (eastern end of the pit area, adjacent to the ROM pad). |
| Q2    | • Earthworks associated with Pit Stage 2 will be undertaken.  
       | • The base levels for Pit Stage 2 will be RL 54.0m AHD (eastern end of the pit area, adjacent to the ROM pad).  
       | • Rehabilitation of the benches associated with the pit will commence as necessary. |
| Q3    | • Earthworks associated with Pit Stage 3 will be undertaken.  
       | • The base levels for Pit Stage 3 will be RL 30.0m AHD (western end of the pit area).  
       | • Rehabilitation of the benches associated with the pit will commence as necessary. |
| Q4    | • Earthworks associated with Pit Stage 4 will be undertaken.  
       | • The base levels for Pit Stage 4 will be RL 6.0m AHD (centrally located within the pit area).  
       | • Rehabilitation of the benches associated with the pit will commence as necessary. |
| Q5    | • Earthworks associated with Pit Stage 5 will be undertaken.  
       | • The base levels for Pit Stage 5 will be RL -66.0m AHD centrally located within the pit area).  
       | • Rehabilitation of the benches associated with the pit will commence as necessary. |
3.0 EXISTING SITE CONDITIONS

3.1 SITE PHYSICAL CONDITIONS AND USAGE

Lot 105 is currently un-developed medium-dense bushland. It is currently not actively utilised for any residential, commercial, industry or other purpose, and is un-serviced by utilities or infrastructure. Lot 105 ranges in elevation from approximately RL 10.0 (AHD) to approximately RL 150.0 (AHD).

The existing un-developed site terrain is undulating and varies significantly in slope, with a maximum general gradient up to 20% slope. Significant ridges and depressions exist in the terrain, and act to define gullies for the local catchments. No significant external catchments enter Lot 105, and due to the high elevation the depressions are dry most of the time, and would likely only convey flow during rainfall events.

Vehicular access within the existing site is limited to four-wheel drive vehicles, and even then would only be achieved over limited portions of Lot 105 due to both terrain and vegetation.

3.2 CLIMATE

The climate for the Gold Coast region is sub-tropical and sub-humid. The rainfall distribution is dominated by summer falls with high variability due to local thunderstorms.

Long-term rainfall records have been acquired from the Bureau of Meteorology and compared with Gold Coast City Council rainfall Intensity Frequency Duration (IFD) charts to determine rainfall conditions at the site.

The monthly rainfall data indicates that rain is likely at all times of the year with the highest totals over the summer months. This is also indicated by the distribution of rain-days each month. The highest recorded daily rainfalls indicate that potentially erosive rainfall is likely throughout the year, with the lowest risk period being from July to September, however statistically significant increases in rainfall occurs from October through to February.

Programming for the works on site will be determined upon receipt of a development approval. Accordingly, the erosion and sediment control measures suggested by this document assume that construction works could occur during a period of higher rainfall which has been determined as the worst case scenario.
4.0 POLICY

- To comply with the requirements of International Erosion Control Association (IECA) Australasia “Best Practice Erosion and Sediment Control” Guidelines. Particular attention to meeting the water quality objectives (erosion and sediment) to those specified.
- To comply with State Planning Policy 4/10 “Healthy Waters” (Chapter 4 – Development Assessment);
- To comply with the Environmental Protection Act, 1994;
- To comply with the Environmental Protection (Water) Policy, 1997; and
- To ensure that the design and construction of works provide an environmentally sound outcome during construction works and post construction.
5.0 PERFORMANCE REQUIREMENTS

5.1 GENERAL

- Compliance with the Environmental Protection Act (1994) in satisfying the developer’s general environmental duty (per Section 2) and Gold Coast City Council’s Environmental Protection Policy;

- The contractor and its staff shall be familiar with the requirements of the International Erosion Control Association (IECA) Australasia “Best Practice Erosion and Sediment Control” Guidelines, and shall ensure that all erosion and sediment control processes adopted on-site are in accordance with that document;

- The contractor shall monitor current and future pending weather patterns with regard to current and proposed construction activity on-site to ensure that un-stabilised earthworks areas have minimal exposure to potentially erosive rainfall and surface runoff;

- Management of all site construction to ensure reasonable and practical measures are taken to prevent/control dust nuisance from the earthworks and construction activities;

- Management of all site construction to ensure reasonable and practical measures are taken to prevent / control erosion and sedimentation from Lot 105; and

- Ensure that all construction earthwork activities take place only within the approved operating times.

5.2 WATER QUALITY OBJECTIVES

All water discharged from Lot 105 during the Establishment Stage (phases E2, and E3) and Development Stage (phase D1) is required to meet the water quality objectives as set out in the BMT WBM Water Resources and Floodplain Management Report (April 2013). In summary the following water quality objectives shall be met:

- Total Suspended Solids (TSS) shall not exceed 50mg/L during the operation of the on-site sediment basin (except for rain events in excess of the basin design capacity), and upon decommissioning of the sediment basin, TSS will be below 90%ile <100mg/L for all weather periods during construction;

- PH is to be in the range of 6.5 to 8.5; and

- Turbidity is to be a maximum of 50 Nephelometric Turbidity Units (NTU’s).
6.0 PERFORMANCE ADJUSTMENT INDICATORS

The contractor shall regularly (before and after rainfall events and as required) inspect and monitor site conditions to ensure compliance with the site Erosion and Sediment Control Program recommendations and performance requirements. Review and / or adjustment of the Erosion and Sediment Control measures shall be undertaken in the following instances.

6.1 EROSION AND SEDIMENT CONTROL

- Receipt of any validated complaints regarding sediment discharge from Lot 105. Valid complaints are any complaints received by telephone, in writing or in person by the Contractor, Superintendent or Council, which are substantiated;
- Monitoring / testing of site discharges indicating levels of suspended solids and pH beyond the nominated limits; and
- Undertake regular visual inspection of the site control measures to ensure no obvious non-conformance with the approved erosion and sediment control program, guidelines and policies referenced in Section 4.0 or Gold Coast City Council staff written instructions.

6.2 DUST NUISANCE

- Receipt of any validated complaints regarding dust nuisance from Lot 105. Valid complaints are any complaints received by telephone, in writing or in person by the Contractor, Superintendent or Council, which are substantiated; and
- Visual inspection of the site control measures indicting obvious non-conformance with any dust control measures.
- Refer to Katestone Environmental Air Quality Assessment (April 2013) for Gold Coast Quarry.

6.3 COMPLAINT RESPONSE AND RESOLUTIONS SYSTEM

- A sign of an appropriate size (no smaller than 841mm x 594mm) is to be erected close to the site entrances in a clearly visible location from public roadway. Details including name, contact telephone number and address of the Principal Contractor and Superintendent must be clearly identified in letters minimum 50mm high on the sign;
- In the event that the Superintendent or Contractor receives the complaint they shall immediately inform the respective other party;
- All complaints shall be investigated immediately, and initial remedial measures put into action to minimise potential short-term hazard;
- The Superintendent shall liaise with the Council if required to determine the appropriate course of action and make recommendations to the Contractor. Rectification measures shall be to the Council’s and Superintendent’s satisfaction;
• The Contractor shall notify the Superintendent when rectification works are complete; and
• The details of all valid complaints shall be recorded in the site Environmental Register along with a description of the rectification details, including the time and date.
7.0 PROPOSED QUARRY SITE ESTABLISHMENT STAGE WORKS

7.1 GENERAL

The ultimate proposed development involves construction of an extractive industry facility (quarry) including associated access roads, progressive development of plant and stockpile areas, permanent sediment basin, dams and other ancillary infrastructure. Due to the nature of quarry works it is anticipated that the long-term development of the facility will be on-going over a period of time. It is anticipated that the quarry will not reach maximum size for many years after the commencement of works. It is noted that the erosion and sediment control procedures outlined in this report are intended to address only the initial “Establishment Stage” of the development (i.e. up to second quarter of the 100% stage of the total development). This “Establishment Stage” involves construction of the access road from Old Coach Road down to the permanent sediment basin, and the initial earthworks (filling) to the operations platform. The initial Establishment Stage also involves construction of the dam / weir north-west of the main operations platform, and associated dam access road.

It is advised that once the initial stage is established (i.e. intersection works are stabilised and permanent sediment basin installed) the ongoing development works can adopt the erosion and sediment control measures outlined in the quarry facility Stormwater Management Plan (SMP).

Due to the significant depths of cut associated with the access road construction (up to 7m deep), and the presence of rock within that cut – road construction has been separated into multiple smaller zones to assist in construction manageability. The zoned staging limits of construction are shown on Erosion and Sediment Control Layout Plan drawings B12119-SK-350 to 353 (Appendix B). Each construction zone must be stabilized prior to commencing earthworks for the next zone. Vegetation should not be removed from a zone, except where essential, unless it is part of the current construction civil works. The aim of this is to reduce the area and duration of exposed soil.

The smaller zone construction extents also serve to minimise the disturbance area (and erosion potential) for each construction zone. Access road earthworks shall commence at the access road intersection with Old Coach Road, and shall extend progressively along the access road into Lot 105. As the access road descends into LOT 105, the limit of each zone’s cut is proposed to “batter up” to the existing surface – therefore creating “self-bunded” zones providing an interim sediment pond at the lower end of each particular zone. A typical detail of the interim sediment pond at the end of each zone is shown on drawing B12119-SK-355 (Appendix B). This interim sediment pond at the end of each construction zone shall be monitored, tested and flocculated (if necessary) in accordance with the International Erosion Control Association, Best Practice Erosion and Sediment Control.
At source erosion control measures and diversion of clean up-slope flows will also be incorporated during construction to help minimize suspended sediments within surface runoff.

The final construction zone (Zone 7) shall involve the construction of the quarry’s permanent Sediment Pond and associated temporary and permanent bunding and / or diversion berms to direct sediment laden surface flows into the basin. In accordance with the site’s “high risk” classification on the Gold Coast City Council “Erosion Hazard Assessment Form” (Appendix D), this sediment pond has been designed as a “Type D” to accommodate the ultimate quarry development.

Though sedimentation control and capture into a basin is expected to be a constantly changing situation on this site, a “worst case” scenario for basin sizing has been adopted (assuming maximum area of disturbance). Calculations for the sizing of the required sediment basin have been included in Appendix C of this report. The basin shall be monitored, tested and flocculated (if necessary) in accordance with the International Erosion Control Association, Best Practice Erosion and Sediment Control.

Within each construction zone (outlined above) the following erosion and sediment control procedures shall be implemented in the following sequence:-

- **Phase 1** – Installation of primary and perimeter sediment controls, diversion berms, sediment fencing and stabilised exit.
- **Phase 2** – Selective site clearing and grubbing, topsoil stripping and initial earthworks within roadway batter extents, installation of further “at source” sediment control devices.
- **Phase 3** – Balance of zone earthworks – ensuring progressive excavation maintains a temporary sediment basin at the lower limit of zone (as outlined above).
- **Phase 4** – Stabilise / seal roads and embankments, swales and other disturbed areas, re-direction of clean or de-flocculated flows away from exposed earthworks areas.
- **Phase 5** – Decanting and removal of current zone Sediment Basin prior to commencement of Phase 1 for next down-slope zone.

**Note:**- These phases will be discussed in more detail on the following sections.

### 7.2 PHASE 1 – INSTALLATION OF PRIMARY AND PERIMETER SEDIMENT CONTROLS, DIVERSION BERMS, SEDIMENT FENCING AND STABILISED EXIT

The first phase will involve the construction of diversion berms and the installation of the erosion and sediment control measures prior to commencement of clearing and the earthworks. The
Phase 1 measures will involve minimal earth disturbing machinery, and the proposed controls will be a combination of diversion berms, sediment fences and stabilised entry / exit points.

Major Phase 1 Earthworks steps will include:

i) Assess and mark / peg current works zone extents and install any necessary diversion berms to divert all clean up-slope surface runoff away from earthworks areas.

ii) Install construction vehicle stabilized entry / exit point for cleaning vehicles of excess mud and dirt prior to exiting Lot 105;

iii) Install sediment fences and other sediment control devices in accordance with (but not limited to) Lambert and Rehbein drawings No. B12119-SK-350 to 355 (Appendix B);

iv) Designation of a construction vehicle hardstand area and temporary stockpile area which is adequately contained by Erosion and Sediment Control measures; and

v) Install high visibility tape fence to perimeter of all areas which are proposed to remain undisturbed (i.e. vegetation and TPZ areas along western edge).

7.3   PHASE 2 – SELECTIVE SITE CLEARING AND GRUBBING, TOPSOIL STRIPPING AND INITIAL EARTHWORKS INCLUDING ROADWAY BATTER EXTENTS, INSTALLATION OF FURTHER “AT SOURCE” SEDIMENT CONTROL DEVICES

Following the installation of the ‘Phase 1’ sediment basin and Erosion and Sediment Control measures as outlined above, Phase 2 will involve the necessary bulk earthworks and general civil works for the construction of drainage, road pavements and retaining walls as detailed on the design drawings for the development.

Major Phase 2 Earthworks steps will include:

i) Maintain sediment fences, sediment basin, stabilised exit and other sediment control devices as outlined in Phase 1, and install any additional fencing required for the post bulk earthworks phase;

ii) Clearing, grubbing and any further preparation required prior to commencement of major earthworks;

iii) Progressively undertake earthworks as detailed on the approved drawings in accordance with site geotechnical report recommendations (if available). Note that
road earthworks shall be cut to be “self-bunded” at all times during construction (per Section 6.1 above); and

iv) On-going construction of civil works associated with the development.

### 7.4 PHASE 3 – BALANCE OF ZONE EARTHWORKS – ENSURING PROGRESSIVE EXCAVATION MAINTAINS A TEMPORARY SEDIMENT BASIN AT THE LOWER LIMITS

Following initial earthworks commencement, maintain temporary sediment basin at lower limit of construction. Install / reinstate associated diversion berms to ensure surface flows from disturbed earthworks areas enter the sediment basin. Complete balance of the earthworks and pavements for the current zone only. At-source sediment filter devices shall be installed (or re-installed) on all roadway and other stormwater inlets during this period.

Major Phase 3 Earthworks steps will include:

i) Continue earthworks excavations, maintaining functionality of temporary (or permanent) sediment basin at lower limit of current zone construction;

ii) Maintain sediment fences, stabilised exit and other sediment control devices as outlined in Phase 1 and 2. Undertake detailed site Erosion and Sediment Control (ESC) audit, and install any additional devices or remediation measures as deemed necessary;

iii) Finalize current stage earthworks as detailed on the approved drawings and in accordance with site geotechnical report recommendations;

iv) Installation of underground utilities and construction of balance of civil works associated with the quarry development;

### 7.5 PHASE 4 – STABILISE / SEAL ROADS AND EMBANKMENTS, SWALES AND OTHER DISTURBED AREAS, RE-DIRECTION OF CLEAN OR FLOCCULATED FLOWS AWAY FROM EARTHWORKS AREAS

Phase 4 will involve the stabilisation / sealing of current zone roads, batter embankments and associated civil works. Any sealed pavements or roofs shall be connected into the underground stormwater system or directed away from earthworks areas. At the completion of this phase the current zone should be considered to be practically stabilised.
7.6 PHASE 5 – REMOVAL OF SEDIMENT BASIN AND FINAL STABILIZATION OF LANDSCAPED AND OTHER UNSEALED AREAS

Following the completion of Phase 4 stabilization measures, the final construction Phase 5 will involve the removal of the sediment basin (except permanent sediment basin in Zone 7). Due to their self-bunded nature, Zones 1 – 6 basin will be removed / relocated progressively by extending the face of excavation along the access road. A prior request must be made to the superintendent (or Council) to remove / extend the sediment basin. It should be noted that prior to removal of the sediment basin, all other “at source” Erosion and Sediment Control measures shall be reviewed and upgraded where necessary to ensure their maximum efficiency.

All Erosion and Sediment Control measures shall be maintained during the on-going construction “maintenance period”, and it shall remain the contractor’s responsibility to maintain their functionality until the project is handed over to the quarry operator for operation. Regular monitoring audits of Erosion and Sediment Control measures over Lot 105 shall remain the responsibility of the contractor up to final handover to ensure no migration of sediments from the site.
8.0 POTENTIAL PROBLEM IDENTIFICATION

The areas of potential concern for this development have been identified as the following:

- Depositing of soil or other construction materials onto roadways from construction traffic activities;
- Public amenity with regard to haulage of transported earthworks; and
- Sediment infiltration into adjacent drainage watercourse from site runoff or decanting of sediment basin.
9.0 STRATEGIES

9.1 STRATEGIES – EROSION AND SEDIMENT CONTROL

The appropriate best management practice shall be implemented including the following:

- Any upstream ‘clean water’ surface flows will be diverted around the boundaries of the earthworks area with suitable diversion berms installed;
- Installation of treatment devices as per Erosion and Sediment Control Program drawing Nos. B12119-SK-350 to 355 (Appendix B). Ensure that any contaminated surface runoff from Lot 105 leaves only after passing through a treatment device. It should be noted that the majority of the disturbed footprint will be diverted through a sediment basin throughout the earthworks construction period and following testing and treatment the basin will be decanted out into the existing gullies within Lot 105;
- An un-disturbed, vegetation buffer zone and sediment fence barrier will be maintained between the construction zone and the watercourse where possible;
- Once the roadway stormwater swales are constructed, rock check dams and other filters will serve as a pre-treatment device before flow enters the sediment basin;
- Ensure construction vehicles exiting and entering Lot 105 are clean of loose dirt or contaminants that may enter the roadway drainage system;
- Minimize disturbance by construction worker’s vehicles via provision of a stabilized parking area clear of earthworks areas;
- Ensure progressive site stabilisation is implemented as soon as practically possible, and maintained at all times during construction;
- Reduce sediment-laden runoff leaving Lot 105 by capture into sediment basin; and
- Ensure that any temporary site buildings and permanent building roofs are connected into the underground drainage system immediately following roof gutter installation. No roofs shall discharge onto exposed earthworks areas.

9.2 STRATEGIES – NUISANCE DUST

- Prevent / minimise dust and fine particle material being transported from Lot 105 via air or wind by ensuring roads and tracks are maintained via the use of water trucks and/or dust suppressants; and
- Restrict unnecessary vehicular movements over exposed earthworks areas. Only necessary construction vehicles shall be allowed within earthworks areas. Workers will be instructed to park their private cars on sealed / stabilised roads or a dedicated stabilised car parking areas.
10.0 ACTIONS

10.1 ACTIONS – EROSION AND SEDIMENT CONTROL

- Construction shall be staged and ESC measures to be implemented as per the phases previously described in Section 6;
- Before commencing earthworks on any part of Lot 105, materials sufficient to protect against storms will be available on site and the work scheduled to ensure that, wherever practicable, any permanent or temporary erosion protection is in place before exposing earthworks to storm runoff;
- Divert clean runoff from the external (and un-disturbed internal) catchments away from the construction area;
- Sediment fences will be used as per the Erosion and Sediment Control Program and drawings (Appendix B) as required to provide temporary controls. These sediment fences will be a temporary barrier of a semi-pervious material (Geotextile) to intercept sediment laden runoff;
- Trenches (where required) will be backfilled and compacted to a level at least 100mm above adjoining ground level;
- Any topsoil removed should be either removed off-site, or stockpiled for subsequent placement of landscaping to batters. Cut off drains and sediment fencing will be used as required to control sediment loss from the stockpiles;
- Roadway gully inlets shall be provided with temporary inlet protection during construction. Roadway swale drains shall be provided with check dams during construction;
- Roof runoff shall be prevented from discharging onto disturbed earth, and will be connected to the underground stormwater system as soon as they are constructed (provide temporary flexible pipe where necessary);
- A designated clean-down facility will be situated at the exit road from Lot 105 onto the existing roadway. Construction vehicles are to be cleaned down prior to exit to restrict tracking of sediment from Lot 105;
- In the event of failure of a sediment control measure causing pollution of the street, sediment is to be swept and shovelled;
- Washing/flushing of streets shall only occur where sweeping and shovelling has failed to collect all the sediment and there is a compelling need to remove the remaining sediment (e.g. for safety reasons) to comply with Environmental Protection (WATER) Policy s19.(4).(b). In such circumstances, sediment controls in the kerb and channel at the gully trap inlet will be implemented where it is safe, practicable, and where there is no significant
risk of causing localised flooding. Sediment removed from roads or from controls at the gully pit inlets will be placed in a controlled area;

- Construction of Sediment Basins shall be constructed and maintained as directed in Brisbane City Council’s “Sediment Basin Design, Construction and Maintenance Guideline”. Runoff is to be directed into these basins at all times by installation of diversion berms or other measures;

- Responsibility for maintaining Erosion and Sediment Control measures will remain with the civil contractor up until “handover” to quarry operator; and

- Erosion and Sediment Control measures shall be monitored, maintained and shall be cleared whenever their capacity falls below 75%.

10.2 ACTIONS – NUISANCE DUST

- Keep unsealed construction tracks damp via watering during times of construction or times of high wind;

- Retention of as many high trees as possible adjacent to excavation zone – to act as wind break and reduce the effect of wind on exposed earthworks areas. Significant tree retention will also provide initial filter capture and buffer to adjoining land for airborne dust particles which may occur;

- Wet down earth, tamping and gravel in full delivery trucks prior to and during unloading process; and

- Responsibility for dust suppression / control measures will remain with the civil works contractor up until “handover” to the quarry operator.
11.0 MAINTENANCE, MONITORING AND REPORTING

- An environmental register will be maintained by the earthworks contractor. This register will include details of all controls, and all records and observations including weather conditions. This register shall be kept on site and be able to be presented for inspection by the Council or EPA at any time upon request;

- The principal contractor will coordinate a suitably qualified person experienced in erosion and sediment control to conduct the following site audits and associated reporting including photograph's of the ESC devices and any corrective action undertaken within 5 days of each audit:
  1. Regular 14 day audits summarized into the site environmental register;
  2. Additional audits following all rainfall events greater than 10mm summarized into the site environmental register; and
  3. Full summary report every two months (maximum) from commencement of works until adequate stabilisation of site. This report must include copies of the above audits, non-conformance and corrective action reports, water quality testing results, plan showing area stabilised and rainfall records.

- Controls will be inspected regularly, and before expected heavy rainfall, to ensure they are intact, and any observation recorded in the environmental register;

- Visual inspection of sediment and water quality control mechanisms will be carried out during (where possible) and after major rain events;

- A NATA registered laboratory shall conduct testing of the Total Suspended Solids, Turbidity and pH content of discharge from the sediment basins. Testing shall be conducted prior to dewatering the settling zone, during prolonged rainfall, a minimum of once every day until discharge stops. Testing is to occur as long as the basins are in operation;

- The contractor shall ensure, where possible, that water has drained from the settling zone of the basin, and preferably the sediment storage zone, prior to the next rainfall event that causes runoff. The sediment basins should be dewatered within 5 days of rainfall including testing and treatment; and

- The contractor must carry out any rectification / improvement measures recommended in writing by the superintendent / authorized Council Officer. Visual inspection of all erosion and sediment control measures shall be carried out by the superintendent on a regular basis, and by the contractor on a daily basis.