Proponent Joyful View Garden Real Estate Development Resort Co Pty Ltd

Cherrabah Granite Mine

Stormwater Management Plan

April 2019
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1. **Introduction**

1.1 **Project overview**

Joyful View Garden Real Estate Development Resort Co Pty Ltd (Joyful View) is proposing to develop and operate a granite dimension and stone mine in Cherrabah, Queensland. The proposed granite mine site (the Site) is located on a rural property (Lot 1000 SP 268215) in the headwaters of the Condamine catchment, approximately 25 km south of Warwick. The mining lease (ML 100128) for the Site covers 17.42 ha of the 1988 ha sized property. The mine is to have an annual production of 8000 tonnes of dimension stone, extracted using wire saw and stitch drill methods.

An Environmental Authority (EA) application for mining activities at the Site was submitted in 2017. The Queensland Department of Environment and Science (DES) refused the application in September 2018 due to inadequate performance outcomes relating to protecting the environmental values. These included the environmental values of land including soils, subsoils, landform and associated flora and fauna, as well as the environmental values of water.

1.2 **Purpose of this report**

This report outlines the environmental values, existing environment, objectives, management plan and potential impacts of the Site relevant to surface water.

The water management plan was developed for the following purposes:

1. To provide a water management plan for mining operations, ensuring water quality compliance during release events, including:
   - Providing details of release locations and conditions
   - Establish a monitoring program for implementation during operations, including outlining monitoring locations, frequencies and parameters for analysis

2. To inform the Environmental Authority of the following details:
   - The potential impacts of mining activities at the site to surface water in the region
   - The details of the release events from the water storages on site
   - The water quality control measures for site runoff

1.3 **Scope and limitations**

This report: has been prepared by GHD for Joyful View Unit Trust and may only be used and relied on by Joyful View Unit Trust for the purpose agreed between GHD and the Joyful View Unit Trust as set out in section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than Joyful View Unit Trust arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.
GHD has prepared this report on the basis of information provided by Joyful View Unit Trust and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

1.4 Scope of work

The scope of work for the Site Stormwater Management Plan (SMP) includes a desktop review of the existing environment and the development of a water management plan for the Site. The following details relate to the work undertaken:

- Desktop assessment and background study
  - Review of existing conditions at the Site and in the surrounding area
  - Review and analysis of the applicable environmental conditions for the Site and the receiving environment
  - Identify and assess the water quality objectives applicable to the region
  - Identify contaminants of concern due to proposed activities
- Catchment analysis to determine the contributing catchments and define the major overland flow paths to and from the site.
- Hydrologic modelling and peak flow estimation for the site.
- Sizing of the detention basin capacity to attenuate the runoff generated from the site.
- Size the sedimentation basin required to treat the runoff from the disturbance areas within the extraction pits in accordance with Stormwater Guideline for Environmentally Relevant Activities, DEHP (2017).
- Design and sizing of the major diversion drains, catch-dams and associated structures to convey the flow to and from the basins.
- Prepare a conceptual land form plan using the available site survey data, aerial survey (e.g. SRTM), mine plan and/or the client sketches.
- Provision of RPEQ certified report and associated plans.

1.4.1 Exclusions

The SMP was developed in accordance with the scope of work, outlined in section 1.4, and does not include the development of a water management regime for the proposed haul road upgrade.

1.4.2 Previous Reports

In preparing this stormwater management plan the following previous reports were reviewed:


1.5 Relevant guidelines

The report has been prepared in accordance with or reference to the following guidelines:

- Technical Guideline Wastewater release to Queensland waters (ESR/2015/1654), 2015
- Australian and New Zealand Environment and Conservation Council (ANZECC) & Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ), 2000
- Guidelines for Managing Risks in Recreational Water (National Health and Medical Research Council), 2008
- Stormwater and environmentally relevant activities (Department of Environment and Heritage Protection), 2014
- Draft Healthy Waters Management Plan – Condamine River basin, 2018
2. **Project Description**

The proposed Cherrabah Granite Mine is located approximately 25km south of Warwick on Lot 1000 SP268215 which is within the Southern Downs Regional Council area and is part of the New England Tablelands. The mining lease covers an area of 17.42 hectares, which is a very small portion of the 1,988 hectare property (<1% of total land area). The site is accessed from Keogh Road via O’deas Road and Cullendore Road. The existing access to the site is via the northeast corner of the property and Keogh Road through the Cherrabah Resort facility. The site layout is shown in Figure 1.

![Figure 1 Site Layout](image)

The proposed development will operate as a granite mine for the extraction and processing of 8,000 tonnes of dimensioned stone product annually. The development will require a mobile fleet of equipment which includes:

- Front end loader
- Excavator and Rockbreaker
- Stitch Drill
- Diamond Wire Saw
- Blade Saw
- Water Truck
- 4WD Light Vehicles
- Forklift
- Generators

The mine operation requires a number of fixed and semi-mobile buildings that include:
• A basic workshop for machinery maintenance comprised of two sea containers and an 'igloo' type shelter;
• A self-bunded fuel storage facility (Approx 30000L);
• Site office; and
• Staff amenity block (lunch room/first aid) including ablutions with septic tank.

2.1 **Stages of Development**

The site will be developed in three discrete stages;

• Site establishment and Construction
• Mine development and Operation
• Rehabilitation and decommissioning of the site once operations have concluded

2.1.1 **Site Establishment and Construction**

Site establishment and construction of the mine requires several construction/earthworks elements including:

• Construction of an internal access road from the Mining Lease to the property entrance: this is to be constructed to rural road standard with a 6m wide gravel pavement on an 8m formation or other suitable design
• Earthworks to level an appropriate processing and stockpiling area to the north of the resource area: including appropriate stormwater drainage infrastructure
• Establishment of the site infrastructure (including office, amenities, power and communications)
• Establishment of access to the extraction area by several access roads graded to suit vehicle access
• Once production exceeds 5,000t/a, upgrade of Keogh Road to an 8m sealed pavement

2.1.2 **Mine Development**

The granite mine will be developed from the base of the resources and progress upslope to the south in a benched fashion. Benches will be determined by block height but a maximum bench height of 10m is proposed. Extraction will be facilitated by sawing (rock saws and/or wire saws). Once the upper layer of weathered stone is removed the mine will be developed in a square benched manner governed by the natural fracture location and spacing. A haul road will be developed on the eastern side of the resource to access the upper benches and an existing 4WD access track will be maintained on the western side of the resource. The vegetation surrounding the resource will be maintained where feasible.

2.1.3 **Rehabilitation and Decommissioning**

Rehabilitation of the mine operation will be carried out in stages, as some areas will be operational for more than 10 years. Separate rehabilitation methodologies are will be used for the extraction areas and the processing and stockpiling areas. The final slope profile for the extraction areas is currently designed with a 90° face angle, 10m bench height and 10m bench width. This design is based on assumed geotechnical specifications; however ongoing analysis is required of the face stability as the mine progresses. At various places around the pit overburden may be placed as a 'bridge' between the benches to allow wildlife passage however each bench will be integrated into the surrounding topography at the edge of the pit. A
sediment basin will be constructed within the floor of the extraction pit which will remain as a water storage to manage sediment runoff from the extraction pit post mining operations.

The processing and stockpiling areas will be contoured to suit the final rehabilitation profile (with appropriate drainage) and compacted areas will be deep ripped followed by topsoil placement.

### 2.2 Potential Contaminants of Concern

Extraction of topsoil, and granite during the operations at the Site will increase the quantity of mobilised sediment and contaminants.

#### 2.2.1.1 Geochemistry of granite

Granite is a coarsely grained material, comprised primarily of three minerals, quartz, alkali feldspar and plagioclase feldspar, which are primarily made up of the following compounds:

- **Quartz**
  - Silicon dioxide compound
  - Commonly occurs in minerals
  - Practically insoluble in water at room temperature

- **Alkali feldspar**
  - Feldspar is determined by the alumina and silica in their chemistry
  - Alkali feldspar is rich in sodium and potassium
  - Practically insoluble in the environment

- **Plagioclase feldspar**
  - Rich in sodium and calcium
  - Practically insoluble in water

Based on the geochemistry of granite, and the practical insolubility in water, total suspended solids (TSS) is the only contaminant of concern of the proposed mining activities.
3. Overview of Stormwater Management System

This Stormwater Management Plan (SMP) applies to the extents of the disturbance footprint of the proposed Cherrabah Granite Mine. The purpose of this plan is to ensure that all stormwater discharges from the site are managed to minimise environmental impacts.

3.1 Water Quality Objectives

The Site is located in the Lord John Creek catchment, which forms part of the Upper Condamine River. Lord John Creek is an ephemeral system and is the main drainage line from the Site. Lord John Creek flows into the Condamine River approximately 21.5 km downstream from the Site which flows directly to the Condamine River. The Condamine River is also considered an ephemeral system in the Upper Condamine River region.

Relevant WQOs for the Site were identified from QWQG (2009) to support and protect different environmental values for water in the Condamine catchment. Lord John Creek is identified as part of the ‘Upper Condamine’. The aquatic ecosystem at the Site and surrounding areas, including the receiving environment for the Site, is considered Moderately Disturbed (MD). The water quality objectives which are applicable to moderately disturbed waters within the Upper Condamine are shown in Table 1.

<table>
<thead>
<tr>
<th>Table 1 Water Quality Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turbidity (NTU)</td>
</tr>
<tr>
<td>Low Flow Conditions (&lt;1.7 m³/s)</td>
</tr>
<tr>
<td>High Flow Conditions (&gt;1.7 m³/s)</td>
</tr>
</tbody>
</table>

As described in section 2.2 the main contaminant of concern associated with the proposed mining activities is total suspended solids. All site runoff will be managed to meet the total suspended solids water quality objective. The water quality objective for the high flow criteria is consistent with the limit specified for events up to 1 in 5 years ARI in the Stormwater Guideline for Environmentally Relevant Activities, DEHP (2017).

3.2 Performance Objectives

In addition to meeting the water quality objectives specified in Section 3.1 all site runoff will be managed to meet the following performance objectives.

- All upslope clean runoff will be diverted around the site and away from site works wherever possible
- Runoff within the site will be managed and conveyed within the site to minimise erosion and the accumulation of additional suspended solids loads by:
  - Maintaining flat grades wherever possible within the site to reduce runoff velocities
3.3 Site Drainage Regime

The site has been divided into three main areas for the purposes of managing site drainage which are as follows:

- Catchment 1 – This comprise the upslope catchment which will be diverted along the western boundary of the extraction pit
- Extraction Pit – Mine water and stormwater runoff from within the extraction pit will drain to sediment basin 1 for storage and potential release
- Processing and Stockpile Area – Stormwater runoff from the processing and stockpile area will drain to sediment basin 2 for storage and release.

The site drainage regime is shown in Figure 2.
Figure 2  Catchment and Extraction Pit Site Layout
4. Stormwater Management

4.1 Hydrology

The formulation and implementation of the stormwater management plan for the proposed development is based on the following key principles:

- Utilisation of existing drainage structures to reduce any post development impacts.
- Where necessary, propose new structures to satisfy the condition that peak flows downstream of the site are not increased.

The site observation undertaken by Ausrocks indicates that decomposed granite, scattered cobbles and boulders predominantly cover the proposed operational area. There is no topsoil within the extraction area and minimal topsoil within the processing and stockpiling area. Small trees and short shrubs populate the crevices in the granite. Figure 3 shows the existing site condition at the extraction pit.

Figure 3  Existing Site – Extraction Pit

In the absence of Lidar information for the subject site the aerial survey data of SRTM (30m grid spacing) was extracted using ELVIS website tool (http://elevation.fsdf.org.au). The data has been process in Civil 3d software to generate the contour plans for the entire site.

Catchment delineation and hydrologic parameters calculation have been undertaken to estimate the peak flows generated from the external catchments flowing to the subject site. The time of concentration for the sub-catchments was calculated using Friend’s equation. The summary of the existing catchment parameters is given in Table 2.

<table>
<thead>
<tr>
<th>Catchment</th>
<th>Area (ha)</th>
<th>Grade (%)</th>
<th>Fraction impervious (%)</th>
<th>Time of concentration (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>15</td>
<td>10</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Extraction pit</td>
<td>2.9</td>
<td>15</td>
<td>70</td>
<td>5</td>
</tr>
<tr>
<td>Processing and stockpile</td>
<td>4.8</td>
<td>9</td>
<td>40</td>
<td>5</td>
</tr>
</tbody>
</table>
The peak flow estimation was carried using DRAINS program and the most updated rainfall data from BOM website, the summary of peak flows for the investigated events is presented in Table 3.

**Table 3  Summary of Peak Flows – DRAINS**

<table>
<thead>
<tr>
<th>Storm event (% AEP)</th>
<th>Peak flow (m³/s)</th>
<th>Catchment 1</th>
<th>Processing and stockpile area</th>
<th>Extraction Pit</th>
</tr>
</thead>
<tbody>
<tr>
<td>63</td>
<td>0.60</td>
<td>0.24</td>
<td>0.45</td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>1.25</td>
<td>0.36</td>
<td>0.58</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>2.06</td>
<td>0.53</td>
<td>0.77</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>2.59</td>
<td>0.67</td>
<td>0.94</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>3.27</td>
<td>0.82</td>
<td>1.10</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>4.02</td>
<td>1.03</td>
<td>1.30</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>4.72</td>
<td>1.17</td>
<td>1.47</td>
<td></td>
</tr>
</tbody>
</table>
5. **Stormwater Control Structures**

The primary stormwater control structure which will be constructed to manage stormwater on the project site comprise the following:

- Diversion Drain
- Earthen Bunds
- Internal Catch Drains
- Sediment Basins

The site general arrangement is shown in

5.1 **Diversion Drain**

The extraction pit will be surrounded on the diversion drain which will be constructed along the eastern, southern and western perimeter of extraction pit to convey upslope clean runoff around the site. The location of the diversion drain in shown in Figure 2. Typical section details of the diversion drain are provided in Figure 6.

The design parameters which have been adopted for the diversion drains are shown in Table 4.

<table>
<thead>
<tr>
<th>Table 4</th>
<th>Diversion Drain Design Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item</td>
<td>Purpose</td>
</tr>
<tr>
<td>Diversion drain</td>
<td>Clean runoff</td>
</tr>
<tr>
<td>Base width (m)</td>
<td>1</td>
</tr>
<tr>
<td>Batter (V:H)</td>
<td>1:2</td>
</tr>
<tr>
<td>Minimum depth (m)</td>
<td>0.5</td>
</tr>
</tbody>
</table>

5.2 **Earthen Bunds**

Two earthen bunds will be constructed upstream of the processing and secondary material stockpile areas to divert clean runoff from upslope areas to the diversion drain. The location of the earthen bunds in shown in Figure 2.

5.3 **Internal Catch Drains**

An internal catch drain will be built to direct contaminated runoff from the processing and stockpile areas to sedimentation basin number 2. The location of the catch drain is shown in Figure 2.

<table>
<thead>
<tr>
<th>Table 5</th>
<th>Catch Drain Design Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item</td>
<td>Purpose</td>
</tr>
<tr>
<td>Internal Catch drain</td>
<td>Dirty runoff</td>
</tr>
<tr>
<td>Base width (m)</td>
<td>0.5</td>
</tr>
<tr>
<td>Batter (V:H)</td>
<td>1:2</td>
</tr>
<tr>
<td>Minimum depth (m)</td>
<td>1</td>
</tr>
</tbody>
</table>
Figure 4  Site General Arrangement
5.4 Sediment Basins

Two sediment basins will be constructed to manage contaminated stormwater runoff generated from the site.

Sediment Basin 1 will be constructed within the extraction pit to manage contaminated runoff generated from the extraction pit area. The basin will be 4m deep with a 1:2 internal batter and will be excavated as a void within the floor of the extraction pit. The basin has been sized in accordance with the *Stormwater Guideline for Environmentally Relevant Activities, DEHP* (2017).

Sediment Basin 2 will be constructed to treat dirty stormwater runoff generated from the processing and stockpile areas in the north east area of the site. Stormwater will be conveyed to the sediment basin via the internal catch drains discussed in section 5.3.

Each sediment basin has been designed to allow for a sediment storage volume which is equal to 50% of the upper settling volume in accordance with the *Stormwater Guideline for Environmentally Relevant Activities, DEHP* (2017). A summary of sediment basin design parameters and dimensions is provided in Table 6.

**Table 6 Sediment Basin Design Parameters**

<table>
<thead>
<tr>
<th>Item</th>
<th>Catchment (m²)</th>
<th>'Cv</th>
<th>#I - 5yr, 24hr (mm/hr)</th>
<th>Settling volume (m³)</th>
<th>Total volume (m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sedimentation basin 1</td>
<td>29,000</td>
<td>0.5</td>
<td>3.91</td>
<td>1361</td>
<td>2041</td>
</tr>
<tr>
<td>Sedimentation basin 2</td>
<td>22,000</td>
<td>0.5</td>
<td>3.91</td>
<td>1032</td>
<td>1548</td>
</tr>
</tbody>
</table>

*Adopted from Table B7 IECA

*Obtained from BOM website

Each sedimentation basins will have an armoured spillway structure which has been designed to cater a flood event with 2% AEP in accordance with the *Stormwater Guideline for Environmentally Relevant Activities, DEHP* (2017).

Long sections for the extraction pit and sediment basin 1 are shown in Figure 5 whilst details for the sediment basin 2 are provided in Figure 6.
Figure 5  Extraction Pit and Sediment Basin 1 Long Sections
Figure 6  Stormwater Control Infrastructure Details
5.4.1 Flow Attenuation

The proposed sedimentation basins will attenuate the peak flows from the site and act as a detention basin. On this basis, further analysis has been undertaken to estimate the attenuated flows from the site, it was assumed that sedimentation basin is full during the investigated storm events hence the sediment capacity was ignored in the model. Figure 7 and Figure 8 show the storage-stage graphs for the sediment basins 1 and 2, respectively.

![Figure 7 Stage Storage Graph for Sediment Basin 1](image1)

![Figure 8 Stage Storage Graph for Sediment Basin 2](image2)

The spillway channel of the sedimentation basin 1 will be built at the north of the extraction area and excavated the pit wall to convey the surcharge flow during major flood events to a channel downstream of the extraction pit. Typical details of the spillway channel are provided in Figure 6.

The spillway channel cut has been designed with an inter-bench side-slope of 1V:1H, with one bench required in the cut with a width of 3m. The typical details of the proposed structures are provided in Appendix.

The combined peak flow from the contributing catchments estimated in DRAINS for existing and developed site is summarized in Table 7.
As shown in Table 7 the results indicate that the peak discharges from the developed site including the extraction pit, laydown and processing area and the stockpile areas have been attenuated to non-worsening levels.

<table>
<thead>
<tr>
<th>Storm event (% AEP)</th>
<th>Peak flow (m3/s)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Existing</td>
<td>Developed</td>
<td></td>
</tr>
<tr>
<td>63</td>
<td>0.65</td>
<td>0.43</td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>0.93</td>
<td>0.57</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>1.27</td>
<td>0.77</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>1.62</td>
<td>0.94</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>1.93</td>
<td>1.14</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2.23</td>
<td>1.40</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2.54</td>
<td>1.61</td>
<td></td>
</tr>
</tbody>
</table>
6. Operational Considerations

6.1 Controlled Releases

The two sedimentation basins have been designed in accordance with the *Stormwater Guideline for Environmentally Relevant Activities, DEHP (2017)* to capture the volume of water received in a one-in-five year rainfall event. The relatively small capacity of the basins means that releasing water into the environment is likely to be necessary over the life of the mine. The following conditions were developed based on the Technical Guideline for Wastewater Releases to Queensland Waters (DES, 2016) and the *Stormwater Guideline for Environmentally Relevant Activities, DEHP (2017)* and apply to releasing water from the sedimentation basins.

- Release conditions
  - To occur within 120 hours of the event which filled the basin. This ensures that a continuous flow is not introduced into a naturally ephemeral system, therefore more closely imitating the natural environment. Similarly, it allows for the site to regain storage capacity to treat future runoff collected.
  - Total Suspended Solid concentration of less than 50 mg/L present in the released water
  - To commence after the natural flow within the waterway has peaked. This is to ensure there is no exacerbation to already elevated TSS levels that usually naturally increase in the early phase of a rainfall event

6.1.1 Release points

Two release points at the downstream (northern) ends of each of the two sedimentation basins. The release points and their locations are detailed in Table 8.

<table>
<thead>
<tr>
<th>Release Point</th>
<th>Location of release point</th>
<th>X-Coordinate</th>
<th>Y Coordinate</th>
</tr>
</thead>
<tbody>
<tr>
<td>RP 1</td>
<td>Sedimentation basin 1 (released into spillway channel)</td>
<td>407412.2</td>
<td>6853713.9</td>
</tr>
<tr>
<td>RP 2</td>
<td>Sedimentation basin 2 (released into spillway channel)</td>
<td>407506.7</td>
<td>6853840.8</td>
</tr>
</tbody>
</table>

6.2 Sediment Removal

The sediment basin storage volume is comprised of two components:

- Settling Volume - to detain sediment laden water
- Storage Volume – to store settled sediment

Accumulated sediment will need to be periodically removed to ensure that the basin storage volume is retained. A ramp has been provided to gain access to the base of the sediment basins.

6.2.1 Further sediment control measures

Mitigation and control measures additional to the sedimentation basin design and release conditions may be required if TSS levels are shown to significantly increase due to mining activities at the Site and include erosion, sediment and treatment controls.
7. Monitoring

Monitoring is an important aspect for the continued management of water at the proposed mine site. Quality monitoring assesses the performance of the control measures implemented in the stormwater management plan. Generally, appropriate monitoring locations are positioned upstream, downstream as well as at the location of interest. This allows for appropriate analysis of the impacts due to activities at a location of interest.

The proposed Cherrabah Mine site is located in the far-upper headwaters of the Condamine catchment. No defined waterways exist upstream of the proposed site location. For this reason, it is impractical to monitor an upstream location. Proposed monitoring locations at the Site and downstream of the Site are detailed in Table 9 and are shown in Figure 9. The following details relate to the proposed monitoring locations:

- **RP 1**
  - Located at the northern end of Sedimentation basin 1
  - Releases directly to the spillway channel, which flows to Lord John Creek
  - To ensure less than 50 mg/L of TSS is released to the environment
  - To monitor actual amount of TSS released to the environment
  - To be monitored during a release event

- **RP 2**
  - Located at the northern end of Sedimentation basin 2
  - Releases directly to the spillway channel, which flows to Lord John Creek
  - To ensure less than 50 mg/L of TSS is released to the environment
  - To monitor actual amount of TSS released to the environment
  - To be monitored during a release event

- **Elbow Valley Station**
  - Located on the Condamine River, approximately 14.5 km upstream of the Condamine River and Lord John Creek junction
  - Provides a baseline TSS reading for comparison with downstream monitoring locations
  - Water quality data, including TSS, is accessible from the Water Monitoring Information Portal, however it is not recorded daily. Monitoring to be undertaken within 5 days of a release event.

- **Lord John Creek at Odea Rd**
  - Closest accessible downstream monitoring location, approximately 10 km downstream from the Site
  - Monitors TSS concentrations in the water for comparison with baseline values
  - Allows for the assessment of the performance of the Site’s control measures and compliance with water quality objective for TSS
  - To be monitored within five days of a release event
### Table 9  Monitoring locations and parameters

<table>
<thead>
<tr>
<th>Location relative to the Site</th>
<th>RP 1</th>
<th>RP 2</th>
<th>Elbow Valley Station</th>
<th>Lord John Creek at Odea Rd</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sedimentation basin 1</td>
<td></td>
<td></td>
<td>Condamine River, upstream of Condamine River and Lord John Creek junction</td>
<td>Downstream from site</td>
</tr>
<tr>
<td>Sedimentation basin 2</td>
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<table>
<thead>
<tr>
<th>Parameters tested</th>
<th>TSS</th>
<th>TSS</th>
<th>TSS, flow rate</th>
<th>TSS, flow rate</th>
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</thead>
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<tr>
<td>Easting</td>
<td>407412.2 E</td>
<td>407506.7 E</td>
<td>415883.3 E</td>
<td>411782.8 E</td>
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<tr>
<td>Northing</td>
<td>6853799.3 S</td>
<td>6853840.8 S</td>
<td>6861345.2 S</td>
<td>6860365.8 S</td>
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<tr>
<td>Monitoring frequency</td>
<td>Release event</td>
<td>Release event</td>
<td>Release event</td>
<td>Release event</td>
</tr>
</tbody>
</table>

**Notes:**
- TSS: Total Suspended Solid
- Flow rate: Measured in liters per second (L/s)
7.1 Monitoring constraints and considerations

There are a number of constraints to the water monitoring regime that were considered. These constraints may cause issues or delays to monitoring events, and include:

- **Accessibility and safety:**
  - Odea Road is an unsealed road; access during or after heavy rainfall event may not be possible
  - Monitoring during very high flow events may be dangerous for personnel, and monitoring may not be able to be completed within specified time frame
  - Access to monitoring locations may be compromised by external factors such as road works. Alternative nearby sampling locations may be suitable in these circumstances.

- **Practicality**
  - Mobilisation of a monitoring team within five days of a release event may be difficult or impractical.
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Document Status

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Date: 29/03/2019