**AMENDMENT MAY 2013**

ENVIRONMENTAL IMPACT ASSESSMENT
MARY'S MOUNT BLUE METAL QUARRY

# SECTION 4.2

# SURFACE WATER STUDY & SEDIMENT & SURFACE WATER MANAGEMENT

PREPARED BY:

North West Projects Pty Ltd

Northwest Projects
Gunnedah

# BLUEMETAL QUARRY

# SURFACE WATER STUDY

# MARYS MOUNT GUNNEDAH

30/4/13

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# 1 INTRODUCTION

Northwest Projects has been commissioned by Gunnedah Quarry Products to undertake a surface water report for the proposed expansion of the hard rock quarry at Barkers Rd Marys Mount Gunnedah .The report is to identify surface water catchments with recommendations for a staged works program to address any impacts.

## 1.1 Description of Project

Gunnedah Quarry Products (GQP) proposed to expand the its current quarry operation at "Burleith" Barkers Rd Marys Mount to 120 ,000 tonnes pa . The proposed expansion will allow GQP undertake operations beyond the approved 2 ha limit.
The increased extraction limits shall be achieved via higher output volumes of proposed extraction and crushing plants on site.
Transportation of processed materials from site is proposed by road haulage .The purposed of this report is to investigate and provide recommendations providing for surface water ,drainage and water usage.

## 1.2 Scope of Report

This report has been prepared to accompany an Environmental Assessment report for Hard Rock Quarry Expansion GQP Marys Mount.The report forms part of the supporting documentation considering surface water impacts.

## 1.3 Existing Development

The "Burleith" quarry is located approx 25 km south-west of Gunnedah of Barkers Rd Marys Mount. GQP has been operating the quarry for approx 2 years under conditions provided by Gunnedah Shire Council on original Development consent 507167, which included maximin output of 90,000 tonnes pa with haulage route from quarry along Barkers Rd to Quia Rd.
Hard rock is extracted by ripping with bull dozer and loading to crushing plant on site. Further screening and stockpiling is carried out on hard stand areas on site.Products of various sizes are used for road making, blast stemming , rail ballast and builders fill.

# 2 Site Water and Runoff

## 2.1 Hydrology

The intensity and frequency rainfall chart for Mullaley area is provided in diagram 2.0. Rainfall in this area is dominant in summer with the highest intensity also occurring in with storm periods during this time.
In high rain fall period the site sheds water in various minor down slope flow paths around the hill, with a main gully located on the northern side of the current quarry area.
Currently all water shed from the existing quarry area and general northern side is collected via a contour bank around the base of the hill ,referred to as bank A in diagram 2.1 below , and drained to Dam A.


Diagram 2.0 - Design Rainfall Intensity

## 2.2 Surface Flow Collection

As described above flows from the general northern side and current quarry areas is collected via contour bank at the base of the hill and directed to Dam A.
Rainfall – flow calculations from the proposed Quarry areas A for the 1 in 100 yr storm (refer Appendix A) have confirmed the contour bank A and Dam A with capacity of 8 ML will ensure no surface water leaves the site.

## 2.3 Water Balance

Current Usage of water on site is limited to dust suppression on haul roads, crusher and a small amount for employee amenities. Water storage on site will be via 20,000 L steel water tank, Dam B min 1 ML for treated effluent from Dam A. Currently Gunnedah Quarry Products has access to the existing stock and domestic supply bore on the western side of the property, this bore has potential for 50,000 L/hr.As detailed below the water requirement of the quarry can be supplied from on site dams and the bore. It should be note that the bore is currently stock and domestic only , as part of the approval process Gunnedah Quarry Products would seek a licence from NSW Office of Water for suitable extraction rate. The current and proposed water usage is given in Table 2.1

| Usage Item | Current Usage L/Day | Maximum Future Usage L/Day | Supply Source |
|---|---|---|---|
| Haul Road Dust Susspression | 5000 | 0 (road sealed) | Dam B Supply Bore |
| Crusher Dust Suppression | 5000 | 15000 | Dam B Supply Bore |
| Amenities | 200 | 800 | Supply Bore |

Table 2.1 – Site Water Usage

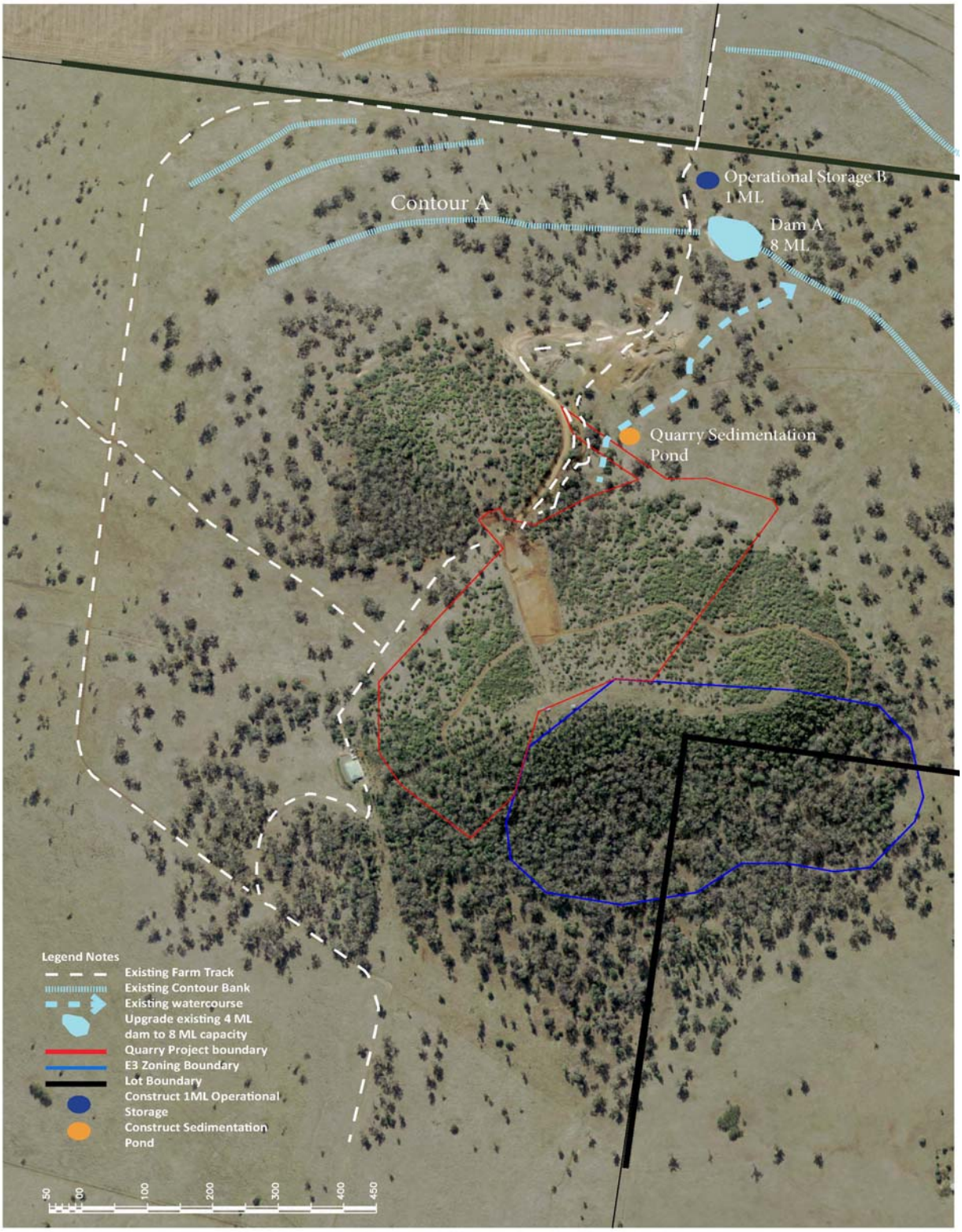


Diagram 2.1 - Site Drainage Controls

# 3 Runoff Control Measures

### 3.1 Drainage Channels / Contour Banks/ Dams

Drainage channels where runoff naturally flows are to be trenched to a average depth of 300 mm and line with rock to slow water flow. Contours banks to be top soiled and constructed within recommended grades and batters to prevent erosion. Generally maximum longitudinal grade on contours banks is to be max 1%.

The Reconstructed Dam A on the northern side of the quarry will collect run off and sediment from the quarry, spillways and high flow areas are to be lined with rip rap size rock and monitored for maintenance ( refer to Runoff Management Plan).

### 3.2 Monitoring and Maintenance

Refer to Water Management Report for Environmental Monitoring, Management and Design requirements for surface discharges.
Due to the large amount of earth movement and machinery traffic in quarry sites monitoring and maintenance of waterways/erosion points is essential for effective management of the quarry.
In general the Production Manager will inspect all control measures on site on a weekly basis and following significant rainfall events. The specific monitoring requirements are given in table 2.1 below.

| Issue | Frequency | Performance Criteria |
|---|---|---|
| Visual Inspection of Controls | Weekly and after rainfall events | Drainage channels clear and draining , no adjacent erosion areas.<br>Earth Banks intact , no sediment build up.<br>Bunding – no gaps or low points or leakage points |
| Visual inspection of Waterways | Weekly and after rainfall events | No discernible sediment deposition or breach of banks. |
| Visual Inspection of road drainage areas | Weekly and after rainfall events | Grading to drains, erosion points to min depth. |

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# 4 Recommended Works Program

**The following Works Program is recommended :-**

1. Reconstruction of Dam A to capacity of 8 ML .
2. Construct Dam B 1 ML for management of on site effluent and reuse
3. All dams to be constructed to requirements of Managing Urban Storm Manual" (NSW Government , 2004) .
4. Diversion Banks , Sediment trap and Drains as recommended in the Management of surface water report.

Note : The above items have been determine from a general site appraisal , a full scope of work , survey and design should be undertaken prior to undertaking any work.

# APPENDIX A - RUNOFF CALCULATIONS

### Project Specific Data

The analysis for this report has been based on a site inspection undertaken by P Hutchison on 30/11/12 , together with information provided as follows:-

- Printed Site Plan (no reference number) prepared by Stewart Surveys Pty Ltd (Gunnedah);

Climate information was sourced from BOM for the location: 31.100S, 149.900E and includes Intensity Frequency Duration Chart - Issued 30/11/2012.

Table A details the input data used in the analysis .

| Catchment | Approx Lot Area (Ha) | Mainstream Length (km) | Fall (m/km) |
|---|---|---|---|
| SA | 24 | 1.5 | 120 |

Table A – Summary of input data used in this analysis

### Time of Concentration ($t_c$)

The time of Concentration has been calculated using formula (1) below:

$$t_c = \frac{FL}{A^{0.1}S^{0.2}} \quad (1)$$

*where:* $t_c$ *= time of concentration in minutes;*
$F$ *= 92.5 for Area (A) expressed in Ha;*
$L$ *= mainstream length in km;*
$S$ *= mainstream slope expressed in m/km;*
$A$ *= area in Ha.*

The calculated result for $t_c$ for a Water Drop to reach the dam from the furthest point in the catchment.

### Peak Flow Rate *(Q)*

The peak flow rate has been calculated using formula (2) below:

$$Q = 2.78\ CIA \qquad (2)$$

*where:* $Q$ = *peak flow* $m^3/s$;
$C$ = *coefficient of runoff*
i. *For SA 1% AEP – 90 mm/hr;*
ii. *For SB 1% AEP – 110 mm/hr*
$I$ = *rainfall intensity in mm/hr;*
$A$ = *area in Ha.*

The calculated result for $Q$ based on a time of concentration $t_c$ from formula (1) above

## Analysis

The time of concentration *($t_c$)* for rainfall to reach each drainage structure from the furthest point, together with the calculated flow volumes (Q) are detailed in Table A1 below.

| Catchment | Area (Ha) | Mainstream Length (km) | Time of Concentration ($t_c$) (minutes) | Intensity of 1%AEP event (mm/hr) | Volume of Flow ($m^3/s$) |
|---|---|---|---|---|---|
| DAM A | 24 | 2.5 | 65 | 70 | 3.7 |

Table A1 – Summary of Flow Volumes

# APPENDIX B – PHOTOGRAPHS

**EXISTING DAM A**

**EXISTING DAM A**

**EXISTING CONTOUR A - SOUTH**

**EXISTING CONTOUR A - WEST**

Northwest Projects
Gunnedah

# BLUEMETAL QUARRY

# SEDIMENT AND SURFACE WATER MANAGMENT

# MARYS MOUNT GUNNEDAH

30/4/13

# Table of Contents

# 1 INTRODUCTION

A Plan of Surface water Management is required for the development to satisfy Enviromental targets. The basis of site water management is to capture all surface runoff and direct to Dam A 10ML dam on the northern side of the quarry. All componets of the water management system are to be designed to comply with **Managing Urban Stormwater ,Soils and Construction Volume 20 Mines Quarries Department of Environment and Climate Change (Dec 2008).** The water management Plan is to form part of the overall Plan of Management for the Quarry.

# 2 Sediment & Erosion Control

## 2.1 Sediment Basin

A sediment basin is to be established in the quarry to capture all sedimentation from the active quarry area. The sediment basin is proposed to be located within the quarry area and also act as the quarry drainage sump . The quarry floor is to be graded to ensure that surface flows are directed to the sump area with over flow drained to Dam A.

## 2.2 Sediment and Erosion Control

The Management of the quarry is to include the following sediment controls :-

- The sediment basin is to be designed to the requirements of the "Managing Urban Storm Manual".
- All stormwater from the quarry area to be diverted to the sedimentation basin then to the retention Dam A.
- All General site Runoff is to be diverted via banks to the retention Dam A.
- Retention Dam A to have a capacity to retain the 1% event.

- Dam A to be constructed to Dept of Environment and Climate Change Standards , including seepage.

- Erosion and sediment control components are to be inspected regularly and after all rainfall events with any reistatement work to be undertaken.

- Sedimentation basin to be maintained to minimum available capacity .

Refer to Appendix A Construction Notes Erosion Control Devices for design details for sediment control structures.

## 2.3 Surface Flow Managment

In order to minimize off site impact of surface water from the expanded quarry all surface water is to be collected and diverted to the main detention Dam A. Components of the surface flow management are to be designed to cater for the 1% event with specifications to meet the "Blue Book" standards. A operating storage dam B is to be constructed to receive treated runoff water and general supply water for reuse in quarry activities. Storage B would be a small earth dam approx 1 ML with pumped inflow from Dam A.

The Management of the Quarry to include the following Surface water Controls

- Install and maintain water management components as per "Managing Urban Stromwater (NSW Government , 2004) .

- Banks to be constructed to divert surface flow to Dam A from up slope areas and working quarry.

- Chemical and fuels to be stored in bunded areas in accordance with standards.

- DamA storage capacity to be managed to ensure a retention capacity of 1% event is available .

- Effluent from Dam A to be released to Dam B after suitable retention time ( min 5 days) and testing has confirmed suitable for discharge ( EPA criteria meet).

## 2.4 Monitoring/Reporting/Corrective Action

The following controles to be implemented as part of the Quarry Environmental Management Plan.

- Regular monitoring for evidence of soil erosion and monitoring of quality of retention pond water .
- Monitoring reports to be provided to Gunnedah Shire Council and relavant State Authorities.
- Inspect drainage and sediment controls monthly and conduct maintenance as required.
- Testing Dam A inflow prior to release of water to Dam B or Discharge . Testing to be conducted by registered NATA lab to EPA guildlines. Test reports to be logged and refered to relevant authorities.

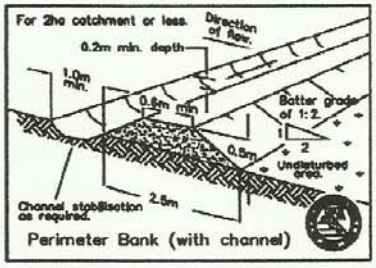
# APPENDIX A

# CONSTRUCTION DETAILS

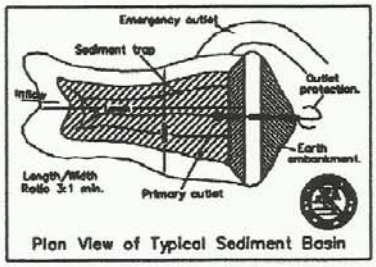
# SEDIMENT AND SURFACE FLOW DEVICES

## Construction Notes

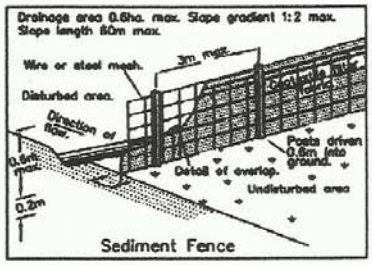
- Construct access road with erosion control measures. Sow all disturbed areas outside of the quarry pit, excluding road surface, with the Couch grass 3 kg/ha (spring/summer),Ryegrass 20 kg/ha (autumn/winter) & Starter R 15 or equivalent 100 kg/ha.
- Install pipe culverts, with headwalls, within the drainage line on the main access road.
- Install diversion banks/berm with min. 1 m base width, 0.3 m minimum depth and batter gradients to be no steeper than 1:3 (V:H).
- Clearly delineate internal roads, work areas and all stockpiles and protect by erosion and sediment control works.
- Progressively install both temporary and permanent erosion and sediment control works per the erosion/sediment control schedule of works.
- Regularly inspect all sediment control structures for damage, and remove to overburden site.
- Carry out ongoing maintenance including re-sowing/fertilising of areas as required.



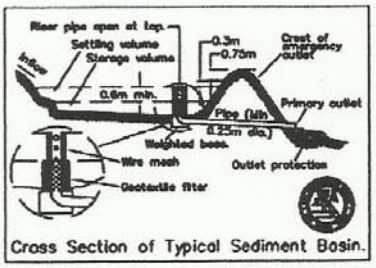
Perimeter Bank (with channel)



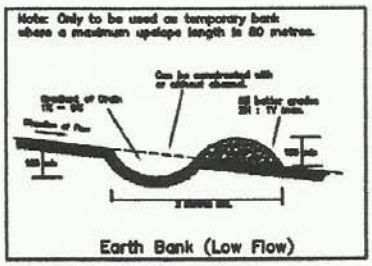
Plan View of Typical Sediment Basin



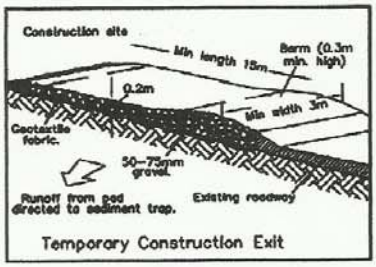
Sediment Fence



Cross Section of Typical Sediment Basin.

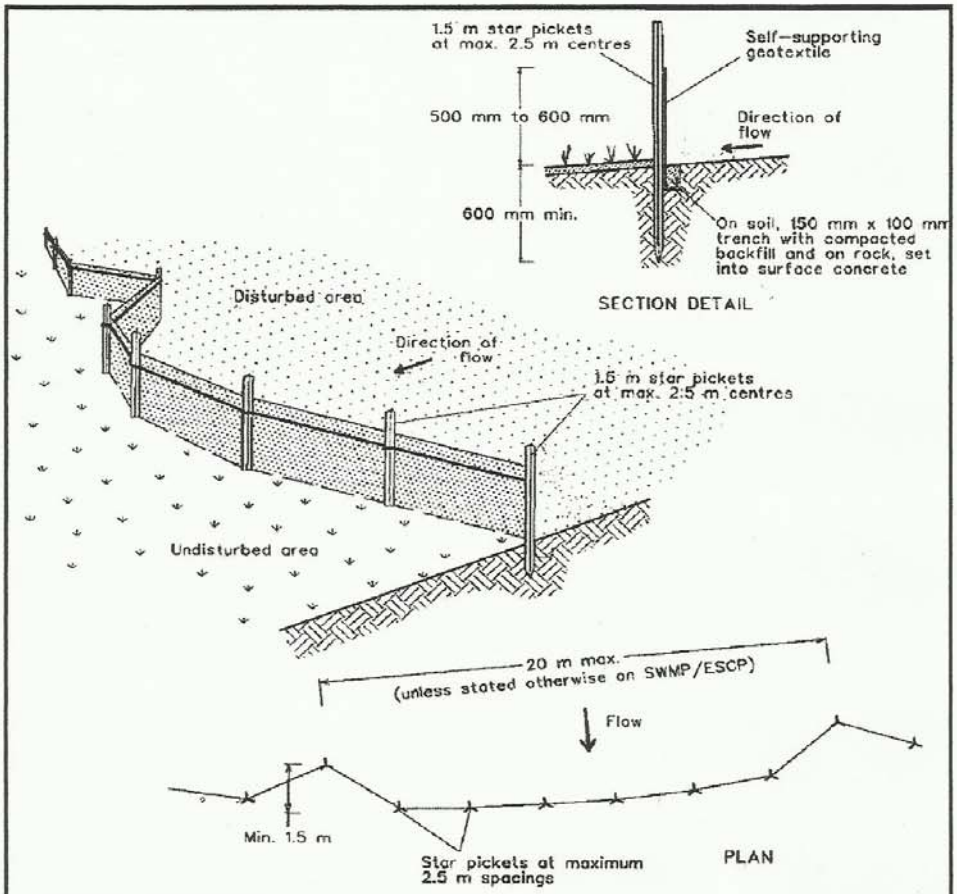


Earth Bank (Low Flow)



Temporary Construction Exit

# TYPICAL SILT FENCE ARRANGEMENT



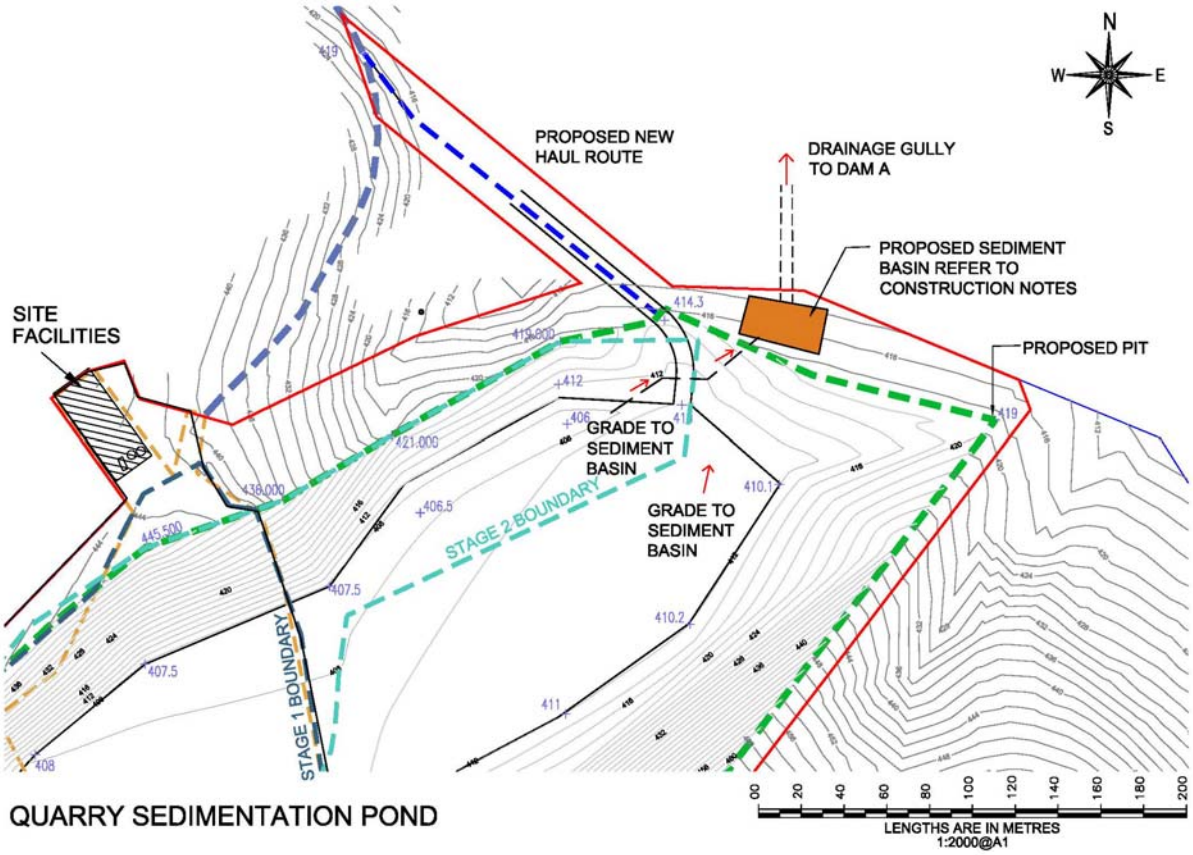

## Construction Notes

1. Construct sediment fences as close as possible to being parallel to the contours of the site, but with small returns as shown in the drawing to limit the catchment area of any one section. The catchment area should be small enough to limit water flow if concentrated at one point to 50 litres per second in the design storm event, usually the 10-year event.
2. Cut a 150-mm deep trench along the upslope line of the fence for the bottom of the fabric to be entrenched.
3. Drive 1.5 metre long star pickets into ground at 2.5 metre intervals (max) at the downslope edge of the trench. Ensure any star pickets are fitted with safety caps.
4. Fix self-supporting geotextile to the upslope side of the posts ensuring it goes to the base of the trench. Fix the geotextile with wire ties or as recommended by the manufacturer. Only use geotextile specifically produced for sediment fencing. The use of shade cloth for this purpose is not satisfactory.
5. Join sections of fabric at a support post with a 150-mm overlap.
6. Backfill the trench over the base of the fabric and compact it thoroughly over the geotextile.

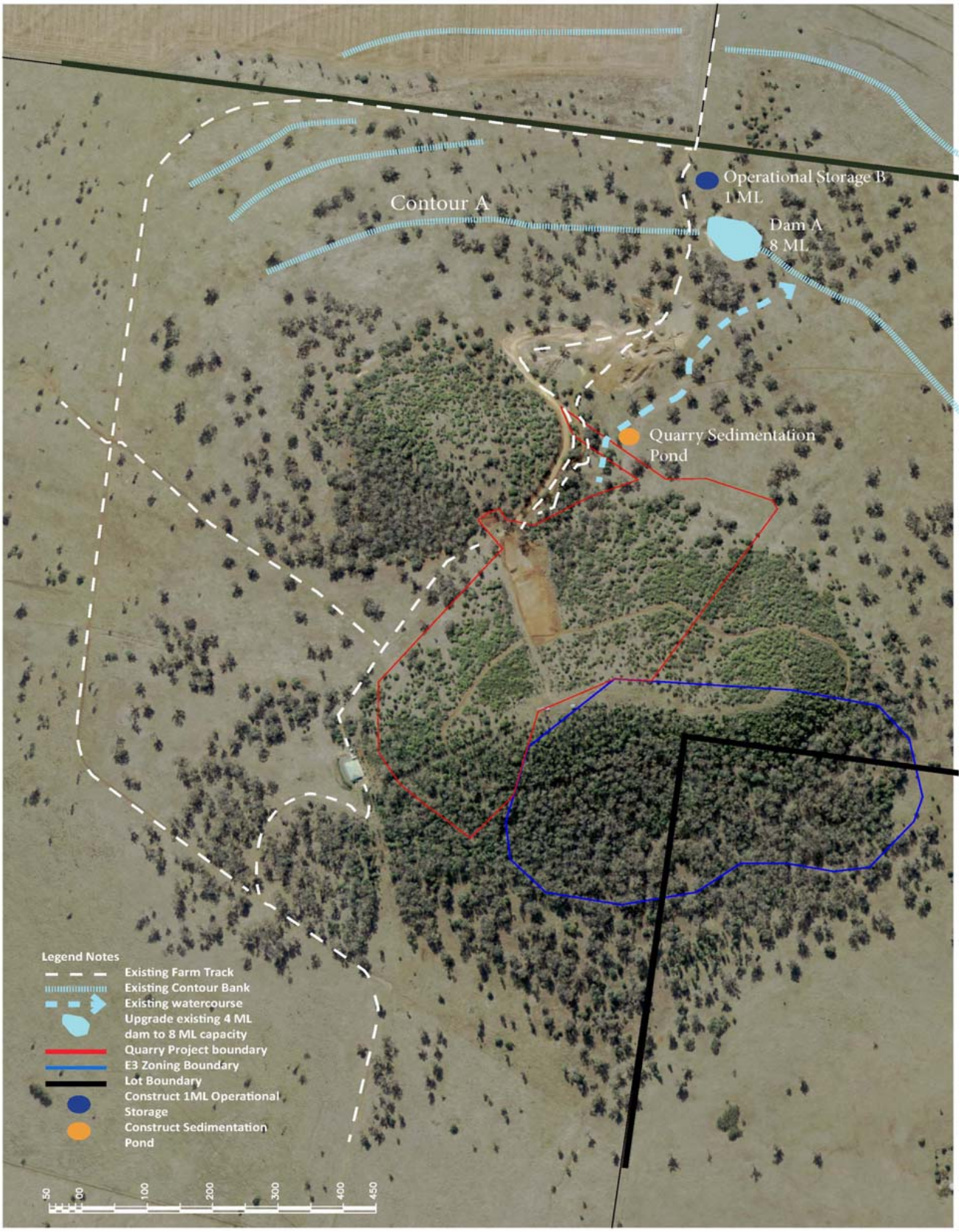
# APPENDIX B

# GENERAL LAYOUT

# SEDIMENT AND SURFACE FLOW DEVICES




QUARRY SEDIMENTATION POND




Site Drainage Controls