

GLENCORE

Sustainable Development Plan

Grout Remediation Plan - Site 2

West Wallsend Colliery

Contents

1.	Background	4
1.1	Existing Environment	5
1.2	Regulatory Context	8
2.	Introduction	10
2.1	Key Objectives & Purpose	10
3.	Remediation Options	10
3.1	Remediation Options Investigated	10
3.1.1	Option 1 – Manual breakup of grout material and removal by Capalotta Cap Bora Super Sucker Heavy Vehicle	10
3.1.2	Option 2 – Manual breakup of grout material and removal by person and/or ATV	12
3.1.3	Option 3 – Manual breakup of grout material and removal by vehicle	13
3.1.4	Option 4 – Manual breakup of grout material and removal by helicopter	14
3.1.5	Option 5 – Mechanical breakup of grout material and removal by earthmoving equipment/heavy vehicles	15
3.1.6	Option 6 – Mechanical breakup of grout material and removal by helicopter	16
3.1.7	Option 7 – Leave the grout in situ and allow it to naturally weather	17
3.2	Preferred Remediation Option	17
3.2.1	Operational Planning	17
3.2.2	Grout Removal Process	18
3.2.3	Heli-lifting	19
3.2.4	Waste Characterisation, Disposal and Tracking	19
3.3	Ancillary Activities	19
3.3.1	Rockfall Stabilisation Works	19
3.3.2	Vegetation Clearing/Minor Ground Disturbance	19
3.3.3	Installation of safety barriers/controls/manual handling systems	20
3.3.4	Weed Control Activities	20
3.3.5	Equipment Storage Areas	20
3.3.6	Erosion and Sediment Control Activities	21
3.3.7	Access tracks and Car parking	21
3.3.8	Post Remediation Activities and Determination of Final Rehabilitation Criteria	23
3.4	Risk Management	25
3.4.1	Training & Answers	25
3.4.2	Grout Remediation Team – Required Knowledge and Skills	25
3.4.3	Public Safety	26
3.5	Change Management	26
3.6	Responsibilities	27
4.	Environmental Impact Assessment	28
4.1	Aboriginal Cultural Heritage	29
4.2	Historic Cultural Heritage	30
4.3	Noise	30
4.4	Air Quality	31

4.5	Flora & Fauna	31
4.6	Erosion & Sedimentation	33
4.7	Surface Water & Hydrology.....	34
5.	Monitoring Stakeholder Consultation, reporting, remediation timeline and evaluation	35
5.1	Monitoring	35
5.1.1	Surface Water Monitoring	35
5.1.2	Aquatic Macro Invertebrate Monitoring	35
5.1.3	Vegetation Monitoring	35
5.1.4	Erosion Monitoring	35
5.1.5	Photo Monitoring Points	37
5.2	Stakeholder Consultation.....	37
5.3	Reporting	38
5.4	Remediation Timeline.....	39
5.5	Evaluation	39
5.6	Summary of Commitments	40
6.	References	45
6.1	Legislation.....	45
6.2	Miscellaneous.....	45
7.	Appendices.....	46
7.1	Appendix 1 – Remediation Direction	46
7.2	Appendix 2 – Due Diligence Ecological Assessment.....	47
8.	Control and revision history	48
8.1	Document information	48
8.2	Revisions.....	48

1. BACKGROUND

West Wallsend Colliery is an underground coal operation located in the Newcastle Coalfields of New South Wales and is managed by Oceanic Coal Australia Limited (OCAL) on behalf of the Macquarie Coal Joint Venture. OCAL is the major joint venture participant in the Macquarie Coal Joint Venture (MCJV) with 70 per cent ownership. Other participants include Marubeni Coal Pty Ltd, OCAL Macquarie Pty Ltd and JFE Minerals (Aust) Pty Ltd. OCAL, which also wholly owns OCAL Macquarie Pty Ltd, is wholly owned by Glencore Plc.

West Wallsend Colliery (WWC) undertakes its mining operations in accordance with the sites Project Approval (PA_09_0203), Environment Protection License (EPL1360), Environmental Assessment (West Wallsend Colliery Continued Operations Project 2010) and Subsidence Management/Extraction Plans. As outlined in the WWC Environmental Assessment, the majority of the WWC's underground mining area is located within the Sugarloaf State Conservation Area (SSCA).

The Environmental Assessment for continued operations, predicted subsidence cracking within the Sugarloaf State Conservation Area as part of its detailed Subsidence Assessment for the operation.

Subsidence remediation activities coordinated by WWC are undertaken in accordance with the approved remediation management methods listed in the sites Environmental Assessment and subsequent Subsidence Management/ Extraction Plans required under the site's Project Approval. As outlined in these respective management plans, remediation of surface cracking on gently sloping terrain with vehicular and equipment access is generally undertaken using earthworks machinery. In areas where access is limited or in steeper terrain WWC has utilised a contractor Orica Australia (Orica) to assist with filling selected surface cracks using grout.

Remediation activities undertaken within the SSCA are undertaken in consultation with the OEHL (through consent with the National Parks and Wildlife Service). Grout products used by Orica within the SSCA to fill surface cracking in the SSCA have been chosen in consultation with and approved by OEHL.

WWC has developed and maintained a site specific surface grouting procedure to assist with providing guidance for remediation activities. Prior to the remediation of each surface cracking area WWC adopts a risk based approach to managing hazards associated with any work area.

Since April 2012, WWC has successfully remediated surface cracking across Longwalls 38 - 41 using grouting techniques within the SSCA in accordance with its existing procedures.

The grouting activities within the SSCA generally involved the establishment of a grout mixing site (Adjacent existing access tracks/trails) and the installation of poly pipelines, these are run from the mixing site to the location of the subsidence cracks requiring remediation.

Orica has been the site's principle grouting contractor for subsidence, grouting remediation works in the SSCA during this time.

Remediation of surface cracking adjacent Longwall 41 commenced in December 2012.

At approximately 1pm on 20 September 2013, two ecologists from Umwelt who were engaged by WWC to undertake biodiversity monitoring at a site toward the northern extent of Longwall 41, identified the presence of the approved grouting product (Air – O – Cem), down slope of a previously remediated subsidence crack in the SSCA. Following the notification of the potential incident, WWC immediately conducted a site inspection of the affected area. Following confirmation of the incident, notifications to the relevant authorities were made by Oceanic Coal Australia Ltd (OCAL). **Figure 1** shows the location of the grout affected area within the SSCA.

1.1 Existing Environment

The Sugarloaf State Conservation Area (SSCA) was created in 2007 and covers an area of approximately 3,937Ha. The conservation area extends from Seahampton in the North to Awaba in the South. The area is predominantly vegetated with forest consisting of several general vegetation communities. The incident area is located on the foothills of the Sugarloaf Range within the Hunter Sub-region of the Sydney Basin Bioregion (Thackway and Cresswell, 1995), and the Gosford-Cooranbong Coastal Slopes landscape (OEH, 2007).

As outlined in WWC's detailed incident report, the grout affected area extends approximately 120m down slope of a previously remediated subsidence crack site. The average width of the affected area is approximately 1m. It is estimated that the average depth of the grout product is approximately 100mm. Based on the above information it is estimated that approximately 12 cubic meters of grout has travelled down the side of a steep slope area on the northern end of longwall 41, terminating on the embankment of an ephemeral drainage channel in the Cockle Creek catchment. The terrain within the affected area varies from gentle slopes (towards the bottom and middle of the affected area) to moderate and steeply sloping terrain (on the foothills toward the top of the affected area).

Based on vegetation mapping initially undertaken during the WWC continued operations environmental assessment (Umwelt 2010) and a targeted ecological assessment by (Kleinfelder 2013 – **Appendix 2**), as part of the development of this GRP, there have been three vegetation communities that have been identified as occurring within or adjacent to the grout affected area / proposed work areas. These are discussed in further detail below:

The proposed primary access into the site is via an existing foot track through Coastal Plains Smooth Bark Apple Woodland. The floristic description of this community is outlined below:

Floristic Description: The vegetation is dominated by the canopy species *Angophora costata* (Smooth-barked Apple) and *Corymbia gummifera* (Red Bloodwood) in association with *Eucalyptus acmenoides* (Red Mahogany). The area contains a scattered midstorey of *Allocasuarina torulosa* (Drooping Sheoak). Shrubs in the area include *Persoonia linearis* (Narrow-leaved Geebung), *Xanthorrhoea* sp. (Grass Tree) and *Doryanthes excelsa* (Gymea Lilly). The groundcover was dominated by *Themeda australis* (Kangaroo Grass) and *Rytidosperma pallida* (Silver-top Wallaby Grass).

A typical visual description of this community is provided in **Plate 1** below:



Plate 1 - Coastal Plains Smooth Bark Apple Woodland located within area of proposed primary access track

As described by Kleinfelder, the grout affected slope area is characterised by two main vegetation communities, Coastal Foothills Spotted Gum Ironbark Forest and Hunter Valley Moist Forest - Dry Variant. The floristic descriptions of these communities are outlined below:

Coastal Foothills Spotted Gum Ironbark Forest:

Floristic Description: The vegetation is dominated by the canopy species *Angophora costata* (Smooth-barked Apple) and *Corymbia gummifera* (Red Bloodwood) in association with *Eucalyptus acmenoides* (Red Mahogany). The area contains a scattered midstorey of *Allocasuarina torulosa* (Drooping Sheoak). Shrubs in the area include *Persoonia linearis* (Narrow-leaved Geebung), *Xanthorrhoea* sp. (Grass Tree) and *Doryanthes excelsa* (Gynea Lilly). The groundcover was dominated by *Themeda australis* (Kangaroo Grass) and *Rytidosperma pallida* (Silvertop Wallaby Grass).

Hunter Valley Moist Forest Dry Variant:

Floristic Description: The dominant canopy species are *Corymbia maculata* (Spotted Gum), *Eucalyptus punctata* (Grey Gum) and *Eucalyptus acmenoides* (Red Mahogany). A midstorey of *Allocasuarina torulosa* (Drooping Sheoak) also occurs. Shrub species include *Leptospermum trinervium* (Flaky-barked Tea-tree), and *Persoonia linearis* (Narrow-leaved Geebung). The upper ground layer is dominated by *Pteridium esculentum* (Bracken Fern). The dominated grass species include *Imperata cylindrica* (Blady Grass), *Entolasia stricta* (Wiry Panic) and *Themeda australis* (Kangaroo Grass).

A typical visual description of these communities is provided in **Plates 2 and 3** below:



Plate 2 - Coastal Foothills Spotted Gum Ironbark Forest located on the slopes of the affected area



Plate 3 - Hunter Valley Moist Forest Dry Variant located on the slopes of the affected area.

As described by Kleinfelder, the ephemeral drainage channel located below the grout affected area is predominantly made up of the Hunter Valley Moist Forest –Mesic Variant. The floristic description of this community is outlined below:

Floristic Description: The dominant canopy species are *Corymbia maculata* (Spotted Gum) and *Eucalyptus punctata* (Grey Gum). A mesic midstorey occurs which is dominated by species such as *Trochocarpa laurina*, *Acmena smithii* (Lilly Pilly), *Eupomatia laurina* (Bolwarra), *Pittosporum revolutum* (Rough-fruit Pittosporum), *Clerodendrum tomentosum* (Hairy Clerodendrum) and *Commersonia fraseri* (Brush Kurrajong) The ground layer is dominated by *Pteridium esculentum* (Bracken Fern), *Lomandra longifolia* (Spiny-headed Mat-rush) and *Blechnum cartilagineum* (Gristle Fern). Other ferns include *Doodia aspera* (Rasp Fern).

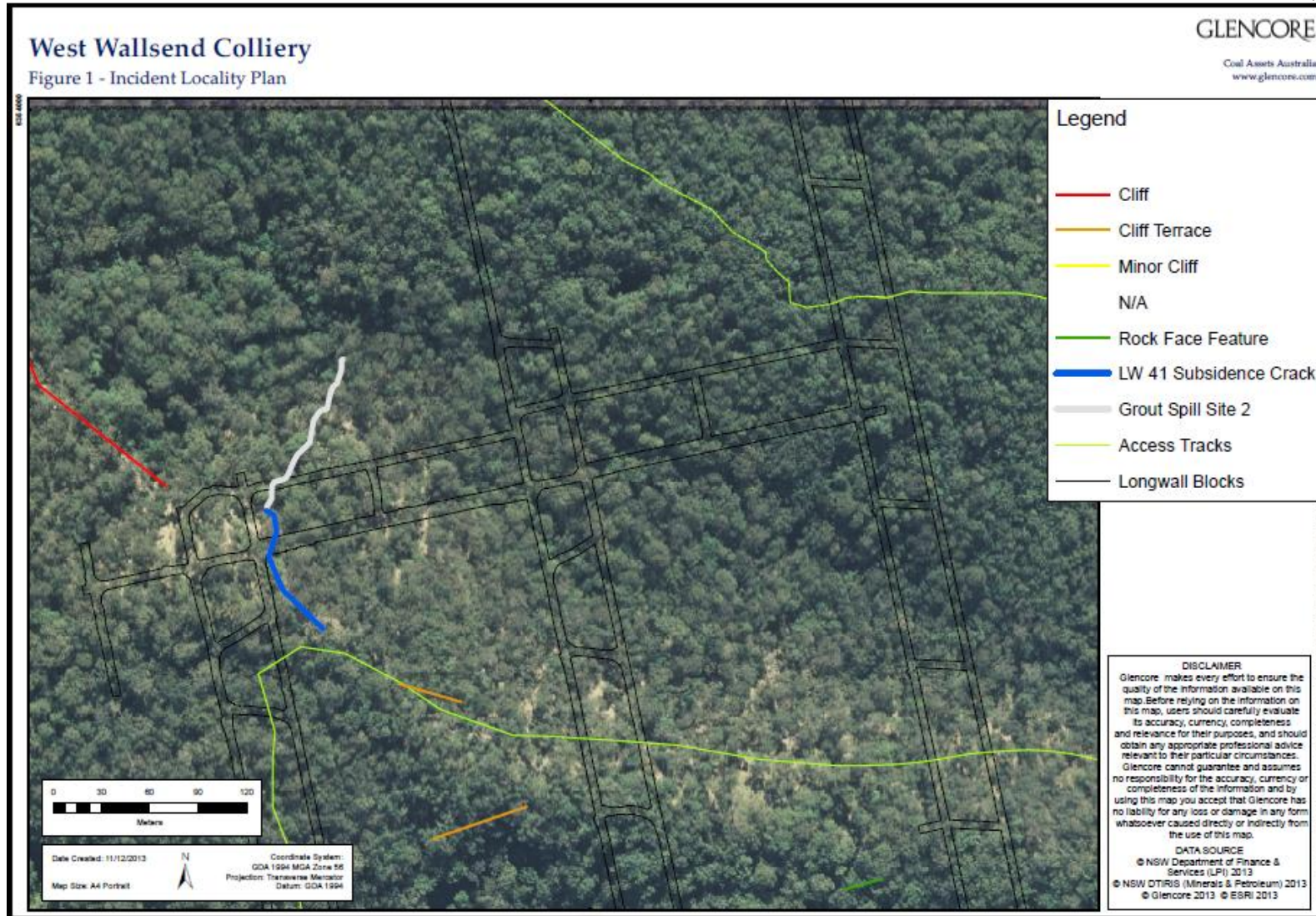
A typical visual description of this community is provided in **Plate 4** below:



Plate 4 - Hunter Valley Moist Forest - Mesic Variant located in the drainage channel adjacent the grout affected area.

1.2 Regulatory Context

As outlined in **Section 1.0**, WWC undertakes its mining operations in accordance with the sites Project Approval (PA_09_0203), Environment Protection License (EPL1360), Environmental Assessment (West Wallsend Colliery Continued Operations Project 2010) and Subsidence Management/Extraction Plans. This Remediation Plan has been developed and will be implemented in accordance with the Remediation Direction issued by the OEH (Notice DOC13/76057). Refer to **Appendix 1**



2. INTRODUCTION

2.1 Key Objectives & Purpose

The Key Objectives and Purpose of this Grout Remediation Plan are listed below:

- Outline identified remediation options for the removal of the grout product from the affected area of the SSCA.
- Identify and discuss the preferred remediation option based on site investigations.
- Outline associated activities required to successfully implement the remediation plan.
- Identify and outline the potential environment and community impacts regarding the remediation plan and the mitigation measures to be implemented to reduce these impacts.
- Outline the proposed operational planning, monitoring, reporting and timing of the remediation activities.
- Outline how the remediation activities will be carried out to an extent as far as possible to restore the natural, environmental, and cultural values of the site in a controlled and sustainable manner to allow for a net environmental benefit from the remediation works.
- Satisfy the Direction to Carry Out Remedial Works DOC 13/76057 issued by OEH.
- Clearly outline the responsibilities of all parties associated with the implementation of the Remediation Plan.

3. REMEDIATION OPTIONS

3.1 Remediation Options Investigated

Following the identification of the incident, OCAL, in consultation with Orica, commenced investigations into potential remediation options for the affected area. The following remediation options were investigated for the grout affected area:

1. Manual breakup of grout material and removal by Capalotta Cap Bora Super Sucker heavy vehicle.
2. Manual breakup of grout material and removal by person and/or All Terrain Vehicle (ATV).
3. Manual breakup of grout material and removal by heavy vehicle.
4. Manual breakup of grout material and removal by helicopter.
5. Mechanical breakup of grout material and removal by earthmoving equipment/heavy vehicles
6. Mechanical breakup of grout material and removal by helicopter.
7. Leaving the grout in situ and allowing it to weather naturally.

These options are discussed in further detail below:

3.1.1 **Option 1 – Manual breakup of grout material and removal by Capalotta Cap Bora Super Sucker Heavy Vehicle**

This remediation option involved the manual break up of grout material using various types of non mechanical equipment and then pulverising it into a powder like state. This would potentially allow for the grout material to be 'sucked' approximately 560 metres across the State Sugarloaf Conservation Area to the nearest possible potential truck accessible access track.

JR Richards, a waste services provider has provided advice into the practicality and feasibility of this removal method. Schematics of the typical 'sucker truck' to be used (Cap Bora) were provided and are displayed below in **Figure 2**.

Upon further investigation, the waste services provider was not able to provide assurance as to the design capability of the Cap Bora for this particular application due to the difficult terrain. It was also recognised that significant upgrades to existing access tracks would be required to provide safe and stable access for this equipment. The advantages and disadvantages of this option are discussed below:

Figure 2

Vacuum Loader - Cap Bora Excavation Unit



Tank / Debris - capacity 11 cubic metres

- Tipping with dual-action hydraulic cylinders
- Rear door hinged with hydraulic opening
- 8" pneumatic exhaust valve.
- De-cant / Discharge of sludge / liquids 6" outlet
- Vacuum shut-off via electronic tank sensor when tank full with liquid

Vacuum System - High capacity tri-lobe Hibon Rotary blower

- 9000m³/h (5301cfm)
- Innovative sound proofing to reduce noise emissions
- Large filter bag house (ref filtering system)
- Noise levels below 85dB(A) @ 1 metre within working RPM rang

Unloading / Pneumatic Unloading system (Discharge)

- Special tipping body system allows unloading over standard mobile skip bins and banded areas, which can be filled up completely without moving the vehicle
- Unloading from a maximum height of 2 metres
- Pneumatic / Venture discharge allows vehicle to unload dry / wet / sludge material up to a height of 40 metres – 1bar / 102.9 kpa
- Eliminate dust contaminates whilst unloading using special equipment



Advantages	Disadvantages
<ul style="list-style-type: none"> • Removal method would require minimal disturbance to the SSCA during grout removal activities. • Would reduce potential for manual handling injuries as material would be transferred via mechanical means. 	<ul style="list-style-type: none"> • Preliminary investigations confirmed that the required application was likely to fall outside of the equipments design parameters. • Noise impacts from the daily use of sucker truck could potentially impact on the local community • Would require the grout to be pulverised into a powder like state prior to removal. This would potentially increase the risk of the grout material becoming airborne or mobilised during removal.

3.1.2 **Option 2 – Manual breakup of grout material and removal by person and/or ATV**

This remediation option involved the manual break up of grout material using various types of non mechanical equipment and then collecting the material into bags. The bags would then be either dual lift carried by person or transported from the affected area approximately 560m by a small all terrain vehicle (ATV), to the nearest possible potential truck accessible access point on land owned by Oceanic Coal. The advantages and disadvantages of this option are discussed below:

Advantages	Disadvantages
<ul style="list-style-type: none"> • Removal method would require minimal disturbance to the SSCA during grout removal activities. • Use of ATV's can reduce risk of manual handling injuries in difficult terrain. 	<ul style="list-style-type: none"> • Potential for manual handling injury when dual lifting and transporting bags of waste grout by foot from the affected area over undulating terrain. • Potential for unplanned movement/ injury when using an ATV to remove grout from the affected area over undulating terrain. • Dual lift carry would be extremely time consuming and would require a substantial increase in workforce numbers to maintain efficient progress with remediation activities. • Increased potential for weed spread

	<p>through the use of an ATV.</p> <ul style="list-style-type: none"> Track clearing for access to the affected area.
--	---

3.1.3 Option 3 – Manual breakup of grout material and removal by vehicle

This remediation option involved the manual break up of grout material using various types of non mechanical equipment and then collecting the material into bags. A formed access track would be constructed into and adjacent the affected area to create access for heavy and light vehicles into the site. The bags of grout would be loaded into vehicles adjacent the affected area for transport offsite. The advantages and disadvantages of this option are discussed below:

Advantages	Disadvantages
<ul style="list-style-type: none"> Construction of a formed access track into the affected area would allow ready access for vehicles into the area which would in turn reduce the time required to transport the waste grout from the immediate area. Construction of a formed access track into the affected area would improve emergency response capability for emergency services and or employees/contractors. Construction of a formed access track into the affected area would reduce distance needed to be walked by site employees/contractors. 	<ul style="list-style-type: none"> Would require moderate ground disturbance works within the SSCA during the construction period of the access track due to difficult terrain. Increased disturbance footprint could result in surface water quality impacts from erosion and sedimentation of exposed areas. Additional surface disturbance could result in localised spreading of weeds from vehicle movements.

3.1.4 Option 4 – Manual breakup of grout material and removal by helicopter

This remediation option involves the manual break up of grout material using various types of non mechanical equipment and then bagging the grout into bags suitable for heli-lifting. The grout bags would then be heli-lifted to a location on an adjacent landholder’s property. The grout bags would then be loaded onto trucks and transported to an appropriately licensed waste facility by a licensed waste contractor. The advantages and disadvantages of this option are discussed below:

Advantages	Disadvantages
<ul style="list-style-type: none"> • This method was successfully trialled under an existing remediation plan for a previously grout affected area in consultation with OEH. • Removal method would require minimal disturbance to the SSCA during grout removal and transport activities. • Use of heli-lifting technique would reduce risk of manual handling injuries associated with carrying bags out by foot. • Heli-lifting has been proven to be an efficient access technique in remote areas. • Doesn’t require the construction of formed access tracks into the affected area which reduces the disturbance footprint for the remediation activities. • Less intrusive method of remediation with minimal impact on surrounding environment. • Manual removal allows for the activity to be controlled in a sustainable manner as opposed to mechanical means. • Manual removal will ensure that care can be taken around sensitive areas to minimise disturbance within the affected area. 	<ul style="list-style-type: none"> • Option still requires access into the affected area by foot across undulating terrain which has the potential for injury. • Increased noise impacts on surrounding community during heli-lifting campaigns • Increase visual exposure to the local community through the use of helicopters. • Potential for increased dust generation from heli-lifting process. • Manual removal can be quite time consuming which could delay the time taken to complete the works. • Additional risks associated with introducing airborne equipment to the removal process.

3.1.5 Option 5 – Mechanical breakup of grout material and removal by earthmoving equipment/heavy vehicles

This remediation option involved the mechanical break up of grout material using various types of mechanical equipment (small earthmoving equipment, jackhammers, power tools etc). The broken up material would then be collected into bags. A formed access track would be constructed into and adjacent to the affected area to create access for earthmoving equipment as well as heavy and light vehicles into the site. The bags of grout would be loaded into vehicles adjacent the affected area for transport offsite. The advantages and disadvantages of this option are discussed below:

Advantages	Disadvantages
<ul style="list-style-type: none"> • Construction of a formed access track into the affected area would allow ready access for vehicles into the area which would in turn reduce the time required to transport the waste grout from the immediate area. • Construction of a formed access track into the affected area would improve emergency response capability for emergency services and or employees/contractors. • Construction of a formed access track into the affected area would reduce distance needing to be walked by site employees/contractors. • The use of small earthmoving machinery to break the grout up in situ could be undertaken very quickly. 	<ul style="list-style-type: none"> • Would require moderate ground disturbance works within the SSCA during the construction period of the access track due to difficult terrain. • Mechanical breakup of the grout material increases the potential for impacts on the surrounding environment. • Increased disturbance footprint could result in surface water quality impacts from erosion and sedimentation of exposed areas. • Increased potential for injury with mechanical equipment in close proximity to workers. • Additional surface disturbance could result in localised spreading of weeds from vehicle movements.

3.1.6 **Option 6 – Mechanical breakup of grout material and removal by helicopter**

This remediation option involves the mechanical break up of grout material using various types of mechanical equipment (small earthmoving equipment, jackhammers, power tools etc). Small earthmoving machinery would be tracked into the affected area across the undulating terrain. The broken up material would then be collected into bags suitable for heli-lifting. The grout bags would then be heli-lifted to a location on an adjacent landholder’s property where they would then be loaded onto trucks and transported to an appropriately licensed waste facility by a licensed waste contractor. The advantages and disadvantages of this option are discussed below:

Advantages	Disadvantages
<ul style="list-style-type: none"> • The use of small earthmoving machinery to break the grout up in situ could be undertaken very quickly. • A formed access track isn’t necessarily required for this option as the equipment could be tracked into the affected. • Use of heli-lifting technique would reduce risk of manual handling injuries associated with carrying bags out by foot. • Heli-lifting has been proven to be an efficient access technique in remote areas. • Doesn’t require the construction of access track into the affected area for Heli-lifting which reduces the disturbance footprint for the remediation activities . 	<ul style="list-style-type: none"> • Option still requires access into the affected area by foot across undulating terrain which has the potential for injury. • Mechanical breakup of the grout material increases the potential for impacts on the surrounding environment. • Potential increase for erosion due to equipment tracking adjacent the drainage line. • Potential for finite material to be left behind. • Increased potential for injury with mechanical equipment in close proximity to workers. • Tracking of earthmoving equipment would require a moderate amount of vegetation clearing during access into and adjacent the affected area to allow for this equipment to be used. • Increased noise impacts on surrounding community during heli-lifting campaigns. • Increase visual exposure to the local community through the use of helicopters. • Potential for increased dust generation from heli-lifting process. • Additional risks associated with introducing airborne equipment to the removal process.

3.1.7 Option 7 – Leave the grout in situ and allow it to naturally weather

This remediation option involved leaving the grout material in situ within the affected area and allowing it to naturally weather.

The advantages and disadvantages of this option are discussed below:

Advantages	Disadvantages
<ul style="list-style-type: none"> • Low level of disturbance within the SSCA required. 	<ul style="list-style-type: none"> • This option could be perceived by the community as “doing nothing”. • The grout material, while inert in nature is a foreign material which is not consistent with other materials within the SSCA. • Visual impact to the local community using the SSCA. • Could potentially impact on surface water quality within the adjacent drainage channel following rainfall events.

3.2 Preferred Remediation Option

Following a detailed assessment of all options it was decided that the preferred option was **Option 4** for the following reasons:

- This option has been successfully trialled in a recent grout remediation program in consultation with OEH.
- This option requires minimal surface disturbance works to achieve the desired outcome.
- Use of heli-lifting technique would reduce risk of manual handling injuries associated with carrying bags out by foot.
- Heli-lifting has been proven to be an efficient access technique in remote areas and has been tested within a recent grout remediation trial.
- This option does not require the construction of an access track into the affected area for Heli-lifting which reduces the total disturbance footprint for the remediation activities.

Further detail on the preferred option and how it will be implemented is outlined below in **Sections 3.2.1 to 3.4**.

3.2.1 Operational Planning

Given the unique nature of this remediation project, careful consideration and planning of operational requirements is critical to achieving the outcomes of the Grout Remediation Plan. Prior to commencing grout removal activities under this Grout Remediation Plan, WWC, in consultation with OEH will develop a detailed Operational Project Plan (OPP) for the proposed remediation activities. The OPP will

provide the operational framework for the remediation activities to be undertaken throughout the project and will provide the following:

- Detail key actions/activities/milestones required to achieve the outcomes of the GRP; and
- Outline estimated completion timeframes for the various actions/activities/milestones required under the GRP;

The OPP is a dynamic project management tool that will be regularly updated and managed by the OCAL Grout Remediation Project Supervisor to assist with tracking remediation progress.

3.2.2 Grout Removal Process

The methodology that will be adopted for the manual breakup and removal of the grout from the affected area is generally consistent with Option 4 of this GRP - Manual breakup of grout and removal by helicopter. The following equipment will be used to breakup and remove the grout material from the affected area into Bulk bags ahead of heli-lifting activities:

- Crow bars – Bulk removal
- Breaker bars – Bulk removal
- Pelican Picks– Bulk removal
- Mattocks– Bulk removal
- Shovels– Bulk removal
- Hand Picks and Screw Drivers– Bulk removal
- Chisels– Bulk removal
- Wire brushes– Fine removal
- Battery powered tools – Bulk and Fine removal
- Dust pan and brooms – Fine removal
- Scoops – Fines removal
- Misting spray bottles – Dust control
- Rakes – Leaf Litter / Bulk and Fine removal
- Storage buckets (20l) – Grout transport
- Brattice/Tarps– Grout wet weather management
- Pallets – level storage (if required)
- Bulk Bags – Grout storage and transport

It is anticipated that grout removal from the affected area will be undertaken by a small team of men (less than 6). Grout removal and ancillary activities will be undertaken during daylight hours Monday to Friday for the duration of the program.

As displayed in **Figure 4** the remediation project area has been broken up into 20 metre sections. Following the approval of this GRP, Orica will commence grout removal activities from the affected area starting at the lowest point and progressing upslope. It is proposed that grout be removed from 3 sections at a time (60m blocks) to ensure continuity of works. Once the first 60m has been completed and provisional signoff has been received from OEH, grout removal activities will progress into the second 60m block (remainder of the remediation area).

The grout material will continue to be placed in bulk heli-lift bags following its removal from the affected area. The bags will be positioned at the designated heli-lifting locations as determined by OCAL, Orica and OEH.

3.2.3 Heli-lifting

Approximately 6 potential heli-lift locations were identified within the grout affected area as part of the development of this GRP.

These heli-lift locations were based on the existing topography and the canopy spans of surrounding vegetation and are generally located adjacent the affected area.

Waste grout bags will be heli-lifted from the existing pre determined locations to a suitable cleared area on an adjacent private landholding (Refer to **Figure 3**).

Depending on remediation progress it is expected that multiple heli-lift campaigns may be required throughout the remediation project. These heli-lifting campaigns are expected to be relatively short in duration and are unlikely to impact on the surrounding community due to limited time required to undertake the works.

Although it is not expected that equipment/supplies will be required to be heli-lifted into or out of the work area for the remainder of the program it is possible that this may need to occur as remediation works progress and will be undertaken where required in consultation with OEH. Heli-lifting of equipment/supplies into or out of the work area will be assessed on a case by case basis and appropriate controls will be implemented to minimise the impacts on the surrounding environment and local community should this be required.

3.2.4 Waste Characterisation, Disposal and Tracking

Based on the products MSDS, the grout material has been assessed by a waste management services provider and is characterised as general waste – non putrescibles.

Each bag of grout material that is removed from the affected area will be transported to a licensed waste disposal facility by a licensed waste contractor. The volumes and tonnages of the waste material will be recorded and tracked in accordance with the OEH Direction.

3.3 Ancillary Activities

In order for OCAL/ Orica to achieve the outcomes of this remediation plan the following ancillary activities have been and will continue to be undertaken:

3.3.1 Rockfall Stabilisation Works

During the preparation of this GRP it has been determined that rockfall stabilisation activities may be required on a steep slope immediately above the top section of the grout affected area prior to works commencing in this area. These works will involve the controlled displacement of rocks above the work area to reduce the potential of these rocks rolling down slope when grout removal activities are being undertaken in this area. Future stabilisation activities may need to be undertaken during the remainder of the program in consultation with OEH if required using a similar methodology.

3.3.2 Vegetation Clearing/Minor Ground Disturbance

Selective brush cutting/trimming of vegetation as well as the removal of selected logs and rocks along the access tracks, heli-lift locations and sections of the affected area will be undertaken following the approval of this GRP. Vegetation clearing will be undertaken by suitably qualified bush regeneration contractors ahead of grout removal works. All vegetation to be modified or removed will be marked and assessed by OEH prior to works commencing. This will ensure that that any clearing of vegetation is

undertaken in a controlled and environmentally responsible manner. The extent of clearing along the access track will be minimised and is primarily required to allow safe, unobstructed access for personnel and equipment to access the remediation area. Where possible, the clearing of mature trees (>30cm diameter) will continue to be avoided. No clearing of mature trees is expected to be required to undertake the remediation activities.

As recommended in an independent aviation audit an area of approximately 5m² cleared area is required around heli-lift locations to provide adequate line of sight to the helicopter during heli-lifting. In some areas the trimming of canopy vegetation may be required to provide this adequate line of sight for the helicopter pilot. Where possible, and safe to do so, branches that are impacted by trimming activities will be positioned in a way to provide habitat for ground dwelling fauna. Any hollows that are identified during pre clearance inspections will be offset with nest boxes by OCAL/Orica throughout the remediation campaign.

Heli-lift locations will be designed to reduce potential impacts to surrounding vegetation where possible.

A coordinated approach for the planning, establishment and management of heli-lift sites will be undertaken in consultation with OEH.

Clearing of vegetation within and adjacent to the affected area will be undertaken to reduce the risk of slips, trips, falls and improve the accessibility of the area for safety, remediation works and access in the case of an emergency. Vegetation clearing will be minimised where possible and will be constrained to low and mid storey vegetation where possible.

3.3.3 Installation of safety barriers/controls/manual handling systems

Based on the outcomes of the site inspections additional safety barriers and controls will be installed as the works progress. These works may include the following:

- Installation of demarcation barriers/signage around the perimeter of the work area
- Construction of walkways along the proposed access tracks in higher risk areas to reduce the risk of slips and trips.
- Installation of working at heights equipment, anchor points, guidance ropes
- Installation of transfer chutes in steep areas; and
- Pulley transport systems to allow for grout removal in steep areas to be controlled.

It is expected that these areas will be minor in nature and will be confined to adjacent the existing remediation areas.

3.3.4 Weed Control Activities

Where required, weed control activities will be undertaken by a qualified weed control contractor to reduce the potential for weed spread prior to and during remediation activities in consultation with OEH. for weeds will continue to be undertaken throughout the remediation program and weed control activities undertaken where required.

3.3.5 Equipment Storage Areas

Secure equipment storage areas will be established adjacent the active work areas as remediation works progress. It is anticipated that secure portable containers will be utilised to store equipment/tools/supplies/safety gear overnight on site. Equipment storage areas are generally less than 10m² in area and will be minimised where possible to limit the impact on the surrounding environment.

3.3.6 Erosion and Sediment Control Activities

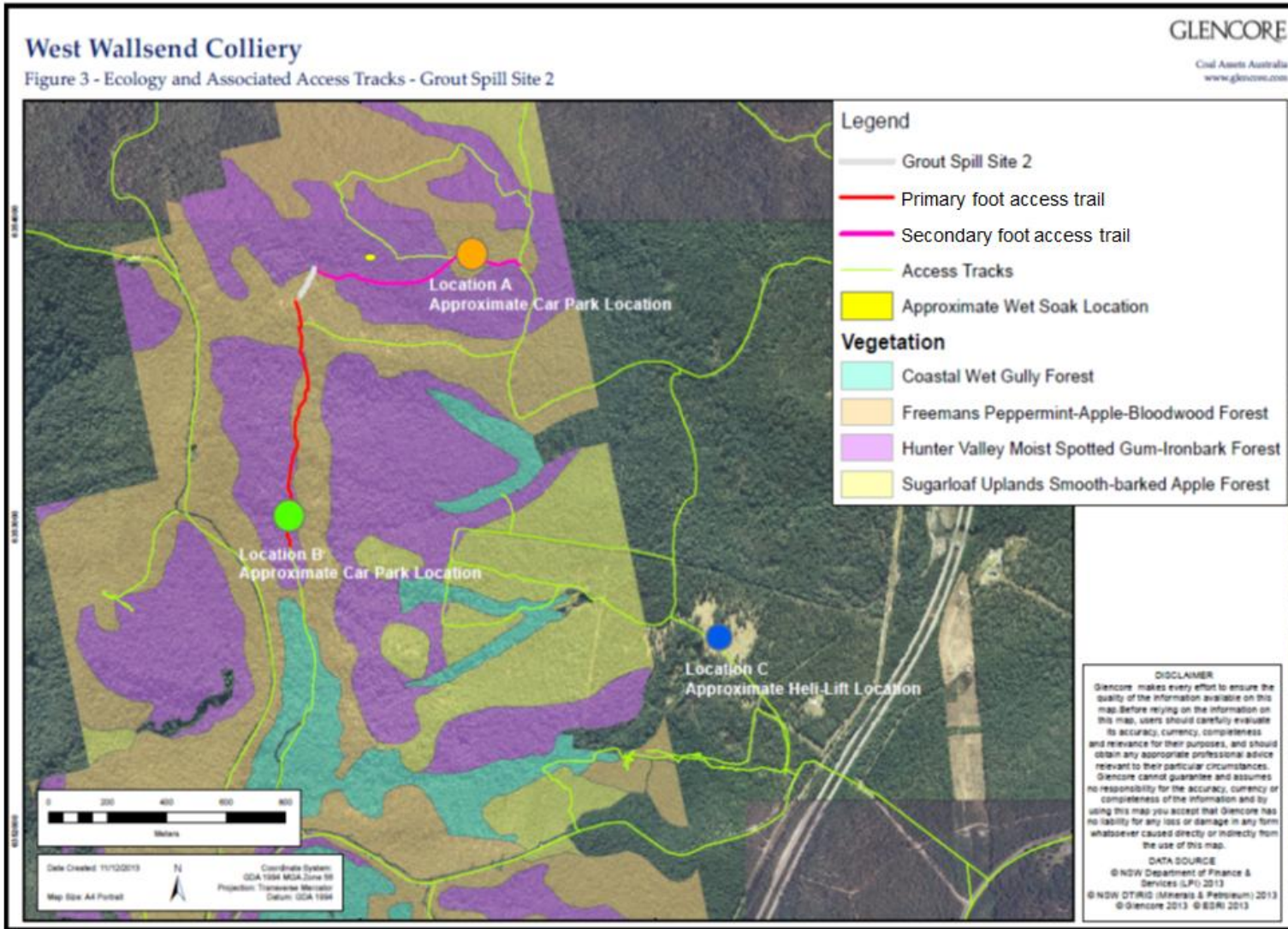
An erosion and sediment control plan has been developed for the site which will be implemented prior to grout removal activities commencing. The plan has been peer reviewed by an Erosion and Sediment Control specialist. Sediment fencing has been installed along the site in consultation with OEH to minimise the potential for grout to mobilise and enter the adjacent drainage channel. Effectiveness of the erosion and sedimentation controls will be monitored daily during remediation work activity. The sediment fencing will be removed once the site is given final sign-off from OEH. Where required specialist advice will be sought regarding the design, placement and maintenance of erosion and sedimentation controls for the remediation work area during and post remediation works.

3.3.7 Access tracks and Car parking

The car park and access track which will be utilised for personnel engaged in grout removal activities is at location B (see Figure 3). A secondary access track and car parking area at Location A has been assessed by OCAL and will not be utilised for the duration as the remediation program due to access restrictions. Entry to the proposed remediation area is via an existing access track (Forestry Track East) which has two locked gates which will act as a deterrent for third party vehicular access and reduce impact. This vehicular access track, car parking area and foot track are pre-existing. There are currently 3 car spaces at this location which will be adequate for the number of personnel required for this activity.



Photo 1 and 2. Existing Car Parking area that will be used and typical existing foot track to the remediation area

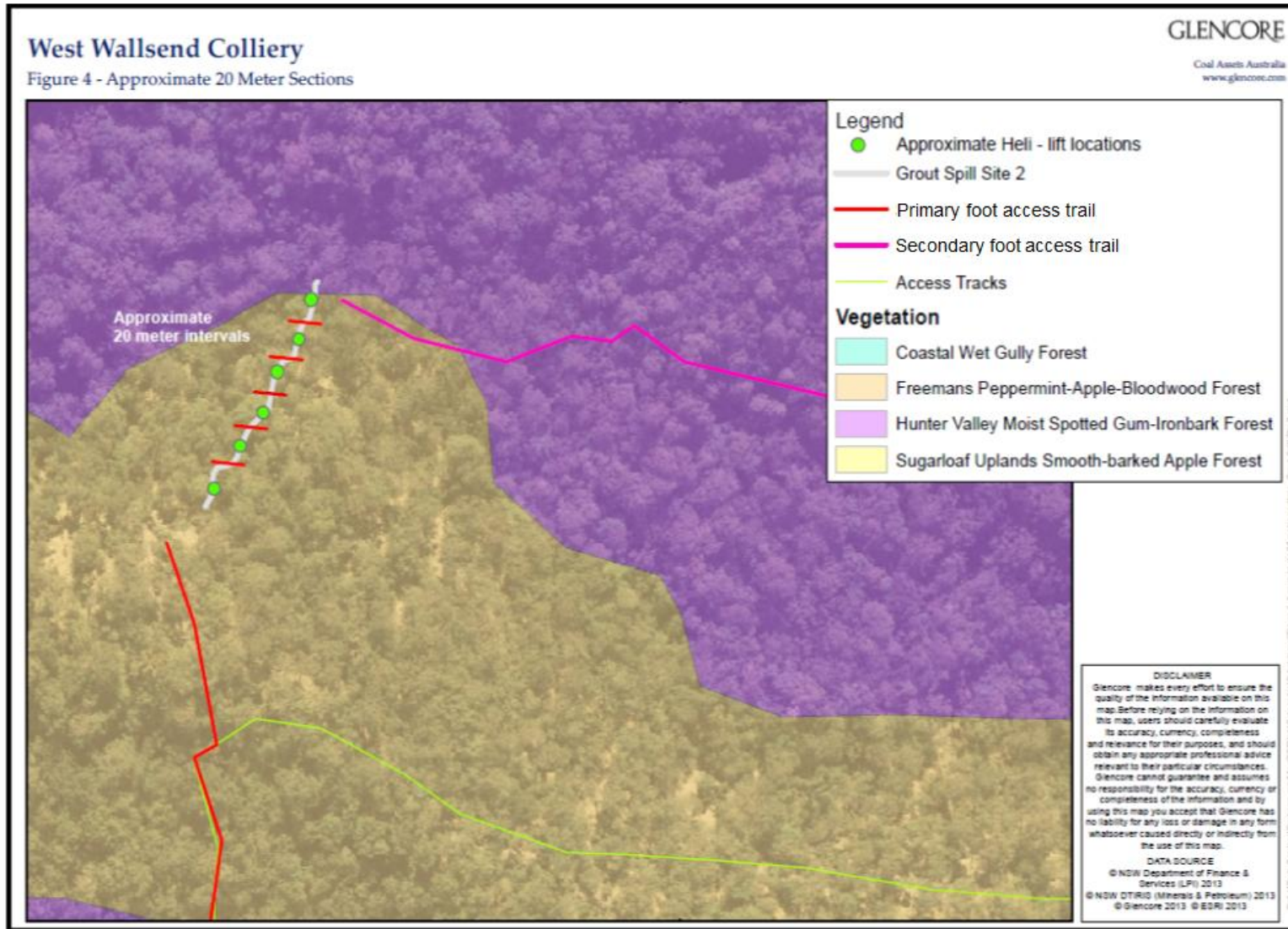


3.3.8 Post Remediation Activities and Determination of Final Rehabilitation Criteria

OCAL, in consultation with Orica and the Office of Environment and Heritage will determine if any post remediation activities are required for the site upon remediation completion. These activities may include but are not limited to:

- Additional weed control activities;
- Identification and supplementary planting of endemic species if required;
- Rehabilitation of access tracks established for the remediation works;
- Removal of all safety barriers/demarcation

OCAL, in consultation with Orica and the Office of Environment and Heritage will develop final rehabilitation criteria for the remediation site to assist with defining the completion requirements for the site. The criteria will be determined based on industry and site knowledge and should take into account existing environmental conditions adjacent to the affected area. An assessment against the criteria will be provided in the post remediation completion report that will be submitted to OEH at the completion of the remediation project.



3.4 Risk Management

A Broad Brush Risk Assessment (BBRA) will be undertaken by OCAL and Orica for the grout remediation site and the controls identified from this assessment will be incorporated into site specific Standard Operating Procedures (SOPs).

OCAL and Orica have comprehensive risk management standards in place to assist with assessing risks to personal safety, the environment and the local community. Where required specific risk assessments may be undertaken for specific tasks to further identify additional controls to manage risks associated with the activity and where deemed appropriate the outcomes from the assessments will be incorporated into site specific Standard Operating Procedures (SOPs) as remediation works progress.

3.4.1 Training & Answers

A site specific induction/training package will be developed outlining the key environmental/ safety hazards and controls identified in the risk assessment, SOP's and the Grout Remediation Plan as well as providing basic environmental awareness information. It will be a site requirement that any contractor/employee undertaking remediation activities on the site is inducted prior to any works commencing. Regular tool box talks on safety and environmental matters are provided as required by the Orica Crew Supervisor and or OCAL Project Supervisor.

3.4.2 Grout Remediation Team – Required Knowledge and Skills

Orica are responsible for the coordination of the day to day activities associated with the implementation of the GRP. Orica, as the supplier and principle contractor for the grouting activities at WWC over the last 20 months have extensive experience in handling the grout product and are familiar with its chemical and physical characteristics.

Orica employees have experience working at various operations which broadens their exposure to strong positive corporate cultures enabling them to understand the importance placed upon requirements for working in sensitive environments. OCAL and Orica management has inspected the remediation site and has tailored induction programs and modules for all employees proposed to undertake works under the Grout Remediation Plan. Prior to the commencement of works on site all employees will be trained (based on the task required to be undertaken) and assessed as competent in the following (as required):

- Orica Site Specific Safe Operating Procedures
- Grout Remediation Plan Requirements
- WWC Contractor Management System / Induction
- Use of Behavioural Safety Systems (SLAM's, Take Two)
- Safe Act Observation System
- Task Analysis System
- Accident Training Module
- Chemical Awareness Module
- Hazard Awareness
- Basic Strata Control Operations
- Manual Handling

To this end Orica have appointed a full time supervisor with experience in managing multiple crews who is also familiar with the grouting product. The Orica remediation team will also be supervised by an

OCAL Project supervisor who will have training in environmental management and will have the necessary skills to ensure that the remediation activities are carried out in accordance with the Plan.

Specialist advice or services will be engaged by Orica where the skills or knowledge required to undertake a specific task fall outside Orica's or OCAL's knowledge or skills set. To date, activities which have been identified as requiring specialist advice and/or coordination have included:

- Ecological assessments
- Erosion and sediment control design
- Vegetation clearing activities
- Weed management activities
- Heli-lifting activities
- Rockfall Stabilisation Works
- Working at heights planning
- Waste removal (disposal)

3.4.3 Public Safety

OCAL / Orica take the management of Public Safety seriously. Based on site experience the following public safety controls will be implemented to control Public Safety:

- All active work areas will be clearly demarcated and appropriate signage installed advising the Public not to enter these areas.
- All work areas within the SSCA will be closed to the Public for the duration of the remediation works.

3.5 Change Management

While it is not expected, and although OCAL in consultation with Orica have undertaken significant planning to form the basis of this remediation plan there may be circumstances arise that require actions to be implemented on the site that may not have been foreseen during the development of this plan.

Any changes to remediation activities outside the approved Remediation Plan will be thoroughly assessed in accordance with the OCAL Change Management Standard. The change management process provides a framework for the assessment of risks associated with a proposed change to site activity to ensure that any changes outside of an approved scope have been approved by the appropriate levels of management and that any required controls have been identified and implemented prior to the change being adopted or accepted.

As part of the change management process, OEH will be notified and due diligence assessments will be undertaken where required in consultation with OEH to minimise impacts. If warranted and if the change management process identifies, the remediation plan may require modification in consultation with OEH. Any significant changes to the methodology approved under this plan will be assessed in consultation with OEH which may involve further trials to assess the effectiveness of the proposed changes.

3.6 Responsibilities

The following table, **Table 1**, outlines the responsibilities of various personnel associated with the implementation of the Grout Remediation Plan.

Table 1:

Position	Key Responsibilities
Remediation Activity Operators	<ul style="list-style-type: none"> • Ensuring they undertake their remediation activities in accordance with the Approved Grout Remediation Plan. • Be aware of the requirements of the Grout Remediation Plan and the key controls to be implemented associated with the activity they are undertaking. • Have an understanding and adhere to all safety and environmental controls required to complete their respective tasks. • Report hazards and incidents immediately to the Remediation Crew Supervisor. • Participate in any safety or environmental tool box talks.
Orica Remediation Crew Supervisor	<ul style="list-style-type: none"> • Provide regular communication of all safety and environmental controls within the Grout Remediation Plan and associated SOP's. • Coordinate day to day activities on site. • Undertake regular inspections of the remediation activities to ensure that all activities are being carried out in accordance with the approved Remediation Plan. • Ensure all work party members are inducted and trained in the appropriate management systems applicable to the tasks they are undertaking. • Coordinate risk based assessments where required for specific tasks. • Regularly report on remediation progress to the OCAL Remediation Project Supervisor. • Liaise with the OEHL site supervisor where required in consultation with OCAL Remediation Project Supervisor.
Orica Operations/HSEC Manager	<ul style="list-style-type: none"> • Ensure that there are adequate resources to allow for the successful implementation of the Grout Remediation Plan.

	<ul style="list-style-type: none"> • Provide strategic support to assist the Crew Supervisor where required.
OCAL Remediation Project Supervisor	<ul style="list-style-type: none"> • Oversee remediation activities and undertake regular inspections of the work area to confirm activities are being undertaken in accordance with the Grout Remediation Plan. • Undertake HSEC interactions to confirm activities are being undertaken in a safe and environmentally responsible manner. • Liaise with OEH Site Supervisor in regards to remediation progression. • Collation of the weekly remediation status reports for the E&C Manager. • Undertake regular reviews of the remediation activities based on site progress and communicate any changes to the OCAL E&C Manager.
OCAL Environment and Community Manager and Operations Manager	<ul style="list-style-type: none"> • Ensure adequate OCAL resources are made available for overseeing the implementation of the Grout Remediation Plan. • Responsible for the management of any changes to the Remediation Plan. • Undertake the reporting required under the approved Plan. • Undertake regular consultation with OEH on the implementation of the Remediation Plan.
OEH Site Representative	<ul style="list-style-type: none"> • Responsible for providing provisional signoff of each remediation section. • Oversee remediation activities and provide advice as required during the implementation of the plan.
All Contractors/Visitors Specialists	<ul style="list-style-type: none"> • Undertake all activities in accordance with the Grout Remediation Plan. • Ensure all work has been approved and is recognised by the Crew Supervisor prior to works commencing.

4. ENVIRONMENTAL IMPACT ASSESSMENT

The following assessment outlines the potential environmental impacts associated with the preferred Grout Remediation Plan and outlines the proposed mitigation strategies to be implemented to manage these impacts.

4.1 Aboriginal Cultural Heritage

Table 4.1:

Potential Impact	Proposed Mitigation Measures
Impact /affect on known Aboriginal objects or Aboriginal places?	<p>Access into the remediation work site is via pre existing access tracks and trails. No upgrades to existing access tracks or trails are proposed to be undertaken. There are no known cultural heritage sites within the grout affected area.. WWC has an established Aboriginal Cultural Heritage Management Plan (ACHMP) in place to manage cultural heritage items.</p> <p>Regular consultation with the sites registered Aboriginal stakeholder groups. AAC Meetings.</p>
Is the activity located in areas where landscape features indicate the presence of Aboriginal objects?	<p>AHIMS Search, GIS Mapping and archaeological assessment undertaken as part of PA09_0203.</p> <p>OCAL is aware of the sensitive land units (i.e. near creek-lines and floodplain areas or ridges close to existing drainage) and that these locations are likely to increase the risk on impacting unknown Aboriginal heritage within the mine lease area.</p> <p>All people working within the remediation area will be inducted. This induction will include Cultural heritage awareness.</p> <p>Should a site be identified during the remediation works it will be managed in accordance with the procedures outlined in the WWC ACHMP.</p>
Impact on wild resources or access to these resources, which are used or valued by the Aboriginal community.	<p>The proposed activity does not significantly affect wild resources within the area, or does it restrict access to surrounding resources.</p>

4.2 Historic Cultural Heritage

Table 4.2:

Potential Impact	Proposed Mitigation Measures
Impact on places, buildings, landscapes or moveable historic heritage items?	Vegetation clearing limited to defined areas as discussed throughout the Grout Remediation Plan. Ultimately, there will be a minimal impact on the vegetation within this area that will not have a significant impact on the visual aesthetics of the landscape.
Impact on vegetation of cultural landscape value.	As per mitigation measures listed above.

4.3 Noise

Table 4.3:

Potential Impact	Proposed Mitigation Measures
Impact on surrounding environment (Neighbours, community, Fauna etc)?	Remote nature of the site Only two residential neighbours located within proximity to the affected area. Consultation with affected landholders will be undertaken. Removal proposed by manual techniques with only small industrial vacuums or alike for small time periods unlikely to impact on surrounding properties. Heli-lift campaigns will be minimised where possible to reduce any noise impacts on the local community. Flights will only occur during daylight hours.

4.4 Air Quality

Table 4.4:

Potential Impact	Proposed Mitigation Measures
Dust Generation from Heli- Lifting causing community complaints or air quality impacts	Heli-lifting will only be undertaken in low wind conditions. Heli-lift drop off zone (Location B) will be suppressed where required to reduce air borne dust.
Dust generation from break up of grout material	Monitor remediation plan and techniques, if significant dust generation occurs, modify technique as required to reduce dust generation.

4.5 Flora & Fauna

Table 4.5:

Potential Impact	Proposed Mitigation Measures
Clearing or modification of vegetation along access track or drainage channel leading to poor regeneration of vegetation after remediation activities.	<p>Due Diligence survey conducted to identify the vegetation community and the potential for threatened or endangered flora and fauna. Clearing activities to be confined to minimum area required.</p> <p>Bush Regeneration Specialists to undertake clearing activities to minimise impact to existing vegetation within the remediation areas.</p> <p>Vegetation monitoring program</p> <p>Categorisation and demarcation of vegetation to be removed will be undertaken prior to clearing works commencing</p> <p>Delineated clearing areas.</p> <p>Replacement of hollows that are removed as a result of ancillary activities with nest boxes (1:1 ratio)</p> <p>Clearing of mature trees (> 30cm diameter) will be avoided where possible.</p>

<p>Is the activity likely to have a significant effect on threatened flora or fauna species, populations, or their habitats, or critical habitat; or an endangered ecological community or its habitat?</p>	<p>As per mitigation measures described above.</p>
<p>Does the activity have the potential to endanger, displace or disturb fauna (including fauna of conservation significance) or create a barrier to their movement?</p>	<p>As per mitigation measures described above.</p>
<p>Impact on an ecological community of conservation significance?</p>	<p>As per mitigation measures described above.</p>
<p>Is the activity likely to cause a threat to the biological diversity or ecological integrity on an ecological community?</p>	<p>As per mitigation measures described above.</p>
<p>Is the activity likely to introduce noxious weeds, vermin, feral species or genetically modified organisms into an area?</p>	<p>As per mitigation measures described above.</p> <p>As outlined in Section 3.3.4, weed control activities will be undertaken within the remediation area to minimise the chance of any further weed spread in the SSCA as a result of the remediation activities.</p>

4.6 Erosion & Sedimentation

Table 4.6:

Potential Impact	Proposed Mitigation Measures
<p>Increased erosion from clearing activities/surface disturbance along access tracks or drainage channel</p>	<p>Vegetation clearing limited to defined areas as discussed throughout the Grout Remediation Plan.</p> <p>An erosion and sediment control plan will be maintained for the remediation work area. The plan will detail all erosion and sedimentation controls to be established prior to, during and post remediation activities as outlined in Section 3.3.6.</p> <p>Photo Monitoring Points</p> <p>Post remediation works</p>
<p>Increased sedimentation, water logging as a result of erosion process during and after remediation activities.</p>	<p>As per mitigation measures listed above.</p>

4.7 Surface Water & Hydrology

Table 4.7:

Potential Impact	Proposed Mitigation Measures
<p>Change in surface water quality within drainage channel/Cockle Creek catchment following rainfall</p> <p>- Impacts on downstream water users</p>	<p>Installation of erosion and sediment controls as the remediation works progress.</p> <p>Surface water monitoring program (Section 5.1.1).</p> <p>Adjacent landowners have been notified of the proposed remediation activities. Ongoing consultation with adjacent landowners will be undertaken throughout the program.</p> <p>Drainage channels are ephemeral in nature.</p> <p>Remediation activities will not affect water flows within the catchment area. No loss of water from the catchment is expected.</p>
<p>Changes in drainage channel morphology (bank stability, creek bed, scours) as a result of remediation activities</p>	<p>n/a</p>

5. MONITORING STAKEHOLDER CONSULTATION, REPORTING, REMEDIATION TIMELINE AND EVALUATION

5.1 Monitoring

5.1.1 Surface Water Monitoring

As outlined in **Section 4**, a surface water quality monitoring program will be implemented for the site to monitor water quality in the surrounding catchment. OCAL has identified 6 sample locations which will be sampled during flow conditions for pH, EC, TSS and alkalinity. Given that the drainage channel below the affected area is ephemeral in nature, samples will not be able to be taken on a defined frequency. Monitoring locations have been chosen to provide water quality results upstream, from the potentially affected channel, downstream as well as a reference channels. The indicative monitoring locations are shown below on **Figure 5**.

OCAL/Orica has sourced and installed samplers at five of the surface water monitoring locations as outlined in **Figure 5** under an existing approved Remediation Plan associated with a different spill site within the same catchment area. One additional sampling site "Upstream 1" will be added to the monitoring network for the second spill site. This sampling location will be positioned in the drainage channel upstream of the affected area. Samples will be collected upstream from access tracks where possible to limit potential for access track runoff to affect samples.

5.1.2 Aquatic Macro Invertebrate Monitoring

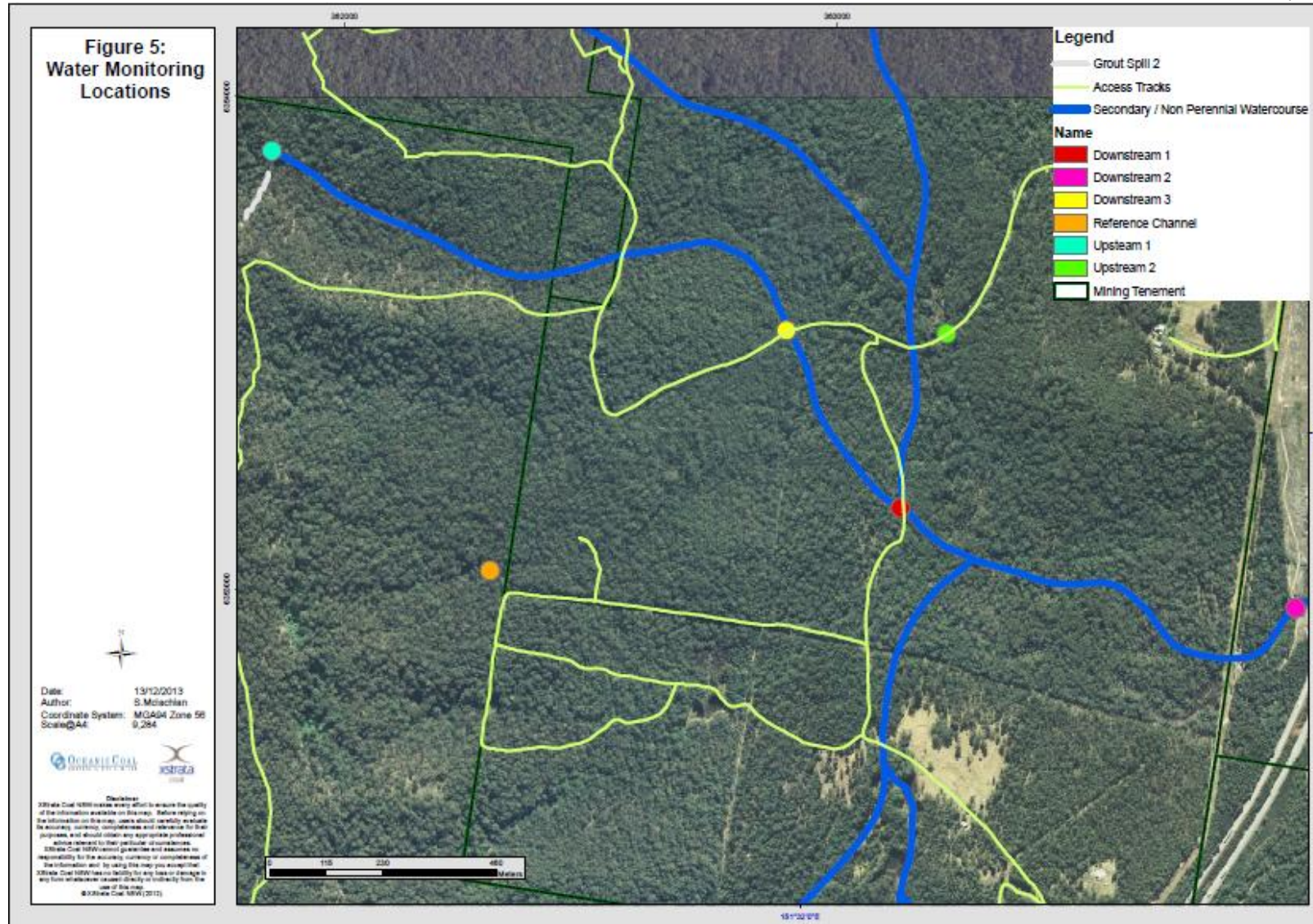
OCAL/Orica have already engaged a suitably qualified specialist to undertake a field survey up to 2km downstream of the affected area to identify any permanent water bodies. The results of the survey indicated that there were no permanent pools of water located within the ephemeral drainage channel. As such aquatic macro invertebrate monitoring is not proposed to be undertaken under this GRP.

5.1.3 Vegetation Monitoring

As outlined in **Section 4**, a vegetation monitoring program will be established in consultation with a qualified ecologist and OEHL for the affected area to assist with documenting the extent (and type) of vegetation growth in the affected area. This monitoring program will be designed to assess the health of the surrounding flora potentially affected by the remediation activities. Results from the monitoring will be used to inform the post remediation plan and will be used to determine any future rehabilitation activities that may be required. Vegetation surveys are proposed to be undertaken prior to and post grout removal and 6 monthly thereafter until final sign off of the remediation project has been received.

5.1.4 Erosion Monitoring

As outlined in **Section 4**, erosion monitoring will be undertaken within the affected area to identify the development of any erosion or sedimentation that results from the remediation activities as works progress. Due to the short term duration of the remediation works, monitoring will be undertaken prior to and post remediation activities by a qualified specialist. The OCAL Project Supervisor will inspect the site after significant storm events (>50mm in a 24 hours period) that have resulted in surface water flows within the affected area. The monitoring will involve a formal walkover assessment of the affected area by a suitably qualified specialist. Where monitoring identifies impacts that are attributable to the remediation activities, suitable controls/ remediation actions will be established to control or minimise any identified impacts in consultation with OEHL. Monitoring will cease once OEHL have given final sign-off on the remediation area.



5.1.5 Photo Monitoring Points

Photo monitoring points have been established along pre determined sections of the grout affected area. OCAL/Orica will undertake photo point monitoring of the work area to show changes over time and the results will be reported to OEH regularly.

5.2 Stakeholder Consultation

OCAL and Orica are committed to adequately consulting with all affected stakeholders regarding the implementation of this Grout Remediation Plan. An overview of key external stakeholders that have been identified by OCAL and the likely consultation methods to be employed throughout the remediation activity program are outlined in **Table 5.1** below:

Table 5.1

Stakeholder	Consultation Method / Description	Frequency
Office of Environment and Heritage / Relevant Regulatory Authorities	Operational Status Report	Weekly
	GRP Cessation Report	Once Off (following completion of works)
	Updates to Operational Project Plan (OPP)	As required
	Site Inspections	As required
Local State and Federal Parliament Members	Operational Status Report	Weekly
	GRP Cessation Report	Once Off (following completion of works)
	Community Newsletter	6 Monthly
	Site Inspections	As required
Adjacent Landowners	Community Newsletter	6 Monthly
	Phone Calls / Emails	As required – based on operational status
	Site Inspections	As required

Stakeholder	Consultation Method / Description	Frequency
Aboriginal Stakeholder Groups	AAC Meetings	6 Monthly
	Community Newsletter	6 Monthly
	Site Inspections	As required
Local Community	CCC Meetings	6 Monthly
	Community Newsletter	6 Monthly
Wider Community / All Stakeholders	WWC Website Updates	Weekly during remediation activities
	WWC Annual Review	Annually
	Media Releases	As required

5.3 Reporting

OCAL will distribute a weekly operational status report on remediation progress at the site to the relevant stakeholders. The report will include the following as a minimum:

- Update on the status of remediation activities against the operational project plan
- Overview of any safety or environmental incidents since the last report
- Summary of any previous monitoring results/reports received since the last report.
- Photos taken from designated photo monitoring points where relevant.

OCAL will continue to develop a Grout Remediation Progress Plan which will be updated weekly and will be uploaded onto the West Wallsend Colliery website (www.westwallsendcolliery.com.au). The Plan will be designed to provide a visual representation of the remediation work progress over time.

In accordance with the OEHL Direction, OCAL will submit a final report on remediation activities following the completion of the grout removal works to the Office of Environment and Heritage and the relevant government authorities.

OCAL will also provide an update on the grout remediation activities undertaken during future Community Consultative Committee (CCC), Aboriginal Advisory Committee (AAC) meetings and in the operations annual review in accordance with the site Project Approval.

5.4 Remediation Timeline

The following table, **Table 5.2**, provides an estimated project timeline which outlines major tasks and milestones associated with the remediation program. It should be noted that this timeline is indicative only and should not be used for auditing or tracking purposes due to the associated unknown variables that cannot be predicted. The timeline is dependent on approvals being received as outlined in the below **Table 5.2**. Any changes to approval timeframes will push project timelines out by the same period.

As outlined in **Section 3.2.1**, OCAL will develop, update and continue to maintain an Operational Project Plan (OPP) for the remediation activities in consultation with OEH throughout the duration of the remediation program.

Table 5.2

Task or Milestone	Estimated date of Completion
Submission of draft G.R.P. to OEH for approval	13/12/2013
Submission of final G.R.P. to OEH for approval	28/02/2014
Approval of G.R.P. by OEH	05/03/2014
Submit OPP for Remediation Site	19/03/2014
Complete Grout Remediation Activities	Refer to Approved OPP

5.5 Evaluation

Throughout the remediation activities, the effectiveness of the remediation activities will be evaluated along with the suitability and practicality of the equipment and remediation team sizing. The Operational Project Plan (as outlined in **Section 3.2.1**) will be updated in consultation with OEH as works progress.

Should a significant change to the operational plan need to occur, consultation and notification to the Office of Environment and Heritage will be managed as described in **Section 3.5**.

As outlined in **section 3.2.2**, following the removal of grout from each 60m work section the area will be inspected by a representative of OEH and OCAL. Where required, leaf litter will be removed to allow for grout removal and inspections of the working section and will be recovered once the provisional sign-off is received from OEH. Provisional signoff will be sought from OEH to confirm that grout removal has been undertaken to a suitable standard. OCAL has developed sign off criteria in consultation with OEH which assists with assessing each remediation section against agreed remediation goals.

If at any stage it is deemed required by OEH, Orica will engage a suitably qualified independent expert to supervise and evaluate the remediation works.

5.6 Summary of Commitments

Table 5.3 below summarises the commitments from the Grout Remediation Plan and provides indicative timing regarding the implementation of these commitments.

Table 5.3

Commitment	Indicative Timing
<p>WWC in consultation with OEH will develop a detailed Operational Project Plan (OPP) for the remediation activities. The OPP will provide the operational framework for the remediation activities and will provide the following:</p> <ul style="list-style-type: none"> • Detail key actions/activities/milestones required to achieve the outcomes of the GRP; and • Outline estimated completion timeframes for the various actions/activities/milestones required under the GRP; <p>The OPP will be developed and managed by WWC in consultation with Orica and will be updated regularly as remediation works progress.</p>	<p>Prior to remediation works commencing.</p> <p>Updated throughout program in consultation with OEH</p>
<p>Each bag of grout material that is removed from the affected area will be transported to a licensed waste disposal facility by a licensed waste contractor. The volumes and tonnages of the waste material will be recorded and tracked in accordance with the OEH Direction.</p>	<p>Ongoing throughout program.</p>
<p>OCAL / Orica will undertake Ancillary activities in accordance with the Grout Remediation Plan</p>	<p>Staged throughout program.</p>
<p>OCAL, in consultation with Orica and the Office of Environment and Heritage will determine if any post remediation activities are required for the site upon remediation completion. These activities may include but are not limited to:</p>	<p>Upon completion of grout removal</p>

Commitment	Indicative Timing
<ul style="list-style-type: none"> • Additional weed control activities • Identification and supplementary planting of endemic species if required • Rehabilitation of access tracks established for the remediation works • Removal of all safety barriers/demarcation 	
<p>A site specific induction/training package will be developed outlining the key environmental/ safety hazards and controls identified in the risk assessment, SOP's and the Grout Remediation Plan as well as providing basic environmental awareness information. It will be a site requirement that any contractor/employee undertaking remediation activities on the site will be inducted prior to any works commencing. Regular tool box talks on safety and environmental matters will be provided as required by the Orica Crew Supervisor and or OCAL Project Supervisor.</p>	<p>Prior to and throughout program</p>
<p>Orica will have a full time dedicated supervisor with experience in managing multiple crews who is also familiar with the grouting product. The Orica remediation team will also be supervised by an OCAL Project supervisor who will have training in environmental management and will have the necessary skills to ensure that the remediation activities are carried out in accordance with the Plan.</p> <p>Specialist advice or services will be engaged by Orica where the skills or knowledge required to undertake a specific task fall outside Orica's or OCAL's knowledge or skills set.</p>	<p>Prior to and throughout program.</p>
<p>All active work areas will be clearly demarcated and appropriate signage will be installed advising the Public not to enter these areas.</p>	<p>Prior to remediation works commencing.</p>
<p>Any changes to remediation activities outside the approved Remediation Plan will be thoroughly assessed in accordance with section 3.5.</p>	<p>Prior to and throughout program.</p>

Commitment	Indicative Timing
OCAL/Orica to ensure that mitigation measures as outlined in Section 4 are implemented	Prior to, throughout and following remediation program.
As outlined in Section 4 , OCAL is proposing that a surface water quality monitoring program be implemented for the site to monitor water quality in the surrounding catchment. OCAL has identified 6 sample locations which will be sampled during flow conditions for pH, EC, TSS and alkalinity.	Prior to, throughout and following remediation program.
OCAL/Orica will source and install samplers at surface water monitoring locations as outlined in Figure 5 .	Prior to undertaking remediation activities.
As outlined in Section 4 , it is proposed that a vegetation monitoring program will be established in consultation with a qualified ecologist and OEHL for the affected area to assist with documenting the extent (and type) of vegetation growth in the affected area. It is anticipated that this monitoring program will include quantitative surveys of the area prior to and post remediation activities.	Prior to grout removal and ongoing at a frequency agreed to by OEHL.
Photo monitoring points will be set up prior to remediation activities occurring along pre determined sections of the grout affected area. OCAL will undertake photo point monitoring of the work area to show changes over time and the results will be reported in the weekly status reports.	Prior to Grout Remediation Activities
OCAL will ensure that consultation with stakeholders is undertaken in accordance with the Stakeholder Consultation Strategy as outlined in Section 5.2 .	Ongoing throughout program.
OCAL will provide OEHL and the Parliament Members with a weekly operational status report on	Weekly.

Commitment	Indicative Timing
<p>remediation progress at the site. The report will include the following as a minimum:</p> <ul style="list-style-type: none"> • Update on the status of remediation activities against the operational project plan • Overview of any safety or environmental incidents since the last report • Summary of any previous monitoring results/reports received since the last report. • Updated photos taken from designated photo monitoring points where relevant. <p>OCAL will also develop a Grout Remediation Progress Plan which will be updated weekly and will be uploaded onto the West Wallsend Colliery website (www.westwallsendcolliery.com.au). The Plan will be designed to provide a visual representation of the remediation work progress over time.</p> <p>In accordance with the OEH Direction, OCAL will submit a final report on remediation activities following the completion of the grout removal works to the Office of Environment and Heritage and the relevant government authorities.</p> <p>OCAL will also provide an update on the grout remediation activities undertaken during future Community Consultative Committee (CCC), Aboriginal Advisory Committee (AAC) meetings and in the operations annual review in accordance with the site Project Approval.</p>	<p>Weekly</p> <p>Within 14 days of OEH signoff after final grout removal.</p> <p>6 Monthly / Annually</p>
<p>Throughout the remediation activities, the effectiveness of the remediation activities will be evaluated along with the suitability and practicality of the equipment and remediation team sizing.</p> <p>As outlined in section 3.2.3, following the removal of grout from each 60m work section the area will be</p>	<p>Ongoing</p>

Commitment	Indicative Timing
<p>inspected by a representative of OEH and OCAL. Provisional signoff will be sought from OEH once OEH representatives confirm that grout removal has been undertaken to a suitable standard. If at any stage it is deemed required by OEH, Orica will engage a suitably qualified independent expert to supervise and evaluate the remediation works.</p>	

6. REFERENCES

6.1 Legislation

- National Parks and Wildlife Act, 1974.
- Protection of the Environment Operations Act, 1997.
- Threatened Species Conservation Act, 1995.
- Work Health and Safety Act, 2011.
- Work Health and Safety Regulations, 2011.
- Environmental Planning and Assessment Act, 1979.
- Water Management Act.

6.2 Miscellaneous

- Office of Environment and Heritage (2007) Mitchell Landscapes with per cent cleared estimates, listed by CMA, Updated November 2007, OEH Website: <http://www.environment.nsw.gov.au/projects/biometrictool.htm>.
- Thackway, R. and Cresswell, I.D. (1995). An interim biogeographic regionalisation for Australia: a framework for setting priorities in the National Reserves System Cooperative Program Canberra. Report to the Australian Nature Conservation Agency, Reserve Systems Unit, Canberra.
- Department of Primary Industries (Office of Water) – Guidelines for in stream works on water front land (July 2012)
- Department of Primary Industries (Office of Water) – Guidelines for watercourse crossings on water front land (July 2012)
- WWC Grout Remediation Trial Phase Report – December 2013 (WWC SD PLN 0105)
- WWC Grout Remediation Plan (WWC SD PLN 0097)

7. APPENDICES

7.1 Appendix 1 – Remediation Direction

7.2 Appendix 2 – Due Diligence Ecological Assessment



Ecological Assessment of Grout Spill (Site 2) within the Sugarloaf State Conservation Area



Glencore Xstrata

February 2014

Ecological Assessment of Grout Spill (Site 2) within the Sugarloaf State Conservation Area

Kleinfelder Report Number: WB13R_89335-138358

Copyright 2013 Kleinfelder

All Rights Reserved

Prepared for:

GLENCORE XSTRATA

PO BOX 4186, EDGEWORTH,
NSW, 2285

Only Glencore Xstrata, its designated representatives or relevant statutory authorities may use this document and only for the specific project for which this report was prepared. It should not be otherwise referenced without permission.

Document Control:

Version	Description	Date	Author	Reviewer
1.0	Draft for client review	12/12/2013	Dr. G Whyte	Chelayne Evans
2.0	Final version (amendments as per Glencore comments)	28/02/14	Dr. G. Whyte	S. Schulz

Kleinfelder Australia Pty Ltd

64 Medcalf Street
Warners Bay, NSW 2282
Phone: 1300 881 869
Fax: 1300 881 035

ABN: 23 146 082 500

Contents

ABBREVIATIONS	V
1. INTRODUCTION	1
1.1 SCOPE	1
1.2 BACKGROUND	1
2. METHODOLOGY	4
2.1 SITE ASSESSMENT	4
3. RESULTS	7
3.1 THREATENED FLORA AND FAUNA.....	7
3.2 VEGETATION COMMUNITY IDENTIFICATION	7
3.2.1 Coastal Foothills Spotted Gum Iron Bark Forest	7
3.2.2 Coastal Plains Smooth Bark Apple Woodland	8
3.2.3 Hunter Valley Moist Forest - Dry Variant	9
3.2.4 Hunter Valley Moist Forest - Mesic Variant	10
3.3 AQUATIC HABITAT	12
4. SUMMARY OF ECOLOGICAL IMPACTS	15
4.1.1 Direct Impacts: Vegetation Clearing	15
4.1.2 Threatened Flora	15
4.1.3 Endangered Ecological Communities	15
5. RECOMMENDATIONS	16
6. REFERENCES	17
7. STAFF CONTRIBUTIONS	18
8. LICENSING	19

Figures

Figure 1: Locality Map	2
Figure 2: Extent of The Grout Spill.....	3
Figure 3 Survey Effort.....	6
Figure 4: Locations of Habitat and Threatened Flora.....	14

Plates

Plate 1:	Coastal Foothills Spotted Gum Ironbark Forest.....	8
Plate 2:	Coastal Plains Smooth Bark Apple Woodland.....	9
Plate 3:	Hunter Valley Moist Forest – Dry Variant	10
Plate 4:	Hunter Valley Moist Forest – Mesic Variant.....	11
Plate 5:	Minor Pooling Location 1.....	12
Plate 6:	Minor Pooling Location 2.....	13
Plate 7:	Minor Pooling Location 3.....	13

ABBREVIATIONS

AHD	Australian Height Datum
DP	Deposited Plan
DSEWPaC	Commonwealth Department of Sustainability, Environment, Water, Population and Communities
EEC	Endangered Ecological Community (category of Threatened Ecological Community)
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
GIS	Geographic Information System
GPS	Global Positioning System
ha	hectares
KTP	Key Threatening Process
LEP	Local Environmental Plan
LGA	Local Government Area
MU	Map Unit
OEH	NSW Office of Environment and Heritage
TSC Act	<i>Threatened Species Conservation Act 1995</i>

1. INTRODUCTION

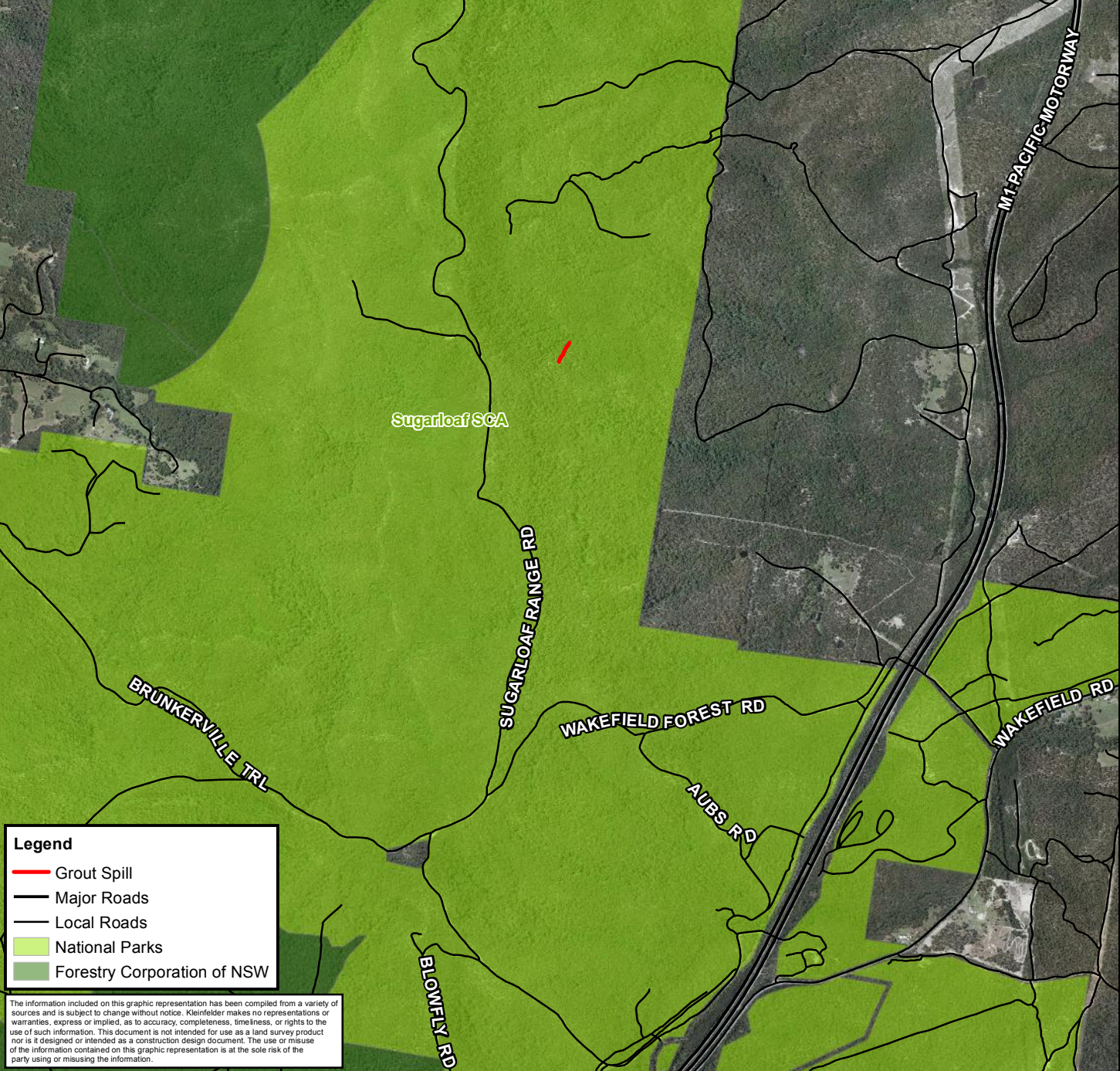
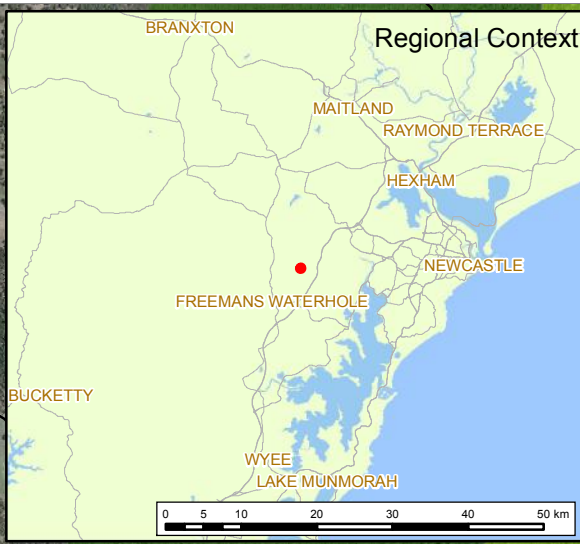
1.1 SCOPE

Kleinfelder was engaged by Glencore Xstrata to conduct an ecological pre-clearance survey within Sugarloaf State Conservation Area. This survey was undertaken of an area affected by a grout spill to help inform the remediation plan for the site.

1.2 BACKGROUND

The Sugarloaf State Conservation Area (SSCA) was created in 2007 and covers an area of approximately 3,937 ha. The conservation area extends from Seahampton in the North to Awaba in the South (**Figure 1**). The area is predominantly vegetated with forest consisting of several general vegetation communities. The incident area is located on the foothills of the Sugarloaf Range within the Hunter Sub-region of the Sydney Basin Bioregion (Thackway and Cresswell, 1995) and the Gosford-Cooranbong Coastal Slopes landscape (OEH, 2007).

As outlined in WWC's detailed incident report, the grout affected area extends approximately 120 m down slope of a previously remediated subsidence crack site. The average width of the affected area is approximately 1 m (**Figure 2**). It is estimated that the average depth of the grout product is approximately 100 mm. Based on the above information it is estimated that approximately 12 cubic meters of grout has travelled down the side of a steep slope area on the northern end of longwall 41 terminating on the embankment of an ephemeral drainage channel in the Cockle Creek catchment. The terrain within the affected area varies from gentle slopes (towards the bottom and middle of the affected area) to moderate and steeply sloping terrain (on the foothills toward the top of the affected area).



Legend

- Grout Spill
- Major Roads
- Local Roads
- National Parks
- Forestry Corporation of NSW

The information included on this graphic representation has been compiled from a variety of sources and is subject to change without notice. Kleinfelder makes no representations or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. This document is not intended for use as a land survey product nor is it designed or intended as a construction design document. The use or misuse of the information contained on this graphic representation is at the sole risk of the party using or misusing the information.

0 0.15 0.3 0.6 0.9 1.2 1.5
Kilometres

KLEINFELDER
Bright People. Right Solutions.
www.kleinfelder.com

PROJECT REFERENCE: 138358
DATE DRAWN: 13/12/2013 09:50 Version 1
DRAWN BY: gjoyce
DATA SOURCE: LPI - 2009

Locality
Glencore Xstrata Vegetation Pre-clearance Survey – Land Remediation within Sugarloaf State Conservation Area – Phase 2

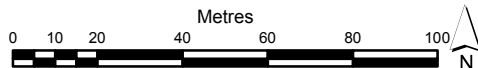
FIGURE: 1

The information included on this graphic representation has been compiled from a variety of sources and is subject to change without notice. Kleinfelder makes no representations or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. This document is not intended for use as a land survey product nor is it designed or intended as a construction design document. The use or misuse of the information contained on this graphic representation is at the sole risk of the party using or misusing the information.



Legend

- Grout Spill
- Major Roads
- Local Roads



PROJECT REFERENCE: 138358
DATE DRAWN: 13/12/2013 10:00Version 1
DRAWN BY: gjoyce
DATA SOURCE: LPI - 2009

Extent of Grout Spill
Glencore Xstrata Vegetation Pre-clearance Survey – Land Remediation within Sugarloaf State Conservation Area – Phase 2

FIGURE: 2

2. METHODOLOGY

2.1 SITE ASSESSMENT

A site assessment was conducted on 11 December 2013. The following survey methodologies were used to compile information on the existing vegetation, and potential habitat for locally occurring threatened flora and fauna species within the subject site.

2.1.1.1 Flora Sampling (Random Meander)

A floristic list was compiled during a random meander within the proposed access track and grout affected drainage channel (**Figure 3**). Note: Following further investigations by OCAL the proposed access track that was surveyed as part of this report is no longer intended to be used.

2.1.1.2 Floristic Identification and Nomenclature

Floristic identification and nomenclature was based on Harden (1992, 1993, 2000 and 2002) with subsequent revisions as published on PlantNet (<http://plantnet.rbgsyd.nsw.gov.au>).

2.1.1.3 Vegetation Community Identification

The identification of vegetation communities was based on the dominant species present in the overstorey, midstorey, shrub and ground layers. The species composition of each vegetation community was compared to vegetation community types as defined by the Lower Hunter and Central Coast Regional Environmental Management Strategy 2000 (LHCCREMS; NPWS, 2000) in order to arrive at an accepted community identity.

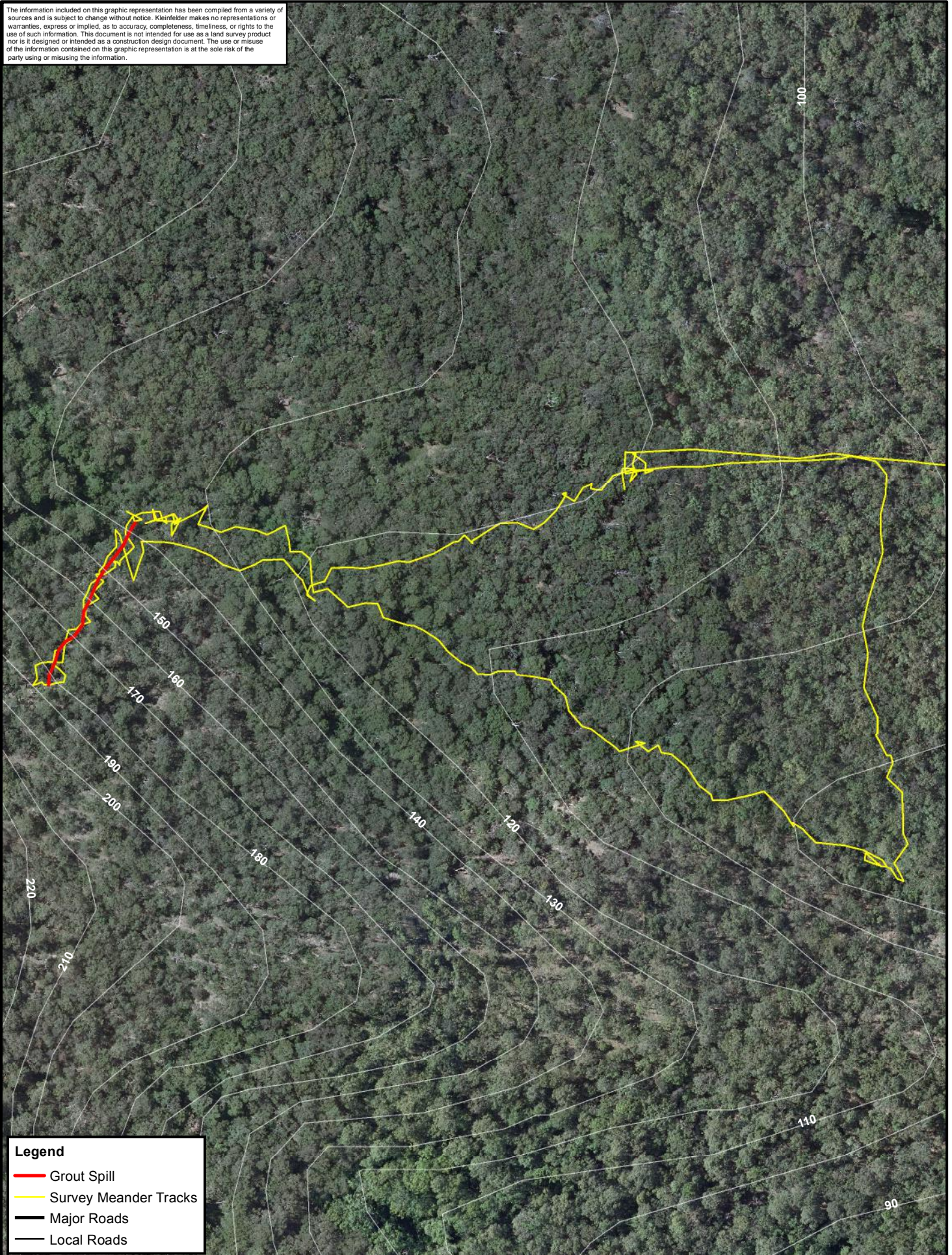
2.1.1.4 Fauna Survey (Opportunistic Sightings)

The presence of all fauna species and potential habitat was recorded. The meandering route was used to undertake targeted surveys for threatened fauna species identified as potentially occurring in the region.

The availability of habitat for threatened fauna was also examined by noting the presence of the following habitat features:

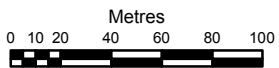
- Presence of woody debris (fallen timber);
- Presence of tree hollows;
- Availability of nectar resources; and
- Other species specific habitat requirements.

The information included on this graphic representation has been compiled from a variety of sources and is subject to change without notice. Kleinfelder makes no representations or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. This document is not intended for use as a land survey product nor is it designed or intended as a construction design document. The use or misuse of the information contained on this graphic representation is at the sole risk of the party using or misusing the information.



Legend

- Grout Spill
- Survey Meander Tracks
- Major Roads
- Local Roads



PROJECT REFERENCE: 138358
 DATE DRAWN: 13/12/2013 10:10Version 1
 DRAWN BY: gjoyce
 DATA SOURCE:
 LPI - 2009

Survey Effort

Glencore Xstrata
 Vegetation Pre-clearance Survey – Land Remediation
 within Sugarloaf State Conservation Area – Phase 2

FIGURE:
3



3. RESULTS

3.1 THREATENED FLORA AND FAUNA

One threatened plant species, *Tetradlea juncea* (Black-Eyed Susan) was identified during the assessment. The plants were found over 150 m from the grout affected area (Figure 4).

3.2 VEGETATION COMMUNITY IDENTIFICATION

Three vegetation communities were identified within the area of the grout spill area. The vegetation occurring directly within the grout spill area was identified as *Coastal Foothills Spotted Gum Ironbark Forest*. Areas around the spill such as downstream within the drainage channel were dominated by other vegetation communities including *Coastal Plains Smooth Bark Apple Woodland* and *Hunter Valley Moist Forest* (Dry and Mesic variations).

Descriptions of these communities are provided in the following sections.

3.2.1 Coastal Foothills Spotted Gum Iron Bark Forest

Distribution: This community occurs directly within the grout affected area (i.e. north facing slope) (**Plate 1**).

Floristic Description: The canopy is dominated by *Corymbia maculata* (Spotted Gum), *Eucalyptus paniculata* (Grey Ironbark) and *Eucalyptus acmenoides* (Red Mahogany). Midstorey is largely absent with *Allocasuarina torulosa* (Drooping Sheoak) in some areas. The main shrub species occurring is *Persoonia linearis* (Narrow-leaved Geebung). The groundcover is dominated by *Rytidosperma pallidum* (Silvertop Wallaby Grass).

Threatened Flora: No Threatened flora were identified.

Vegetation Community: MU15 Coastal Foothills Spotted Gum Iron Bark Forest (NPWS, 2000).

Ecological Community Conservation Status: Not listed.

Fauna Habitat Value: One hollow bearing tree was identified



Plate 1: Coastal Foothills Spotted Gum Ironbark Forest

3.2.2 Coastal Plains Smooth Bark Apple Woodland

Distribution: This community occurs in several areas between the access road to the site and the affected drainage channel (**Plate 2**).

Floristic Description: The vegetation is dominated by the canopy species *Angophora costata* (Smooth-barked Apple) and *Corymbia gummifera* (Red Bloodwood) in association with *Eucalyptus acmenoides* (Red Mahogany). The area contains a scattered midstorey of *Allocasuarina torulosa* (Drooping Sheoak). Shrubs in the area include *Personia linearis* (Narrow-leaved Geebung), *Xanthorrhoea* sp. (Grass Tree) and *Doryanthes excelsa* (Gynea Lilly). The groundcover was dominated by *Themeda australis* (Kangaroo Grass) and *Rytidosperma pallidum* (Silvertop Wallaby Grass).

Threatened Flora: *Tetratheca juncea* was identified approximately 150m from the grout spill area (**Figure 4**).

Vegetation Community: MU30 Coastal Plains Smooth Bark Apple Woodland (NPWS, 2000).

Ecological Community Conservation Status: Not listed.

Fauna Habitat Value: Several stags, hollow bearing trees and logs were identified.



Plate 2: Coastal Plains Smooth Bark Apple Woodland

3.2.3 Hunter Valley Moist Forest - Dry Variant

Distribution: This community occurs on slopes leading into the affected drainage channel (Plate 3).

Floristic Description: The dominant canopy species are *Corymbia maculata* (Spotted Gum), *Eucalyptus punctata* (Grey Gum) and *Eucalyptus acmenoides* (Red Mahogany). A midstorey of *Allocasuarina torulosa* (Drooping Sheoak) also occurs. Shrub species include *Leptospermum trinervium* (Flaky-barked Tea-tree), and *Persoonia linearis* (Narrow-leaved Geebung). The upper ground layer is dominated by *Pteridium esculentum* (Bracken Fern).

The dominated grass species include *Imperata cylindrica* (Blady Grass), *Entolasia stricta* (Wiry Panic) and *Themeda australis* (Kangaroo Grass).

Threatened Flora: No threatened flora species were identified.

Vegetation Community: MU12 Hunter Valley Moist Forest (NPWS, 2000).

Ecological Community Conservation Status: Not listed.

Fauna Habitat Value: Few hollow bearing trees and logs were identified.



Plate 3: Hunter Valley Moist Forest – Dry Variant

3.2.4 Hunter Valley Moist Forest - Mesic Variant

Distribution: This community occurs within the affected drainage channel (**Plate 4**).

Floristic Description: The dominant canopy species are *Corymbia maculata* (Spotted Gum) and *Eucalyptus punctata* (Grey Gum). A mesic midstorey occurs which is dominated by

species such as *Trochocarpa laurina*, *Acmena smithii* (Lilly Pilly), *Eupomatia laurina* (Bolwarra), *Pittosporum revolutum* (Rough-fruit Pittosporum), *Clerodendrum tomentosum* (Hairy Clerodendrum) and *Commersonia fraseri* (Brush Kurrajong) The ground layer is dominated by *Pteridium esculentum* (Bracken Fern), *Lomandra longifolia* (Spiny-headed Mat-rush) and *Blechnum cartilagineum* (Gristle Fern). Other ferns include *Doodia aspera* (Rasp Fern).

Threatened Flora: No threatened flora species were identified.

Vegetation Community: MU12 Hunter Valley Moist Forest (NPWS, 2000).

Ecological Community Conservation Status: Not listed.

Fauna Habitat Value: Few hollow bearing trees and logs were identified.



Plate 4: Hunter Valley Moist Forest – Mesic Variant

3.3 AQUATIC HABITAT

As part of the assessment, a survey of approximately 2 km downstream within the drainage channel below the affected area was undertaken to identify any permanent water bodies that may be present. There were no permanent water bodies identified during the survey. Three locations within the affected drainage channel (**Figure 4**) were noticed to be holding small pools of water and the habitat characteristics at each location were very similar and consisted of pooling water within the rock lines channel (**Plates 5, 6 & 7**).

Detrital accumulations within each habitat were dense and consisted mainly of leaves and woody debris from falling vegetation. The water was stained brown due to detrital accumulation (i.e. tannins from native flora). An anoxic odour was evident, which is an indicator of decomposing vegetation. Fauna habitat includes the associated vegetation (riparian areas), woody debris around the edges of the water, the water column and the benthic environment. No aquatic flora (macrophytes) was identified.



Plate 5: Minor Pooling Location 1

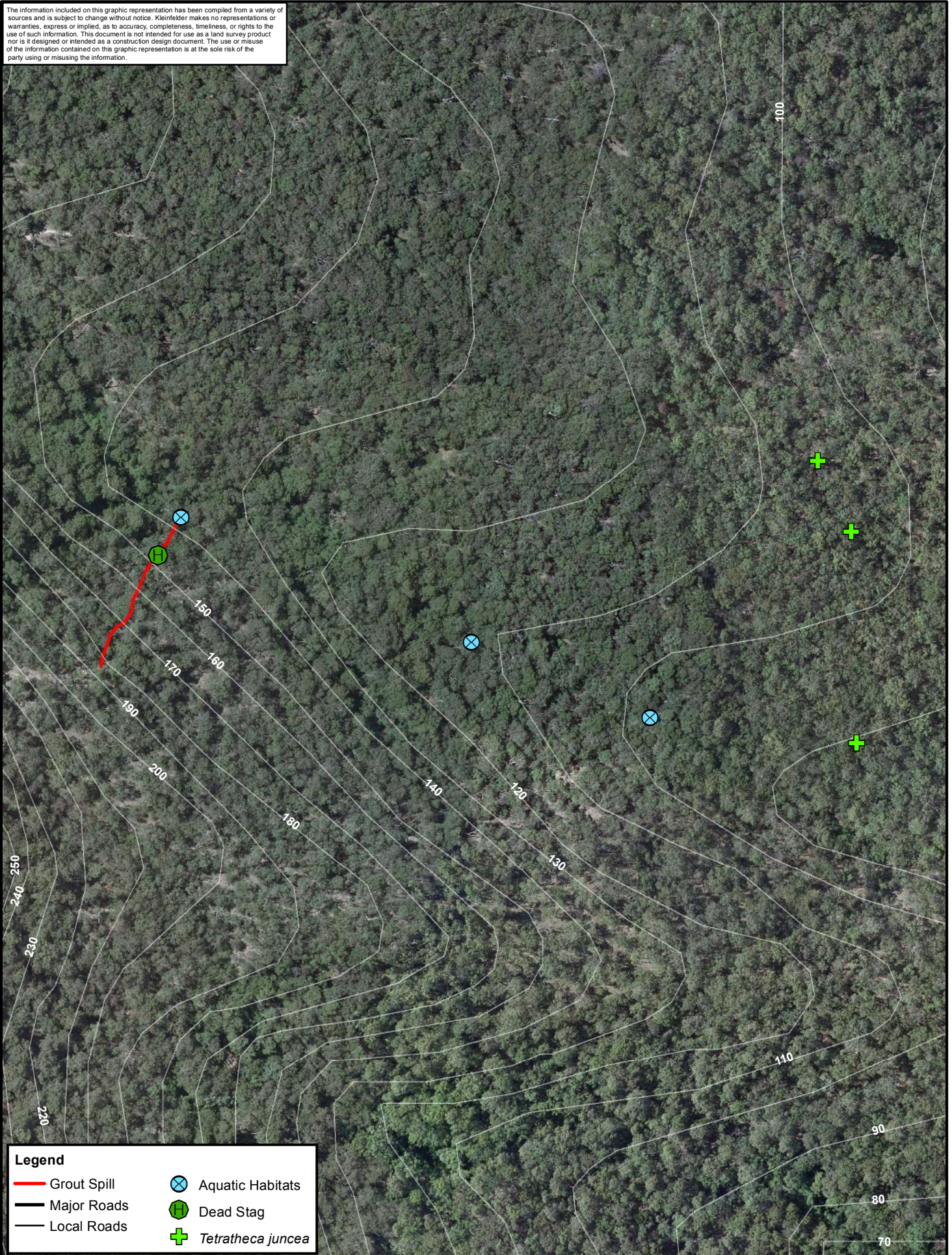


Plate 6: Minor Pooling Location 2



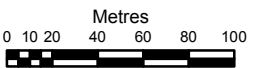
Plate 7: Minor Pooling Location 3

The information included on this graphic representation has been compiled from a variety of sources and is subject to change without notice. Kleinfelder makes no representations or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. This document is not intended for use as a land survey product nor is it designed or intended as a construction design document. The use or misuse of the information contained on this graphic representation is at the sole risk of the party using or misusing the information.



Legend

- Grout Spill
- Major Roads
- Local Roads
- ⊗ Aquatic Habitats
- ⊕ Dead Stag
- + *Tetratheca juncea*



PROJECT REFERENCE: 138358
 DATE DRAWN: 13/12/2013 11:43 Version 1
 DRAWN BY: cevans
 DATA SOURCE:
 LPI - 2009

Locations of Habitat and Threatened Flora

Glencore Xstrata
 Vegetation Pre-clearance Survey – Land Remediation
 within Sugarloaf State Conservation Area – Phase 2

FIGURE:

4



4. SUMMARY OF ECOLOGICAL IMPACTS

4.1.1 Direct Impacts: Vegetation Clearing

Vegetation clearing is to be restricted to the removal of limbs of trees and midstorey species to create heli-lift locations by which grout filled bags can be removed.

4.1.2 Threatened Flora

Tetradlea juncea (Black Eyed Susan) was identified approximately 150 m from the drainage channel.

4.1.3 Endangered Ecological Communities

No endangered ecological communities were identified during the assessment.

5. RECOMMENDATIONS

The following recommendations are provided to minimise potential impacts to native vegetation and fauna habitat associated with the proposal to remove the grout from the affected channel:

- All vehicles and equipment should be clean before entering the site to prevent the spread of soil, weed species or plant diseases;
- A vegetation monitoring program should be implemented to monitor the effectiveness of the remediation works within the affectation area in consultation with OEH.

6. REFERENCES

Harden, G.J. (ed) (1992). Flora of New South Wales Volume 3. NSW University Press: Sydney.

Harden, G.J. (ed) (1993). Flora of New South Wales Volume 4. NSW University Press: Sydney.

Harden, G.J. (ed) (2000). Flora of New South Wales Volume 1. NSW University Press: Sydney.

Harden, G.J. (ed) (2002). Flora of New South Wales Volume 2. NSW University Press: Sydney.

NPWS (2000). Vegetation Survey, Classification and Mapping Lower Hunter and Central Coast Region. Version 1.2. A project undertaken for The Lower Hunter and Central Coast Regional Environment Management Strategy CRA Unit Sydney Zone, National Parks and Wildlife Service.

Office of Environment and Heritage (2007). *Mitchell Landscapes with per cent cleared estimates, listed by CMA*, Updated November 2007, OEH Website: <http://www.environment.nsw.gov.au/projects/biometrictool.htm>.

Thackway, R. and Cresswell, I.D. (1995). *An interim biogeographic regionalisation for Australia: a framework for setting priorities in the National Reserves System Cooperative Program, Version 4.0*. Australian Nature Conservation Agency, Canberra.

7. STAFF CONTRIBUTIONS

Name	Qualification	Title/Experience	Contribution
Gilbert Whyte	PhD	Senior Ecologist	Flora and fauna survey and report writing
Chelayne Evens	BSC (Geog) Dip. SIS	Ecologist/ Workflow Manager	Report Review
Samara Schulz	BEnvSc & Mgt (Hons)	Ecologist	Report Review

8. LICENSING

Kleinfelder employees involved in the current study are licensed or approved under the National Parks and Wildlife Act 1974 (License Number: SL100730, Expiry: 31st March 2014) and the Animal Research Act 1985 to harm/trap/release protected native fauna and to pick for identification purposes native flora and to undertake fauna surveys.

8. CONTROL AND REVISION HISTORY

8.1 Document information

Property	Value
Approved by	Environment & Community Manager
Document Owner	OCAL Grout Remediation Project Supervisor
Effective Date	10/03/2014
Keywords	Remediation, grout, subsidence

For a complete list of document properties, select **View Properties** from the document's context menu on the intranet.

8.2 Revisions

Version	Date reviewed	Review team (consultation)	Nature of the amendment
1	10/03/2014	W Covey	Initial published version
2			
3			