

# Review of Environmental Factors

for the

## Bowdens Gumarooka Exploration Activities – EL 5920(1)

*Prepared in conjunction with:*



**R.W. CORKERY & CO. PTY. LIMITED**

March 2017

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ABN: 37 009 250 051

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for the

## Bowdens Gumarooka Exploration Activities – EL 5920(1)

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R.W. CORKERY & CO. PTY. LIMITED

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## **LIST OF ACRONYMS**

AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
BSAL	Biophysical Strategic Agricultural Land
CCC	Community Consultation Committee
CLG	Community Liaison Group
DD	Diamond (core) drilling
DPI Water	Department of Primary Industries Water
DRE	Division of Resources and Energy
EC	Electrical Conductivity
EEC	Endangered Ecological Community
EL	Exploration Licence
EP&A Act	Environmental Planning and Assessment Act 1979
GPS	Global Positioning System
JORC	Joint Ore Reserves Committee
LGA	Local Government Area
OEH	Office of Environment and Heritage
RC	Reverse circulation percussion drilling
REF	Review of Environmental Factors
SMU	soil mapping unit

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## FOREWORD

This Review of Environmental Factors (REF) has been prepared by Bowdens Silver Pty Limited (“the Company”) in conjunction with R.W. Corkery & Co. Pty. Limited to outline the proposed mineral exploration activities and to assess their likely environmental impacts within a specific area (the “Gumarooka Exploration Area”) of Exploration Licence (EL) 5920 near Lue, approximately 26km east of Mudgee (**Figure 1**). A previous REF issued in 2016 (Bowdens, 2016) focussed on a separate Exploration Area (the “Stage 2 Exploration Area”) to the East of the Gumarooka Exploration Area (**Figure 1**). The activities proposed in this document are additional to the activities proposed in Bowdens (2016) and would be undertaken concurrently with those activities using the same equipment that has been used for the Stage 2 exploration activities.

It is noted that EL 5920 is divided into two discrete areas with the proposed exploration activities wholly located within “EL 5920(1)” located near Lue. The second area, EL 5920(2), is located to the west of the townships of Rylstone and Kandos (see **Figure 1**) and is not the subject of any exploration addressed in this REF.

The primary objective of the proposed Gumarooka Exploration Program is to:

- sterilise a number of areas that may be required for construction of infrastructure for a mining operation, should all the required approvals be received; and
- follow up on previous exploration results.

The Gumarooka Exploration Program builds upon previous Exploration Programs undertaken by Silver Standard Australia (1997 to 2002) and the Stage 1 and Stage 1 Exploration Programs.

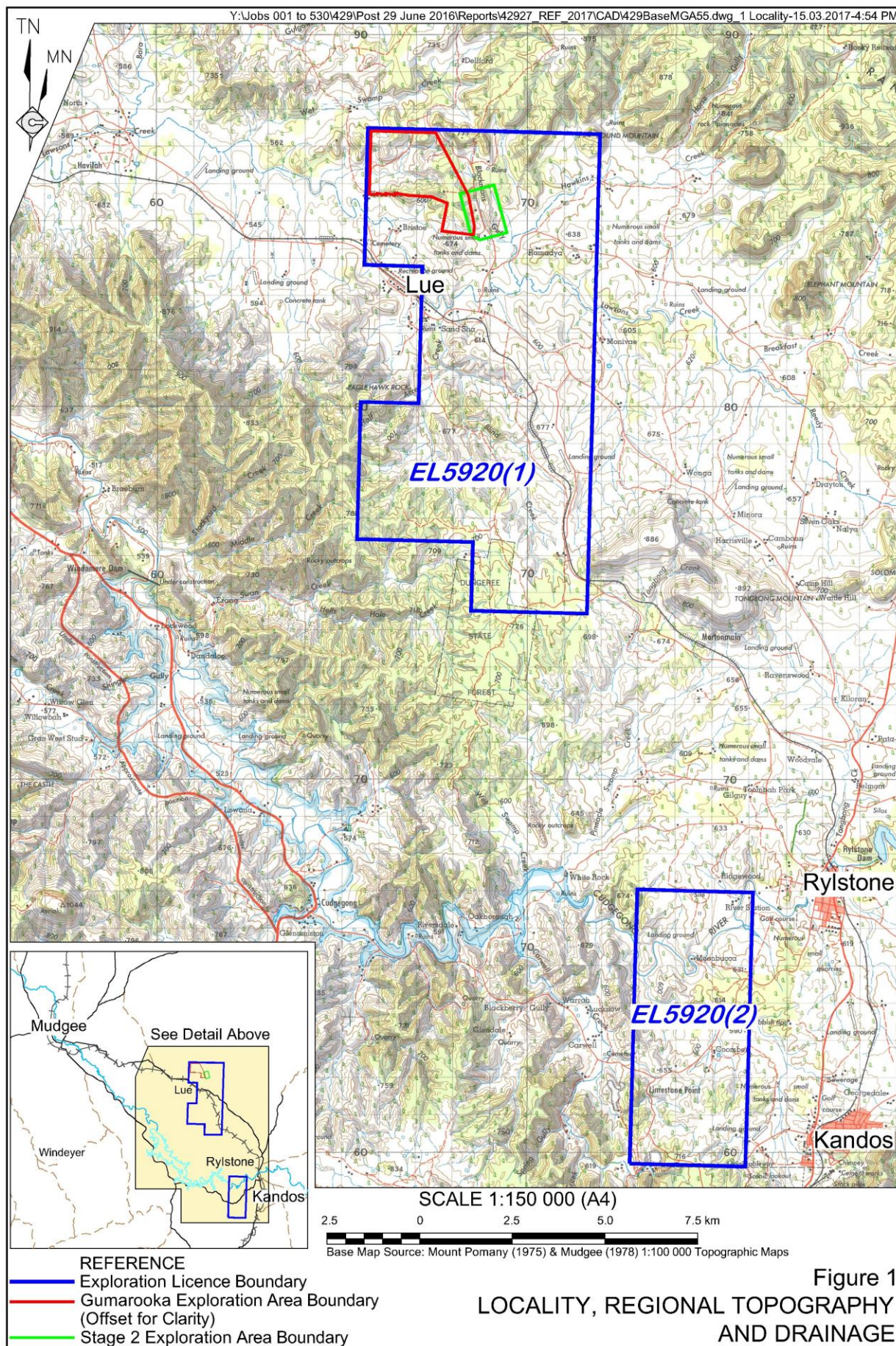
For the purpose of this document, the following terminology is used.

- Licence Area – the area covered by EL 5920.
- Gumarooka Exploration Area – an area of approximately 483ha in which the Gumarooka exploration activities would be undertaken.

The conditions of EL 5920 require all Category 2 or 3 activities to be approved prior to their commencement. The Company has identified the proposed exploration activities as including both Category 2 and Category 3 activities. Hence, an application for approval under the *Mining Act 1992* is required. That application is to be assessed under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and is to be supported by this REF.

This document has been prepared in accordance with the document *ESG2: Guideline for Preparing a Review of Environmental Factors (2015)* (“the ESG2 Guideline”) published by Department of Industry, Skills and Regional Development in July 2015. Sufficient information and detail is provided to allow the DRE to assess the proposed mineral exploration activities in accordance with Part 5 of EP&A Act. **Appendix 1** reproduces a copy of *ESF4 – Exploration Activities Application Form*.







The information contained in this document has been assembled from a combination of published material and data together with a range of site specific material and data being compiled for inclusion within an *Environmental Impact Statement* intended to accompany an application for development consent to develop and operate an open cut mine in the vicinity of the Gumarooka Exploration Area.

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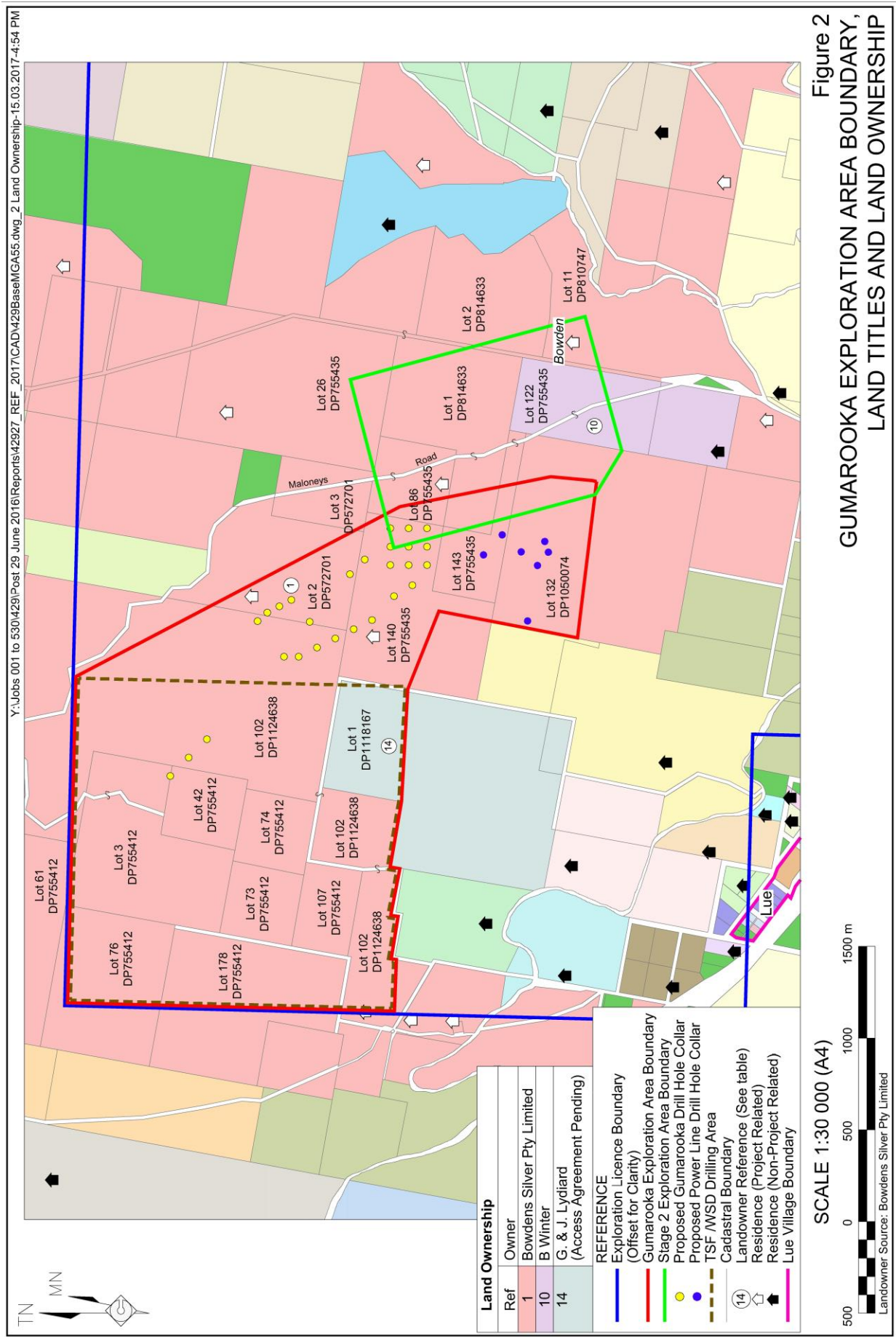
## 1. THE SITE

**Figure 2** presents the land title information and ownership of land within the Gumarooka Exploration Area. **Table 1** presents where in this document the required key information is presented.

The locations of key activities within the Gumarooka Exploration Area are discussed in Section 4.2.

**Table 1**  
**Key Requirements and Where Addressed**

<b>Requirement</b>	<b>Where Addressed</b>
Coordinates of Gumarooka Exploration Area	Figure 13
Boundaries of the title	Figure 1
Lot/Deposited Plan (DP) numbers and boundaries	Figure 2
Topographic contours	Figures 1, 4 & 5
Location of the proposed activity	Figures 1, 4 & 5
Layout of the proposed activity	Figure 13
Major regional features	Figure 1
Existing and proposed access tracks	Figure 13
Existing structures and infrastructure	Figures 8 & 13
Location of identified sensitive land	Figure 9
Nearby sensitive receptors (residences, schools, hospitals, etc.)	Figure 10
Coal seam gas exclusion zones	Not Applicable
Location of threatened species, populations or ecological communities, or their habitats	Figure 11
Location of Aboriginal and historic cultural heritage sites	Figure 12



## 2. THE EXISTING ENVIRONMENT

### 2.1 GENERAL DESCRIPTION

#### 2.1.1 Climate and Weather

**Table 2** presents meteorological data obtained from the Mudgee Airport weather station No. 062101 operated by the Bureau of Meteorology and located approximately 20km west of the Gumarooka Exploration Area.

The climate in the vicinity of the Gumarooka Exploration Area is a warm temperate climate, i.e. warm to hot summers and mild to cool winters. January is the hottest month with a mean maximum temperature of 30.7°C and mean minimum temperature of 15.9°C. July is the coolest month with a mean maximum temperature of 14.3°C, a mean minimum temperature of 1.3°C.

Mean annual rainfall recorded at Mudgee is 672mm with rainfall distributed relatively evenly throughout the year. April and May are the driest months while the mean monthly rainfalls in November and December are higher than other months. The average monthly rainfall varies from 35.1mm in April to 81.5mm during December.

**Table 2**  
**Monthly Climate Averages – Mudgee**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>Temperature (°C)</b> Mudgee Airport Station (Station # 062101) Period of Record 25 Years													
Mean maximum temperature	30.7	29.2	26.7	22.9	18.5	14.9	14.3	16.2	19.5	23.0	26.3	28.6	22.6
Mean minimum temperature	15.9	15.5	12.5	7.8	4.1	2.5	1.3	1.6	4.4	7.5	11.3	13.6	8.2
<b>Rainfall (mm)</b> Mudgee Airport Station (Station # 062101) Period of Record 20 to 22 Years													
Mean monthly rainfall	68.0	65.8	52.5	35.1	39.4	46.6	46.7	35.5	57.4	51.3	75.7	81.5	672.7
Highest monthly rainfall	195.6	233.0	187.0	108.4	124.0	127.2	143.8	112.2	197.4	135.8	162.8	241.6	1 152.4
Lowest monthly rainfall	10.0	2.2	0.0	0.0	0.4	1.4	2.6	1.0	0.8	0.2	9.4	15.0	349.6
Highest daily rainfall	65.0	174.2	56.0	46.2	44.4	37.0	51.2	51.2	61.0	51.0	57.2	100.8	174.2
Average Rain Days (>1mm)	5.5	5.2	5.0	2.7	4.2	5.8	5.7	4.0	5.0	5.3	6.5	6.3	61.2
<b>Evaporation (mm)</b> <sup>1</sup>													
Mean Monthly Evaporation	200	150	125	100	60	50	50	60	100	125	175	200	1 395
Source: <sup>1</sup> Bureau of Meteorology Pan Evaporation Average Map (1975-2005)													

Wind data has been recorded at meteorological stations located to the east of the Gumarooka Exploration Area (MET01) between May 2012 to November 2013 and within Lue village (MET02) between March and November 2013. The station locations and wind roses for all recorded data are presented in **Figure 3**.

The dominant winds experienced at MET01 were a combination of moderate (up to 8m/s) winds from the westerly quadrant and light (up to 5m/s) winds from the northeasterly quadrant. During the day, the westerly component is dominant, whilst during the night the northeasterly component is dominant.



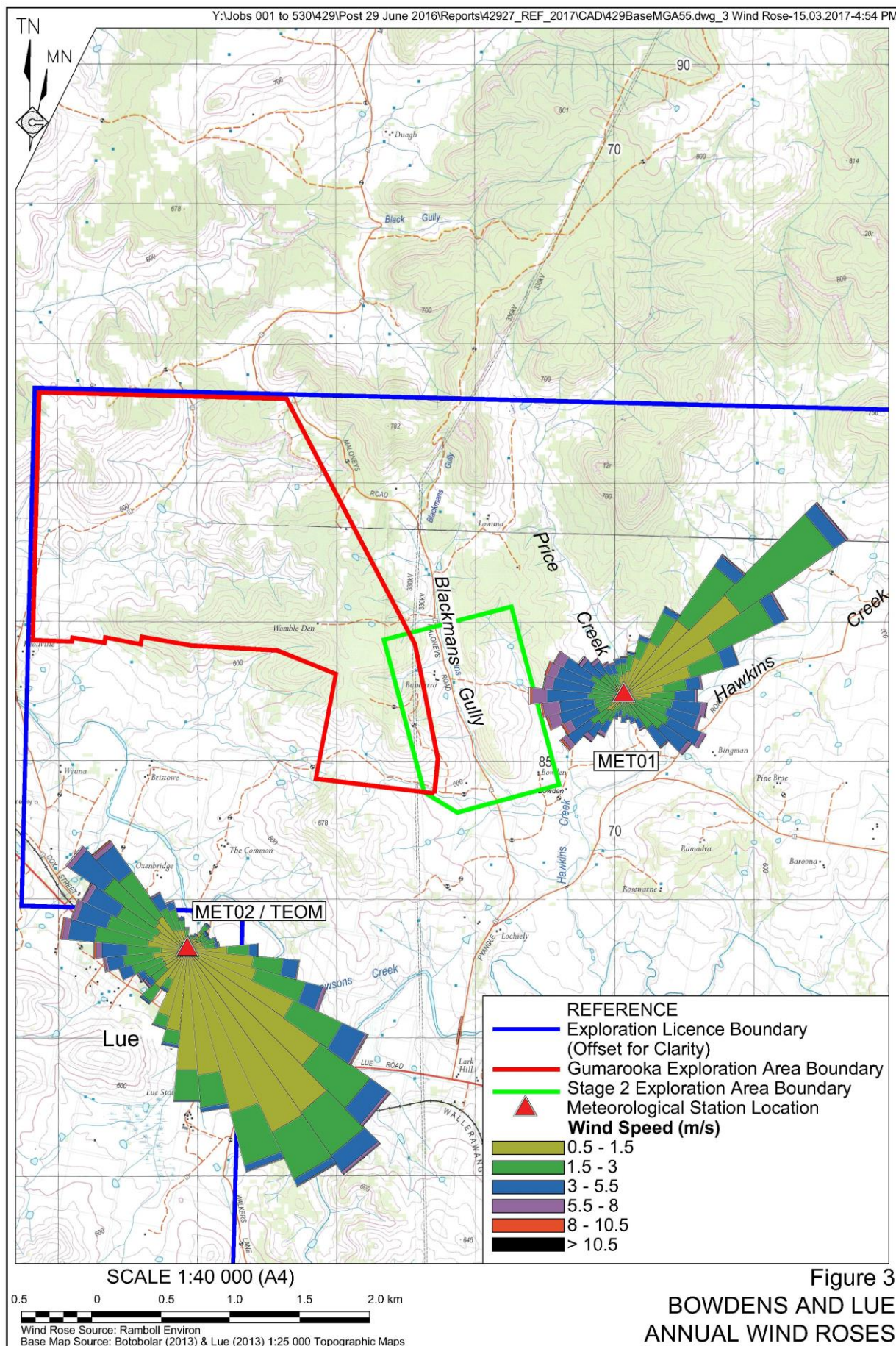


Figure 3  
**BOWDENS AND LUE  
ANNUAL WIND ROSES**

It is noted that the dominant winds experienced in Lue village (MET02) are notably different to those recorded at MET01 principally due to the influence of local topography. Dominant winds were a combination of moderate winds (up to 8m/s) from the northwesterly quadrant and light winds (up to 5m/s) from the southeasterly quadrant. During the day, wind is aligned along the northwest-southeast axis whilst during the night, the southeasterly component is dominant.

### 2.1.2 Topography

**Figure 1** displays the regional topography and drainage whilst **Figure 4** displays the local topography and drainage surrounding the Gumarooka Exploration Area. **Figure 5** displays the slope categories and drainage within the Gumarooka Exploration Area. The stages are displayed in four categories.

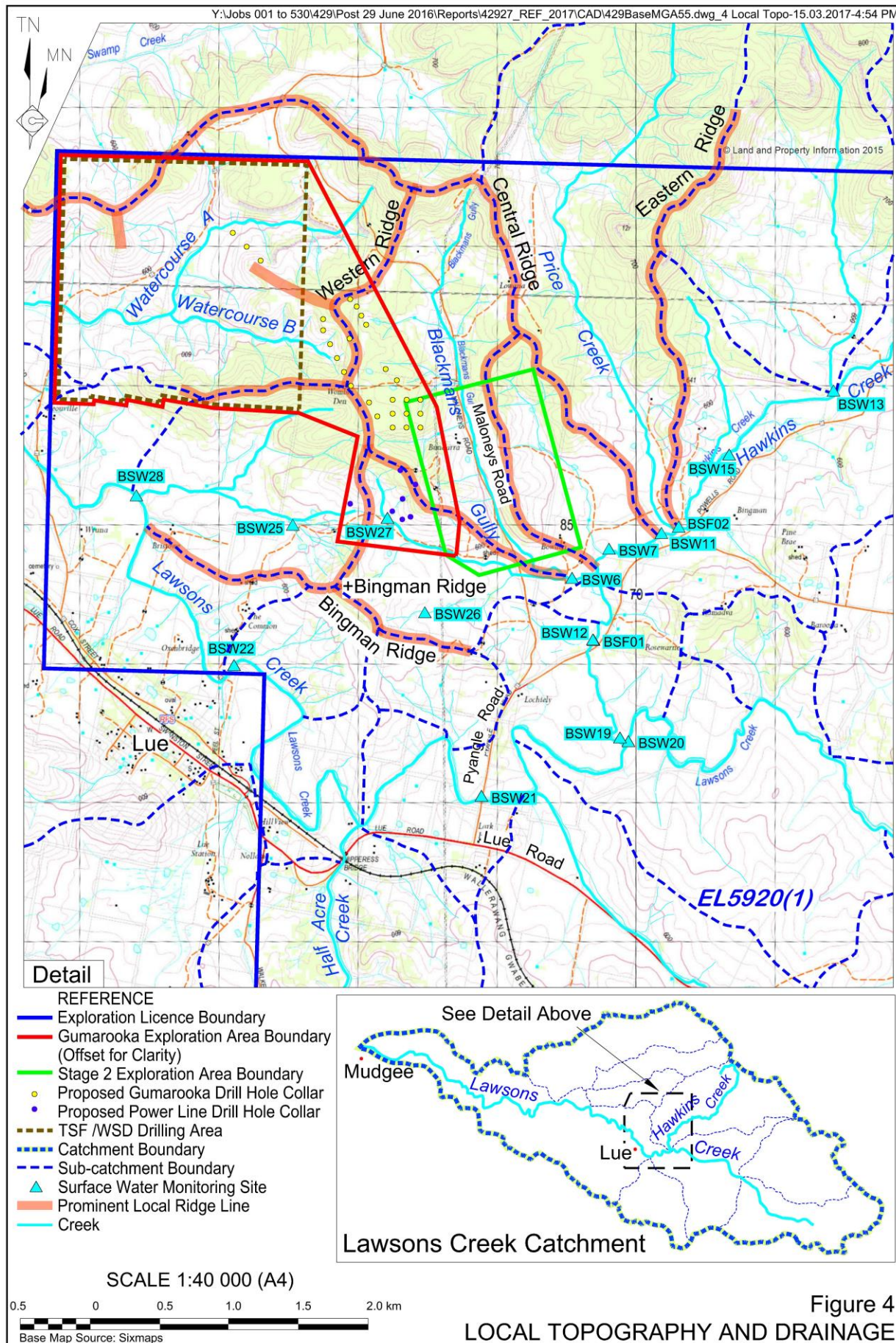
- $>18^{\circ}$ .
- $10^{\circ}$  to  $18^{\circ}$ .
- $5^{\circ}$  to  $10^{\circ}$ .
- $<5^{\circ}$ .

Regionally, the Gumarooka Exploration Area is located on the western flank of the Great Dividing Range. Locally, the topography is dominated by a number of ridges and valleys. The local topography surrounding the Gumarooka Exploration Area comprises three north-south orientated ridges with small intermediate valleys and a broad, flat valley to the south of the Site containing Hawkins Creek. The eastern ridge, located to the northeast of the Gumarooka Exploration Area, has the highest elevation within the local area with a maximum elevation of approximately 770m AHD. The small valley to the west of this ridge, which contains Price Creek, falls to an elevation of approximately 600m AHD before rising again to the top of the central ridge at an elevation of 660m AHD.

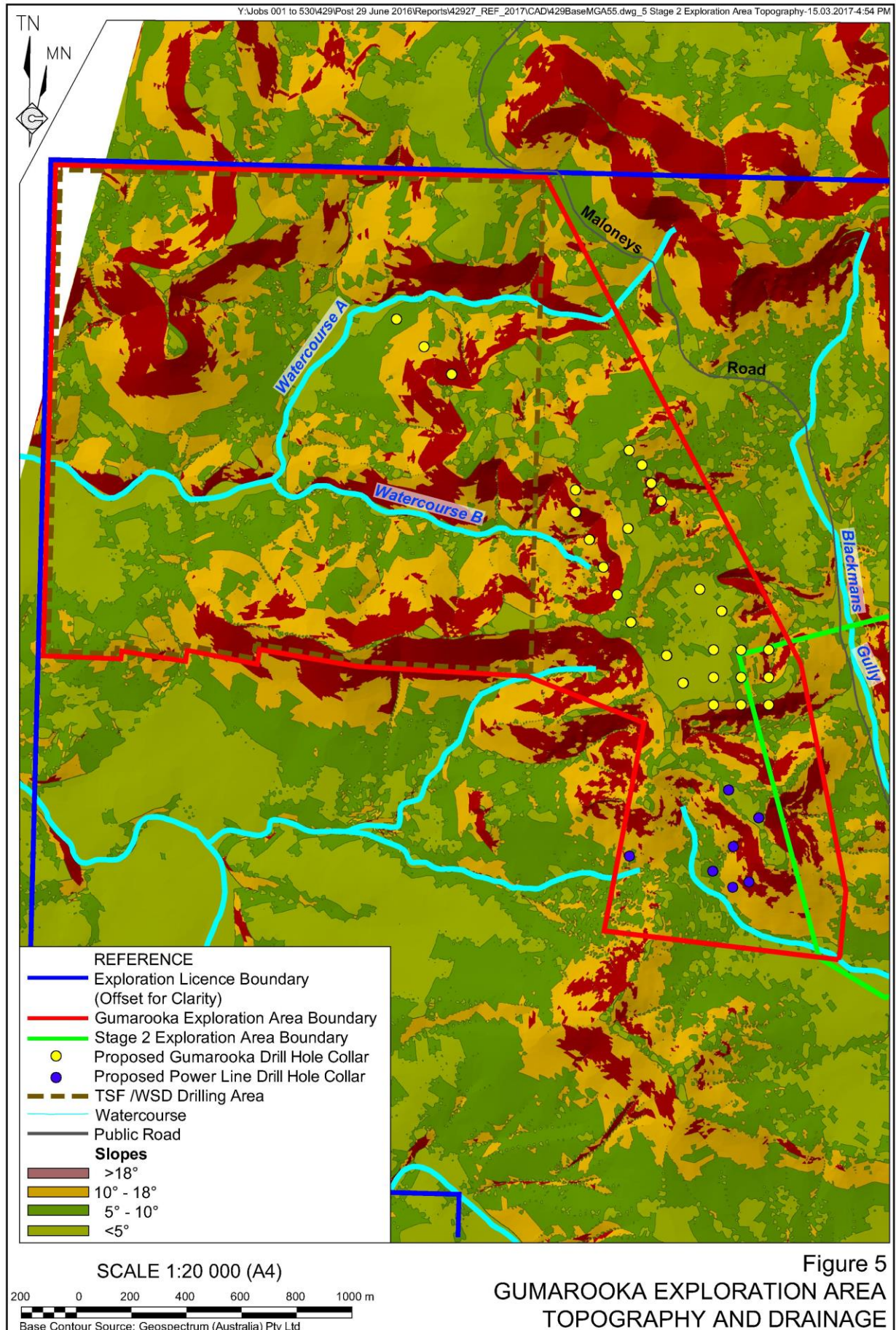
Within the Gumarooka Exploration Area, three east-west oriented ridgelines abut a prominent north-south orientated ridgeline, referred to for the purposes of this document as the Western Ridge. Two unnamed watercourses flow to the west within a number of steeply incised valleys before merging with Lawsons Creek to the west of the Gumarooka Exploration Area. Elevations on the ridgelines vary between 650m AHD and 750m AHD, with the west-flowing watercourses at elevations of between 550m AHD and 600m AHD.

Within the Gumarooka Exploration Area, slopes are typically  $<10^{\circ}$  within the valleys and increase to between  $10^{\circ}$  and  $18^{\circ}$  on the lower slopes of the ridge lines and greater than  $18^{\circ}$  on the upper slopes of the ridge lines (see **Figure 5**). Slopes  $<10^{\circ}$  are typically present on the upper section of each ridge.









### **2.1.3 Soils and Land Capability**

Soil surveying and sampling was completed within the eastern section of the Gumarooka Exploration Area by Geoff Cunningham Natural Resource Consultants Pty Ltd in 2012 and 2013 as part of existing environment studies to support future applications for mining operations. The soil survey included a total of 46 test pits targeting the main topographic features within and surrounding the Gumarooka Exploration Area. A total of four soil mapping units (SMUs) were identified (**Figure 6**). The following provides a description of each of the identified SMUs. It is noted that the 2012 and 2013 study areas do not extend to the western section of the Gumarooka Exploration Area, however, as the landforms and geological setting is similar to the Stage 2 Exploration Area, the Company contends that the descriptions are relevant to the entire Exploration Area.

#### **SMU 1 – Soils of the Crests and Upper Slopes**

The Australian Soil Classification for these soils is “Dermosols (Red and Yellow)”. These soils were test-excavated to a maximum depth of 115cm with some profiles reaching refusal at a depth of only 15cm. These soils are located on crests, rocky outcrops, uplands or upper slope locations. SMU1 is described as follows.

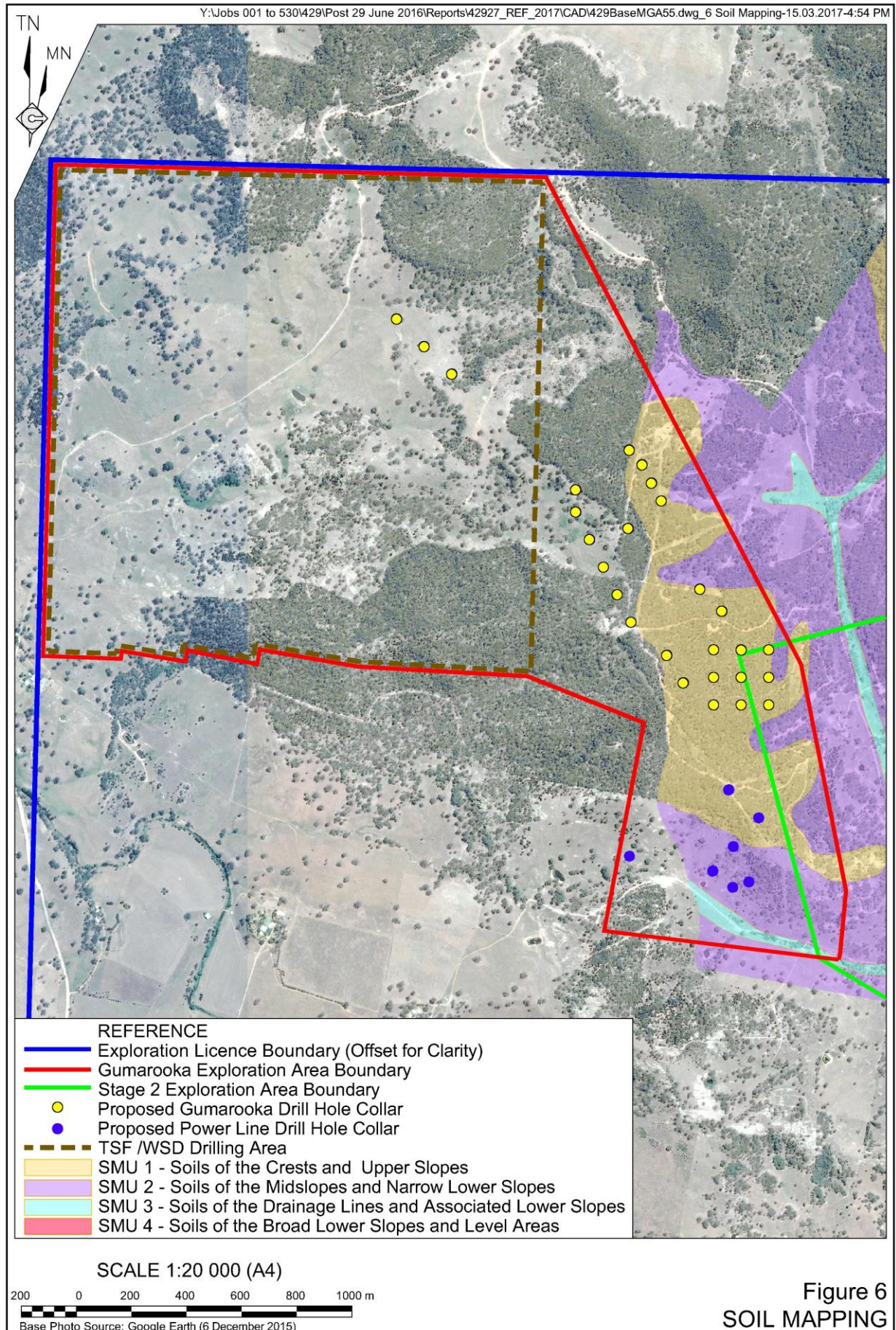
- Surface Condition – usually hardsetting, outcrops sometimes present with surface stone absent with moderate to angular gravel to 15cm to 30cm.
- Topsoil – sometimes well-structured, more usually massive. Consists of sandy loam, sandy clay loam / clay loam, light clay, gritty light to medium clay; pH rarely 4.5 to 6.5; many roots with no lime or manganese present; some to angular and/or flat gravel <5mm to 6 to 10cm; not mottled or bleached; sometimes hydrophobic. Clear, abrupt or sharp horizon from A horizon to bedrock of B1 soil horizon.
- Subsoil – comprises up to two horizons (or bedrock); fine sandy clay loam to medium to heavy clay textured; pH 4.5 to 5.5; many roots; no lime or manganese; some flat and/or rounded gravel <1cm to 10cm and to 20 to 30cm present; not mottled; not bleached; well-structured or massive.

#### **SMU 2 – Soils of the Midslopes and Narrow Lower Slopes**

The Australian Soil Classification for these soils is “Dermosols (Red and Yellow)”. These soils were test-excavated to a maximum depth of between 57cm and 250cm and are located on midslopes or lower slope locations. SMU2 is described as follows.

- Surface Condition – hardsetting, rarely firm, some rounded angular and flat gravel up to 4cm present, angular surface stone 10cm / 15cm to 40cm present, occasionally surface stone absent.
- Topsoil – A<sub>1</sub> horizon. Clayey sand / sandy loam, sandy clay loam, fine sandy clay loam, clay loam, light clay, light to medium clay, medium to heavy clay; roots common; no lime or manganese present; pH 5.5 to 7.0; some flat, angular, rounded and/or rounded / angular gravel <1 to 5cm; rarely to 8cm; roots common; no lime or manganese present, small to moderate amounts of flat floaters 20cm –







40cm x 6cm – 8cm thick; not mottled; not bleached; sometimes hydrophobic; usually well structured; rarely massive. Usually abrupt, but sometimes sharp or clear to A<sub>2</sub> horizon.

A<sub>2</sub> horizon – sandy loam, medium clay, sticky medium clay, medium to heavy clay; roots common, rarely few roots; no lime or manganese present; pH 5.0 to 7.5; some flat, angular, rounded and/or rounded / angular gravel <1cm to 5cm, not mottled; bleached; well structured; occasionally slightly hydrophobic.

- Subsoil – comprising two to four layers (B<sub>1</sub>, B<sub>2.1</sub> B<sub>2.2</sub> and B<sub>3</sub> horizons); generally clay textured, usually not mottled but some mottling occurs at depth in some profiles; pH 4.5 to 7.5, gravel and stones present; usually well structured, occasionally massive; usually not hydrophobic.

### **SMU 3 – Soils of the Watercourses and Associated Lower Slopes**

The Australian Soil Classifications for these soils are “Dermosols (Brown and Black) and Kandosols (Brown and Black)”. These soils were test-excavated to a maximum depth of between 180cm and 250cm and are based on watercourses, creek banks and lower slope locations. SMU3 is described as follows.

- Surface Condition – usually hard setting, occasionally loose or firm; surface stone often absent or some angular surface stone to 15cm present.
- Topsoil – A<sub>1</sub> horizon. Sandy clay loam; sandy clay; light clay; light to medium clay; medium clay; gritty medium clay; many roots; no lime or manganese present; pH 5.5 to 7.0; some angular, rounded and rounded angular gravel <5mm to 2cm; stones to 12cm; not mottled; not bleached; well structured; not hydrophobic.

A<sub>2</sub> horizon – Sandy clay loam; sandy clay; light clay; light to medium clay; medium clay; gritty medium clay; many roots; no lime or manganese present; pH 6.5 to 7.0; some angular, flat, rounded and rounded / angular gravel <1cm to 4cm, sometimes occasional angular stones to 15cm present; not mottled; bleached; well structured; or massive; not hydrophobic.

- Subsoil – Comprised of two to four horizons (B<sub>1</sub>, B<sub>2.1</sub> B<sub>2.2</sub> and B<sub>3</sub> horizons); clayey sand to heavy clay textured; sometimes mottled at depth; usually well structured, sometimes massive; pH generally 5.0 to 7.5; some gravel present; not hydrophobic.

### **SMU 4 – Soils of the Broad Lower Slopes and Level Areas**

The Australian Soil Classification for these soils is “Dermosols (Grey and Brown)”. These soils were test-excavated to a maximum depth of between 88cm and 250cm and are based on lower slopes and ridges, level plain location and rare rock outcrops. SMU 4 is described as follows.

- Surface Condition – usually hard setting, rarely loose; surface stone absent or some to moderate amounts of angular, rounded and rounded angular surface stone 10cm to 20cm present.

- Topsoil – A<sub>1</sub> horizon. Sandy clay loam, sandy clay loam to clay loam, medium clay; many roots; no lime or manganese present; pH 6.0 to 7.0; some to moderate amounts of angular, rounded / angular, rounded and/or flat gravel <1cm to 3cm; not mottled; not bleached; well structured; rarely slightly hydrophobic.  
  
A<sub>2</sub> horizon (sometimes present) – sandy loam; sandy clay loam; few roots; no lime or manganese present; pH 6.0 to 7.0; some angular gravel 1cm to 3cm; not mottled; bleached; well structured; or massive; fabric earthy; not hydrophobic.
- Subsoil – Comprised of two to four horizons (B<sub>1</sub>, B<sub>2.1</sub> B<sub>2.2</sub> and B<sub>3</sub> horizons); variably clay textured; some to moderate amounts of gravel and stones present; some gravel and stones absent; whole coloured or mottles present; usually well structured; not hydrophobic.

The land and soil capability of the land within the Gumarooka Exploration Area has also been mapped regionally by the Office of Environment and Heritage (OEH) (see **Figure 7**). The mapped land and soil capability classes within the Gumarooka Exploration Area is as follows.

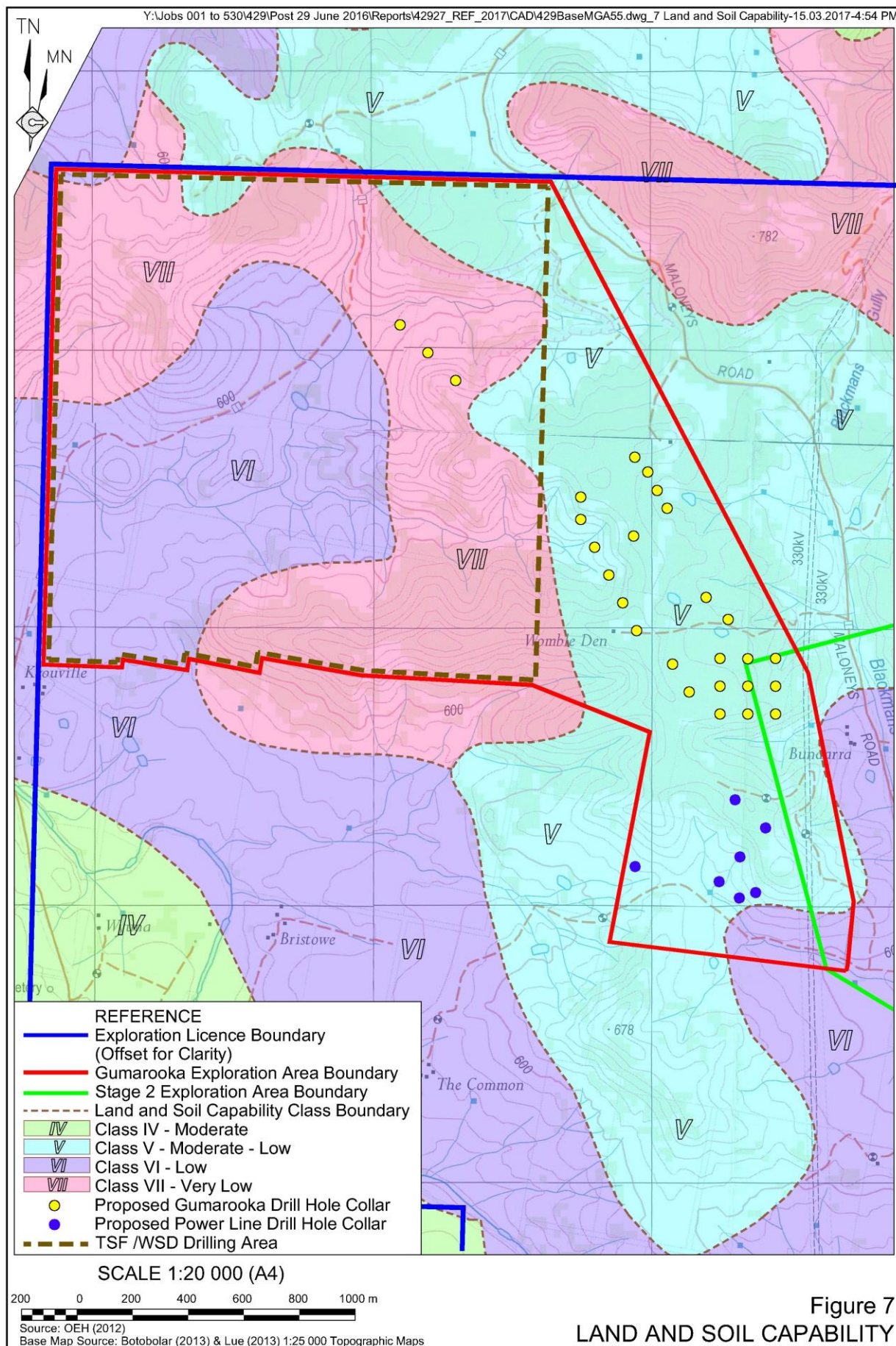
- **Class V Moderate – low capability land:** Land has high limitations for high-impact land uses. Will largely restrict land use to grazing, some horticulture [orchards], forestry and nature conservation. The limitations need to be carefully managed to prevent long-term degradation.
- **Class VI Low capability land:** Land has very high limitations for high-impact land uses. Land use restricted to low-impact land uses such as grazing, forestry and nature conservation. Careful management of limitations is required to prevent severe land and environmental degradation.
- **Class VII Very Low capability land:** Land has extremely severe limitations for most land uses. It is unsuitable for any type of cropping or grazing because of its limitations. The land may be suitable for commercial timber plantations or for native timber on undeveloped land.

These classifications were supported by the soil survey completed by Geoff Cunningham Natural Resource Consultants Pty Ltd in 2012 and 2013.

No biophysical strategic agricultural land (BSAL) has been mapped within the Gumarooka Exploration Area.

## 2.1.4 Existing Land Uses

Existing land uses within and surrounding the Gumarooka Exploration Area comprise primarily rural activities such as grazing and some cropping, with interspersed hobby farms/lifestyle blocks. Land parcels range from grazing properties of up to 200ha to hobby farms/lifestyle blocks of up to 50ha. The outskirts of parts of the Lue village are included within EL 5920(1) but are not within the Gumarooka Exploration Area.



**Figure 7**  
**LAND AND SOIL CAPABILITY**



Within the Gumarooka Exploration Area, the land has previously been used for cattle and sheep grazing albeit at very low stocking rates. The Company maintains a number of cattle and sheep on its property together with agisted stock, principally to minimise fuel loads amongst the remnant native vegetation.

### 2.1.5 Services and Public Infrastructure

**Figure 8** displays the services known to occur within and surrounding the Gumarooka Exploration Area. The key services are as follows.

1. A 500kV power transmission line oriented generally north-south.
2. A network of 415V power transmission lines providing power to local residences and farm buildings.
3. Various buried telecommunications cables principally to the residences and located largely within the local road reserves.

Lue Road, to the south of the Gumarooka Exploration Area, is the main thoroughfare between Mudgee to the west and Rylstone to the southeast. Battens Road is a gravel track connecting Lue with properties to the east of the Gumarooka Exploration Area.

## 2.2 DESCRIPTION OF SENSITIVE LAND

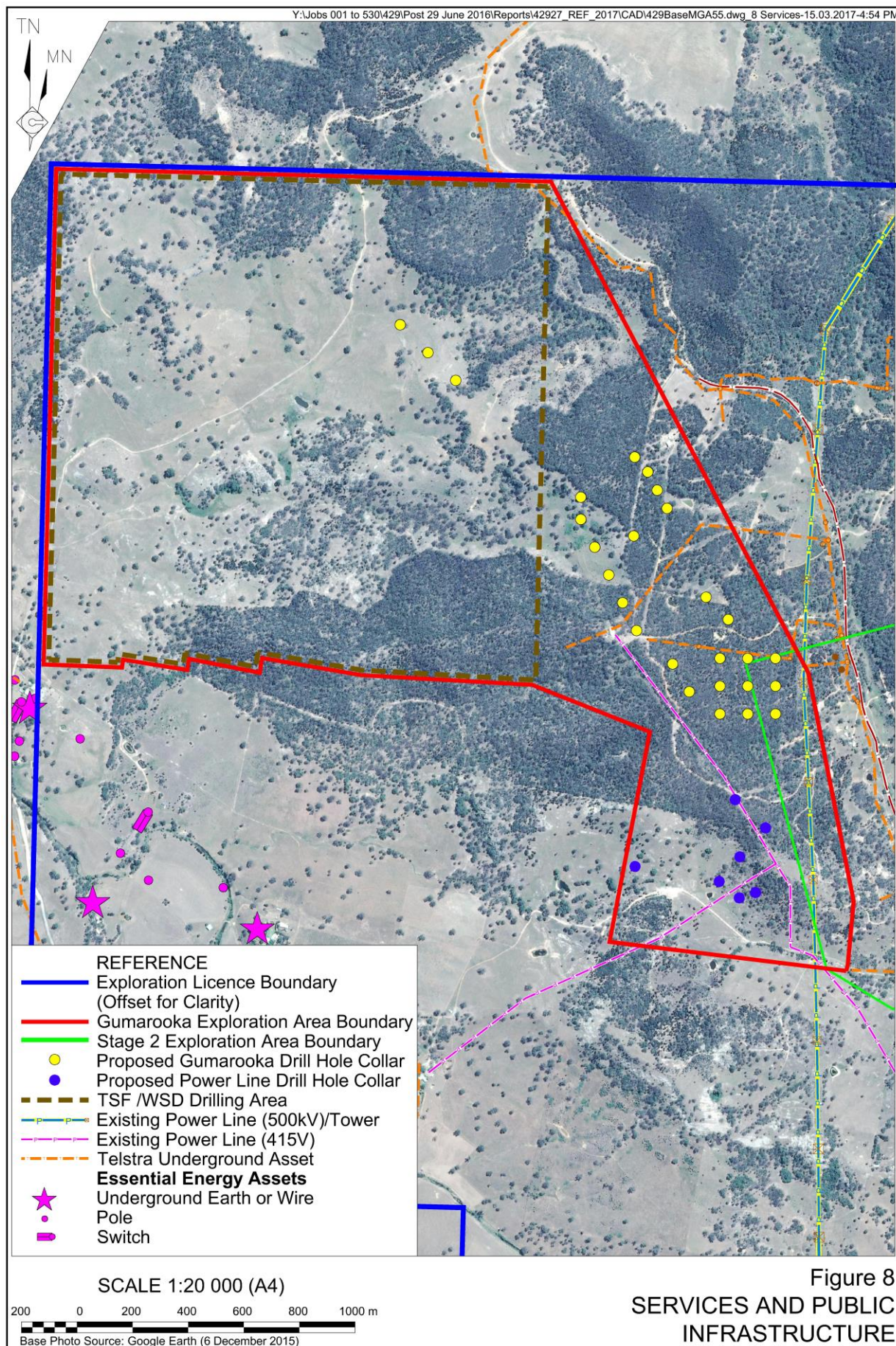
**Table 3** presents an overview of sensitive land within or surrounding the Gumarooka Exploration Area, i.e. in terms of the consideration of a range of areas nominated in the ESG2 Guideline.

**Table 3**  
**Sensitive Land Within and Surrounding the Licence Area**

Page 1 of 2

Sensitive Land	Present within or surrounding the Licence Area
<b>Conservation Areas</b>	
Land reserved under the <i>National Parks and Wildlife Act 1974</i> .	None present
Land acquired by the Minister for the Environment under the <i>National Parks and Wildlife Act 1974</i> .	None present
Land subject to a 'conservation agreement' under the <i>National Parks and Wildlife Act 1974</i> .	None present
Land declared as an aquatic reserve under the <i>Marine Estate Management Act 2014</i> .	None present
Land declared as a marine park under the <i>Marine Estate Management Act 2014</i> .	None present
Land within a State Forest set aside under the <i>Forestry Act 2012</i> for conservation values including: <ul style="list-style-type: none"> <li>• Flora Reserves, or</li> <li>• Special Management (and other) Zones.</li> </ul>	None present
Land reserved or dedicated under the <i>Crown Lands Act 1989</i> for the preservation of flora, fauna, geological formations or for other environmental protection purposes.	None present







**Table 3 (Cont'd)**  
**Sensitive Land Within and Surrounding the Licence Area**

Page 2 of 2

<b>Sensitive Land</b>	<b>Present within or surrounding the Licence Area</b>
<b>Conservation Areas (Cont'd)</b>	
Land identified as wilderness or declared a wilderness area under the <i>Wilderness Act 1987</i> .	None present
Land subject to a 'biobanking agreement' under the <i>Threatened Species Conservation Act 1995</i> .	None present
<b>Drinking Water Catchment Protection Areas</b>	
Land declared to be a controlled area or a 'special area' under the <i>Water NSW Act 2014</i> or a 'special area' under the <i>Water Management Act 2000</i> or <i>Hunter Water Act 1991</i> .	None present
<b>Environmentally Sensitive Areas</b>	
Land identified as critical habitat under the <i>Threatened Species Conservation Act 1995</i> or Part 7A of the <i>Fisheries Management Act 1994</i> .	None present
Land designated as a wetland of international significance under the <i>Ramsar Convention on Wetlands</i> .	None present
Land to which <i>State Environmental Planning Policy No. 14 – Coastal Wetlands</i> applies.	None present
Land to which <i>State Environmental Planning Policy No. 26 – Littoral Rainforests</i> applies.	None present
Coastal Waters of the State as defined in the <i>Coastal Protection Act 1979</i> and the <i>Coastal Protection Regulations 2011</i> .	None present
Land identified in an environmental planning instrument as being of biodiversity significance or zoned for environmental conservation.	Present
Waterfront land as defined under the <i>Water Management Act 2000</i> .	Present <sup>1</sup>
Land with a slope greater than 18 degrees measured from the horizontal.	Present <sup>2</sup>
<b>Land with Potential for Soil and Water Contamination</b>	
Potential Acid Sulphate Soils or Actual Acid Sulphate Soils.	None present
<b>Aboriginal Heritage Protection Areas</b>	
Land declared as an Aboriginal place under the <i>National Parks and Wildlife Act 1974</i> .	None present
Land identified in an environmental planning instrument as being of Aboriginal cultural significance.	None present
<b>Historic or Natural Heritage Protection Areas</b>	
Land identified on the World Heritage List, National Heritage List or Commonwealth Heritage List.	None present
Land, places, buildings or structures listed on the State Heritage Register.	None present
Land identified in an environmental planning instrument as being of heritage significance.	None present
<b>Biophysical Strategic Agricultural Land and Critical Industry Clusters</b>	
Land identified as biophysical strategic agricultural land under <i>State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007</i> .	None present
Land identified as a Critical Industry Cluster Land under <i>State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007</i> .	None present
<b>Community Land</b>	
Public land classified as community land under the <i>Local Government Act 1993</i> .	None present
Note 1: Waterfront land within the REF Area includes the areas within 40m of the creeks defined on the Botobolar and Lue (1986) 1:25,000 topographic maps - see <b>Figure 9</b>	
Note 2: see <b>Figure 5</b>	

As a result of this overview, identified sensitive land within the Gumarooka Exploration Area includes:

- land within 40m of an unnamed tributary of Lawsons Creek (see **Figure 9**);
- some areas where natural slopes exceed 18° (see **Figure 5**); and
- areas identified by the *Mid-Western Regional Local Environmental Plan 2012* as being of biodiversity sensitivity (see **Figure 9**).

## **2.3 DESCRIPTION OF SENSITIVE RECEPTORS**

The locations of sensitive receptors (i.e. residences) surrounding the Gumarooka Exploration Area are shown in **Figure 10**.

## **2.4 DESCRIPTION OF COL SEAM GAS EXCLUSION ZONES**

The proposed activities do not relate to petroleum exploration and therefore coal seam gas exclusion zones do not apply.

## **2.5 DESCRIPTION OF SURFACE AND GROUNDWATER RESOURCES**

### **2.5.1 Surface Water Environment**

There are no permanent watercourses within or immediately adjacent to the Gumarooka Exploration Area. The principal watercourses within the Gumarooka Exploration Area are an unnamed, third order watercourse (under the Strahler classification system), Watercourse A, and Watercourse B (refer **Figure 4**).

- Watercourse A originates in the northeastern section of the Gumarooka Exploration Area, in the topographic high of the Western Ridge. Watercourse A flows in a southwesterly direction until its confluence with Watercourse B, where after Watercourse A flows in a westerly direction.
- Watercourse B is a second order watercourse which originates in the central eastern section of the Gumarooka Exploration Area, in the topographic high of the Western Ridge, and flows in a westerly direction through the central section of the Gumarooka Exploration Area.
- Watercourse A flows into Lawsons Creek, the major regional watercourse, southwest of the Gumarooka Exploration Area approximately 1km southwest of the Gumarooka Exploration Area.
- Blackmans Gully is not situated within the Gumarooka Exploration Area. However, many of second order watercourses flow east from the Western Ridge into Blackmans Gully which flows in a southerly direction before entering Hawkins Creek.



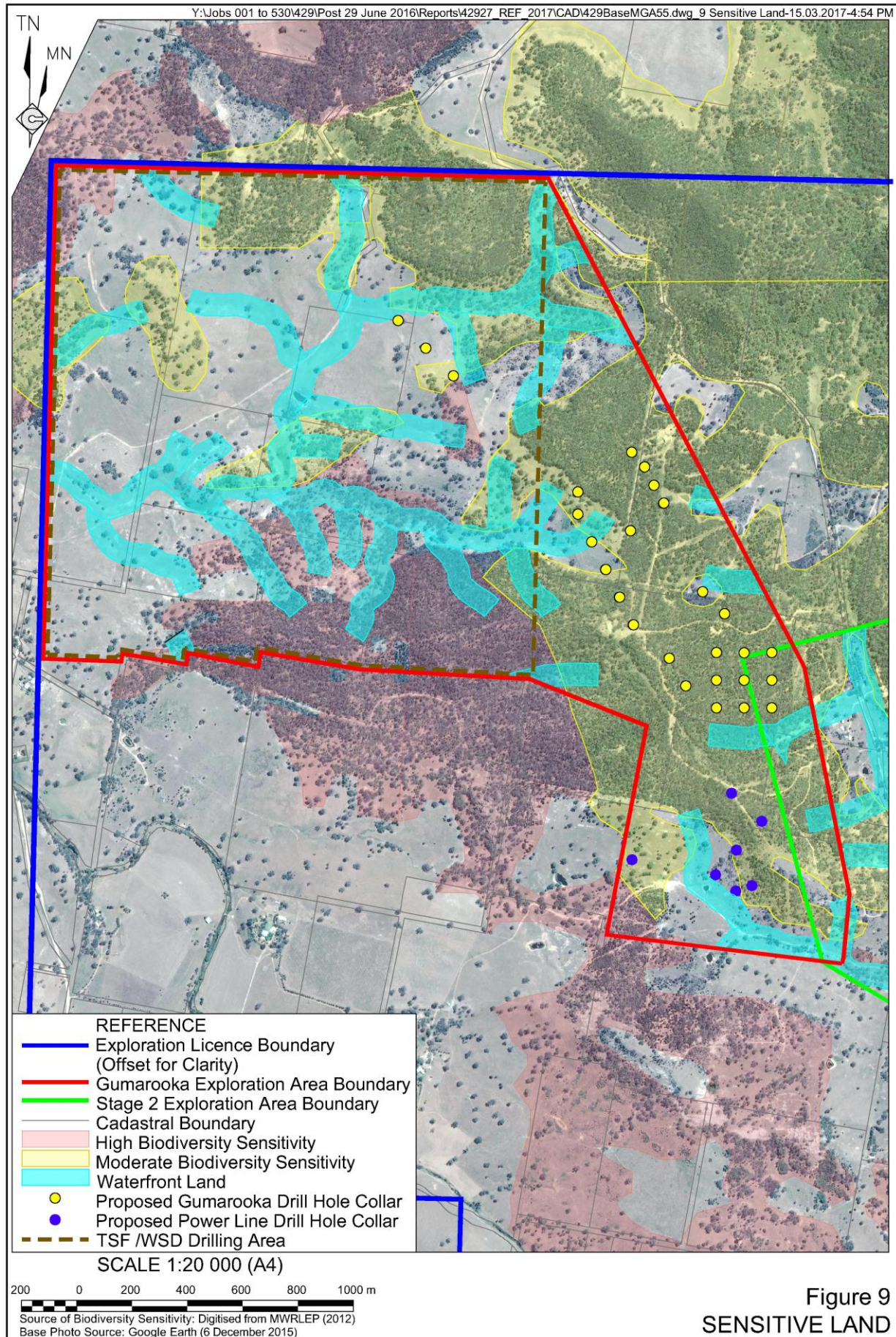


Figure 9  
SENSITIVE LAND



It is noted that the second order watercourses that join to form third order watercourses typically have small catchments of between 10ha to 15ha. Because of this, Watercourse A and Blackmans Gully have characteristics more typical of a second order watercourse (i.e. they respond to rainfall events but has very little baseflow).

Monthly surface water quality monitoring was undertaken between April 2012 and May 2013 at a range of locations within and surrounding the Gumarooka Exploration Area (see **Figure 4**). A summary of the average, minimum and maximum electrical conductivity and pH values for sites located surrounding the Gumarooka Exploration Area is provided in **Table 4**.

**Table 4**  
**Surface Water Quality Summary**

Sample Location	Electrical Conductivity @ 25°C µS/cm			pH		
	Mean	Min	Max	Mean	Min	Max
<b>BSW01</b>	260	190	315	<b>6.2</b>	<b>5.9</b>	7.0
<b>BSW02</b>	88	80	100	<b>5.2</b>	<b>5.0</b>	<b>5.5</b>
<b>BSW03</b>	158	40	<b>820</b>	<b>6.2</b>	<b>5.4</b>	7.6
<b>BSW04</b>	<b>559</b>	205	<b>775</b>	<b>4.1</b>	<b>3.5</b>	<b>6.1</b>
<b>BSW05</b>	73	60	135	<b>5.5</b>	<b>5.0</b>	<b>6.4</b>
<b>BSW06</b>	136	100	170	6.6	<b>6.3</b>	7.1
<b>BSW07</b>	<b>543</b>	<b>430</b>	<b>740</b>	7.0	6.6	7.6
<b>BSW08</b>	166	80	210	6.5	<b>6.1</b>	6.7
<b>BSW09</b>	<b>385</b>	255	<b>565</b>	6.9	<b>6.3</b>	7.3
<b>BSW10</b>	<b>466</b>	345	<b>745</b>	7.1	6.7	7.6
<b>BSW11</b>	<b>588</b>	<b>430</b>	<b>800</b>	7.2	6.8	7.7
<b>BSW12</b>	<b>489</b>	170	<b>715</b>	7.3	<b>5.3</b>	7.9
<b>BSW13</b>	<b>768</b>	350	<b>2 050</b>	7.6	7.0	<b>8.2</b>
<b>BSW14</b>	<b>1 464</b>	<b>600</b>	<b>2 190</b>	7.7	7.3	8.0

Note: **Bold** values indicate exceedance of ANZECC criteria for Upland Rivers in Southeast Australia

## 2.5.2 Groundwater Environment

Hydrogeological investigations have been conducted to date by Jacobs Group (formerly SKM) to support future applications for mining operations (Jacobs, in prep). These investigations identified the presence of four hydrostratigraphic units in the area which are identified as follows.

- Alluvium.
- Sydney Basin Sedimentary Fractured Rock.
- Rylstone Volcanics.
- Ordovician Bedrock.

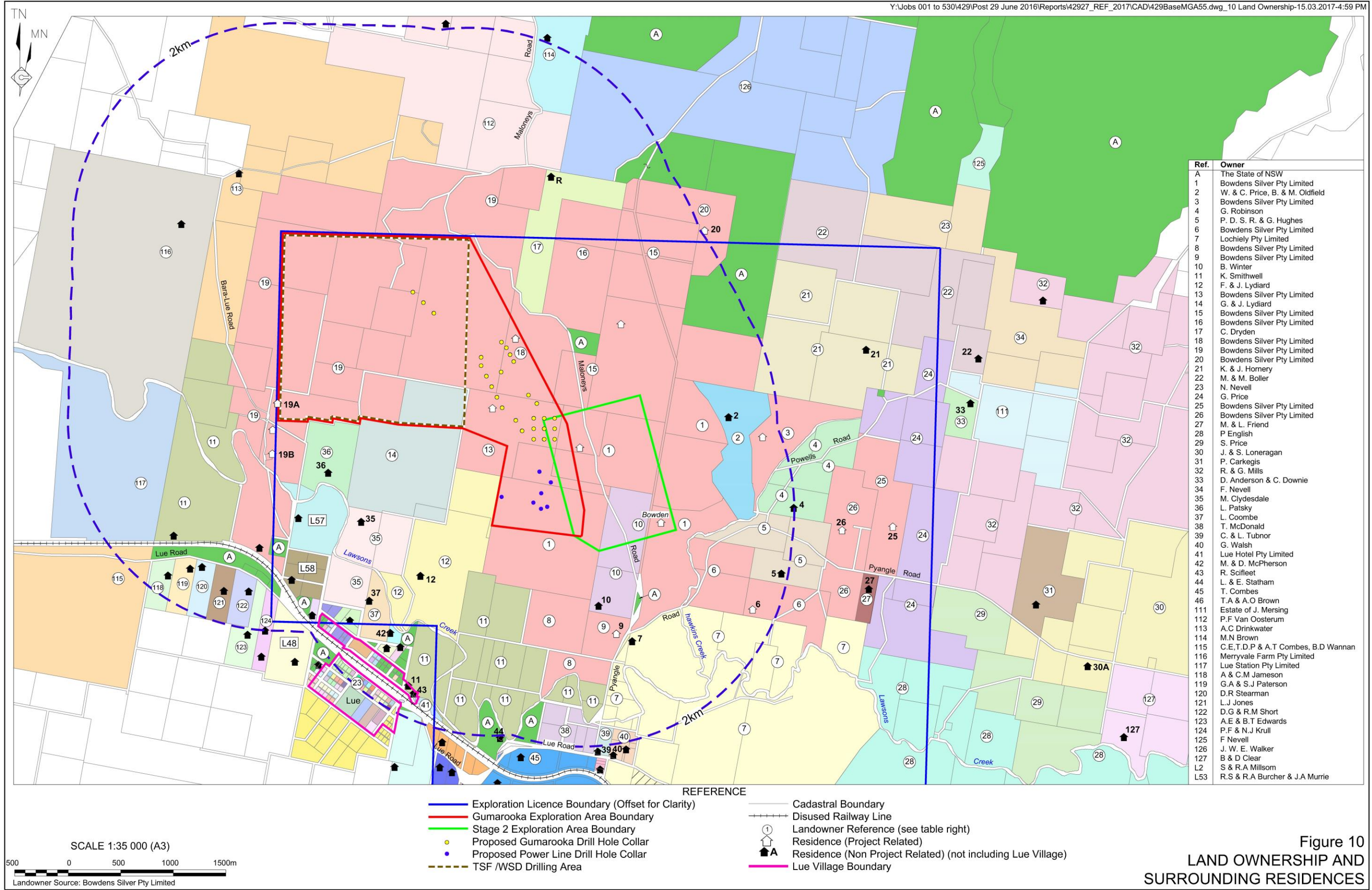


Figure 10  
LAND OWNERSHIP AND  
SURROUNDING RESIDENCES

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The Sydney Basin sedimentary fractured rock is reported to occur as a thin veneer of outcropping sandstone within the eastern section of the Gumarooka Exploration Area, a unit that thickens to the north. Previous drilling found it to be unsaturated in the vicinity of the Stage 2 Exploration Area to the south of the Gumarooka Exploration Area, which is supported by the fact that there are no groundwater users associated with this unit within 2km of the Gumarooka Exploration Area. Jacobs (in prep) anticipate that this unit in the Gumarooka Exploration Area to be partially saturated, however due to the elevated locations of the proposed drillholes in this unit, it is unlikely that significant volumes of groundwater would be encountered.

Underlying the Sydney Basin sedimentary fractured rock are the rhyolitic Rylstone Volcanics. This unit was considered by Jacobs to be a fractured rock aquifer with a reported range in thickness from 10m to 200m. The unit is reported to be comprised of breccia, ignimbrites and tuffs and generally displays a dip to the north. Jacobs conceptualised that this aquifer was an extensively fractured and well-connected unit with this finding being supported by subsequent pump testing.

Groundwater quality information for the Rylstone Volcanics was collected from 10 observation bores on a monthly basis between mid-2012 and mid-2013. Electrical Conductivity (EC) readings ranged from 200 $\mu$ S/cm to 6 400 $\mu$ S/cm, with an average of 1 275 $\mu$ S/cm whilst pH values ranged from 4.5 to 8.7.

Jacobs considered that interaction between the Rylstone Volcanics fractured rock aquifer and watercourses, such as Watercourse A and Watercourse B, is likely to involve leakage of surface water to the groundwater, given the greater depth to the regional water table in these areas.

The Ordovician Bedrock unit underlies the Rylstone Volcanics and outcrops to the south of the Gumarooka Exploration Area. Jacobs reported that the results of pumping tests for this aquifer showed a wide range in hydraulic conductivity values. Four registered bores within 3km of the proposed Gumarooka Exploration Area were interpreted by Jacobs as extracting groundwater from the Ordovician Bedrock aquifer.

Groundwater quality information for the Ordovician Bedrock aquifer has similarly been collected for seven observation bores. EC readings ranged from 10 $\mu$ S/cm to 1 320 $\mu$ S/cm, with an average of 702 $\mu$ S/cm whilst pH values ranged from 4.7 to 7.7.

In summary, the hydrogeological environment is best described as a fractured rock system with superficial lenses of alluvial sediments located along minor drainages. In the fractured rock system, groundwater is generally transmitted through faults, fractures and other openings in consolidated rocks. The effective (largely secondary) porosity of the geological units present at the site is controlled by the density and connectivity of fractures and faults that are present and the aperture dimensions of the fractures. It is conceptualised that the permeability of the fractured rock aquifers will decrease with depth as the weight of overburden rocks close the fractures thus inhibiting the movement of water.

A review of the groundwater levels within the piezometers within and immediately surrounding the Gumarooka Exploration Area display the following groundwater levels.

- Typically <5m below ground level within the valleys.
- Typically 10m to 30m below ground level on the side slopes and ridges.

## 2.6 DESCRIPTION OF THREATENED SPECIES, POPULATIONS AND ECOLOGICAL COMMUNITIES

### 2.6.1 Threatened Ecological Communities and Flora

Vegetation mapping of the Gumarooka Exploration Area and its surrounds was completed by Ecological Australia during 2014. Additional surveys were in progress at the time of finalisation of this document. The preliminary results of the additional surveys were used to inform the following.

A total of 10 plant community types were identified, a number of which meet the classification of White Box Yellow Box Blakely's Red Gum Woodland, listed as an Endangered Ecological Community (EEC) under the *Threatened Species Conservation Act 1995* (TSC Act). These plant community types also meet the classification of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland listed as a Critically Endangered Ecological Community (CEC) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The location of the EEC/CEC, other non-listed native vegetation communities and cleared land is shown on **Figure 11**.

### 2.6.2 Threatened Fauna Species and Populations

A fauna survey was undertaken within the Gumarooka Exploration Area and surrounds by Biodiversity Monitoring Services by both desktop review and field surveys in November 2011, July 2012 and October 2013. Additional surveys were in progress at the time of finalisation of this document. The preliminary results of the additional surveys were used to inform the following.

A total of 22 native mammal, including 12 bat species, nine introduced species, 104 bird, 13 reptile and five amphibian species were located during the surveys, of which 18 are listed as threatened. A list of the threatened species is provided in **Table 5** and the locations of the observed threatened species within the Gumarooka Exploration Area are shown in **Figure 11**.

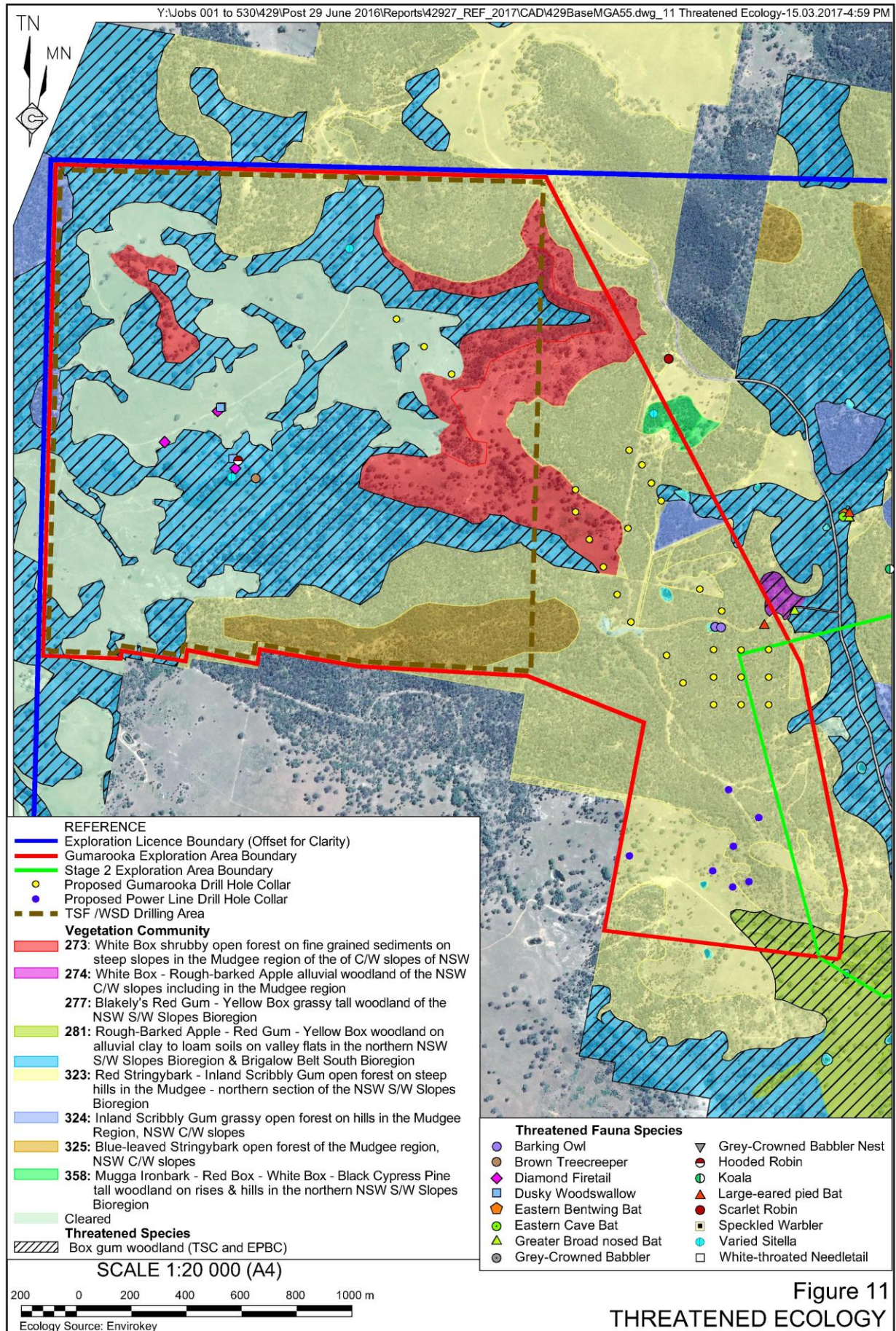
In general, the diversity of species can be considered high for all fauna groups except for small ground and arboreal native mammals for which the diversity is relatively low. The low diversities of ground and arboreal native mammals are probably due to the presence of introduced predators and competitors.

No threatened populations or critical habitats have been identified within or surrounding the Gumarooka Exploration Area.

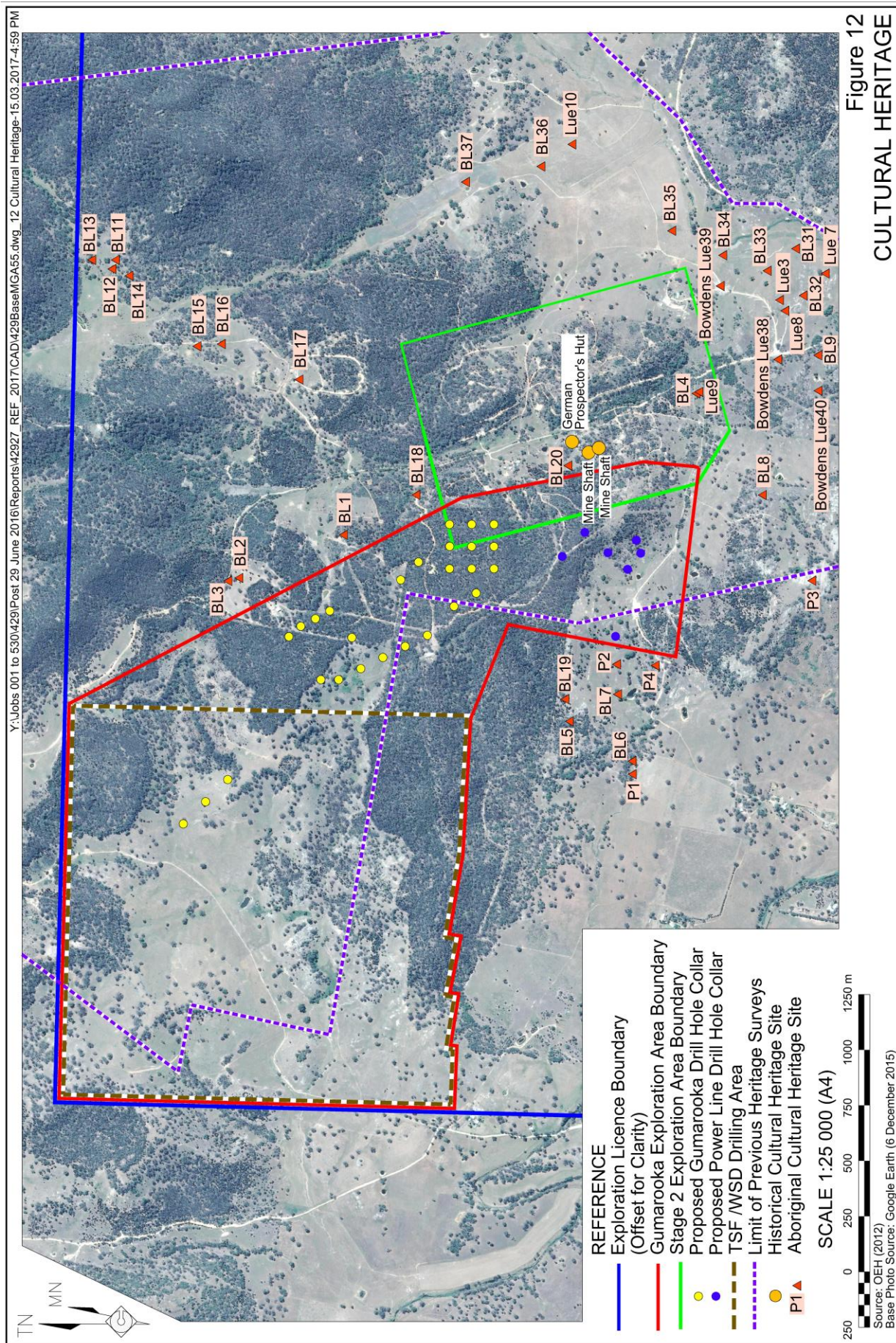
## 2.7 DESCRIPTION OF ABORIGINAL CULTURAL HERITAGE

The majority of the Gumarooka Exploration Area and surrounds has previously been surveyed for Aboriginal cultural heritage by Appleton (1996) and Maynard (1998) and more recently by Landsape in November 2011 (**Figure 12**).











**Table 5**  
**Threatened Fauna Species**

Scientific Name	Common Name	TSC Act Status	EPBC Act Status
<b>Mammals</b>			
<i>Chalinolobus dwyeri</i> *	Large-eared Pied Bat	V	V
<i>Miniopterus schreibersii oceanensis</i> *	Eastern Bent-wing Bat	V	-
<i>Scoteanax rueppellii</i> *	Greater Broad-nosed Bat	V	-
<i>Vespadelus troughtoni</i> *	Eastern Cave Bat	V	-
<b>Birds</b>			
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V	-
<i>Glossopsitta pusilla</i> *	Little Lorikeet	V	-
<i>Ninox strenua</i>	Powerful Owl	V	-
<i>Climacteris picumnus</i>	Brown Treecreeper	V	-
<i>Pyrrholaemus sagittatus</i> *	Speckled Warbler	V	-
<i>Melanodryas cucullata</i>	Hooded Robin	V	-
<i>Petroica boodang</i>	Scarlet Robin	V	-
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V	-
<i>Stagonopleura guttata</i>	Diamond Firetail	V	-
<i>Ninox connivens</i>	Barking Owl	V	-
<i>Artamus cyanopterus</i>	Dusky Woodswallow	V	-
<i>Pomatostomus temporalis</i>	Grey-crowned Babbler	V	-
<i>Phascolarctos cinereus</i>	Koala	V	V
<i>Hirundapus caudacutus</i>	White-throated Needle-tail	-	V
V = Vulnerable		* Observed within Stage 2 Exploration Area	

A review of 1996, 1998 and 2011 surveys and the AHIMS database identifies a range of Aboriginal archaeological sites surrounding the Gumarooka Exploration Area, however, no sites have been identified within the Exploration Area (**Figure 12**).

## 2.8 DESCRIPTION OF HISTORIC CULTURAL OR NATURAL HERITAGE

There are no registered historical cultural heritage sites within the Gumarooka Exploration Area. The closest registered historical heritage site on the NSW State Heritage Register is Lue Railway Station complex, located on the disused Wallerawang-Gwabegar Railway in Lue.

A survey for historic cultural heritage undertaken by Landsape in 2011 identified three historical features thought to be associated with nineteenth century gold mining activities in the Apple Tree Flat Goldfield Reserve (Richard Smart *pers. comm.*, 23 November 2011). These historical cultural heritage sites are located on the western flanks of Blackmans Gully to the east of the Gumarooka Exploration Area (see **Figure 12**). Landsape considered the three sites to be of low historic significance.

### 3. THE PROPOSED ACTIVITY

#### 3.1 SUMMARY OF THE ACTIVITY

Table 6 presents a brief summary of the proposed activity.

**Table 6**  
**Summary of the Proposed Activity**

<b>Exploration Licence No.</b>	5920.
<b>Licence Holder</b>	Bowdens Silver Pty Limited.
<b>Operator:</b>	Budd Exploration Drilling Pty Ltd.
<b>Activity Type:</b>	Reverse Circulation (RC) and Diamond Core (DD) drilling program with ancillary activities.
<b>Activity Location:</b>	2km to 4km north of Lue, NSW.
<b>Activity Duration:</b>	2 year from the approval of the REF.

#### 3.2 DESCRIPTION OF THE ACTIVITY

##### 3.2.1 Overview

The objectives of the Gumarooka Exploration Program are to:

- further define the extent of mineralisation and potential resource within the Gumarooka and Plines prospects; and
- undertake sterilisation and geotechnical drilling within sections of the Gumarooka Exploration Area that may be used for construction of Tailings Storage Facility or a Water Storage Dam.

The program would involve construction of access tracks, drill pads (where necessary) and the drilling of approximately 50 drill holes within the approximately 483ha Gumarooka Exploration Area. The proposed 50 holes would initially be drilled using reverse circulation (RC) drill methods, with some drill holes potentially requiring a diamond core tail to reach the required depth.

**Figure 13** displays the location of all proposed drill holes within the Gumarooka Exploration Area. It is noted that the location of 35 drill collars that would be used to test mineralisation at the Gumarooka and Plines prospects have been determined and are presented on **Figure 13**. However, the locations of the remaining 15 drill holes required for the sterilisation program are reliant on completion of the preliminary design of the potential Tailings Storage Facility and / or Water Storage Dam. As a result, an area, referred to hereafter as the TSF/WSD Drilling Area has been identified on **Figure 13**. The Company would ensure that all sterilisation drill collars are constructed within this area.



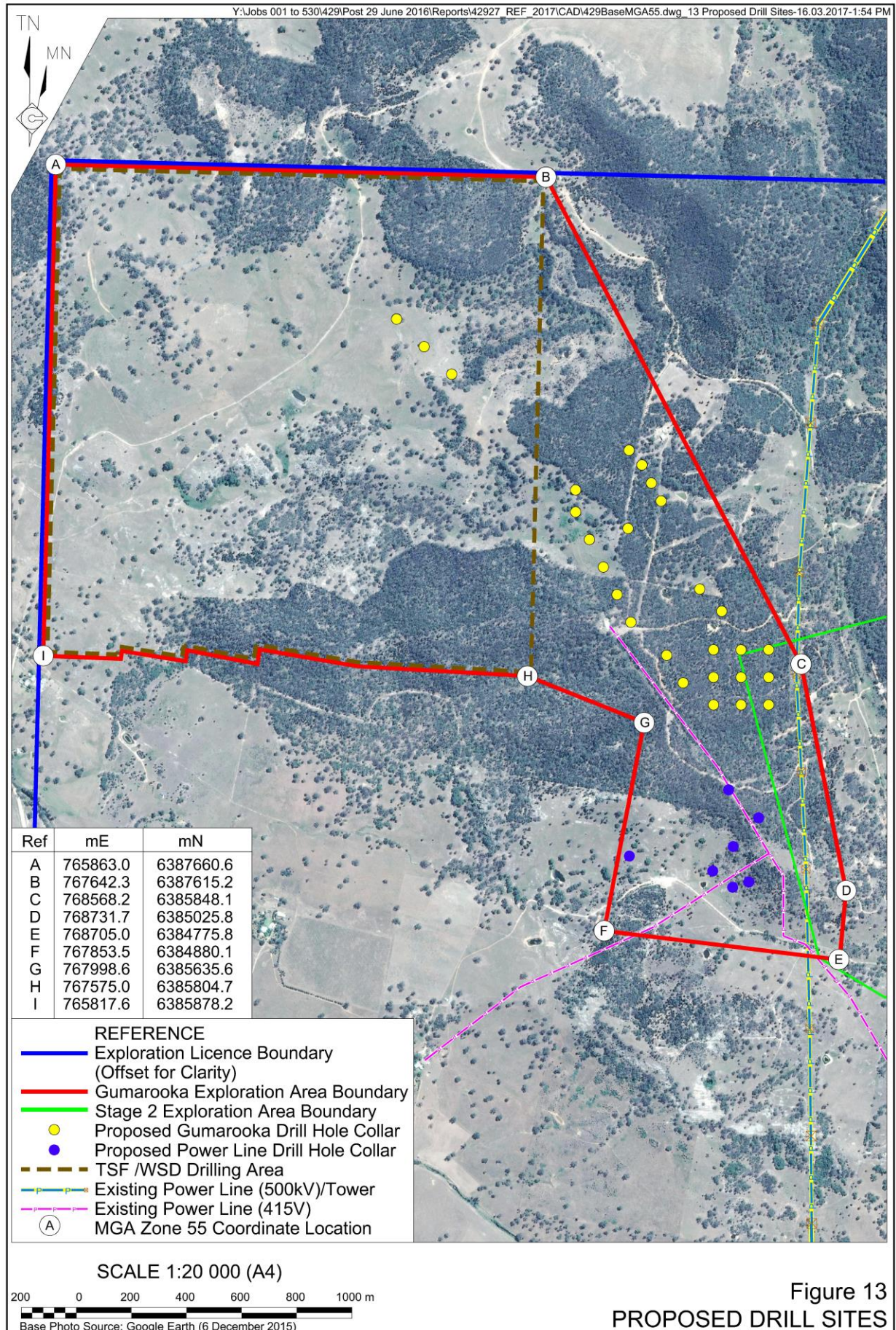


Figure 13  
PROPOSED DRILL SITES



The exploration process would involve the following key steps.

1. Confirmation (by GPS) and pegging of specific drill hole locations.
2. Access preparation, involving track preparation.
3. Drill pad preparation including placement or excavation of sumps.
4. Drilling and sample collection.
5. Demobilisation of all equipment and temporary stabilisation.
6. Final rehabilitation of the drill pad and access tracks (once no longer required).

Selected drill core would be sawn longitudinally to enable sampling for specific chemical analysis. Other cores would be used for geotechnical and metallurgical testing.

**Plates 1 and 2** display reverse circulation and diamond drilling operations in progress. **Plate 3** displays typical diamond drill core and **Plate 4** displays the typical excess reverse circulation sample bag storage on a drill pad.

The process to identify the exact drill hole locations would take into consideration the following to ensure that each drill hole and its associated disturbance would have a minimal impact on the surrounding environment.

- Areas of disturbance associated with all drill holes and access track locations would avoid as far as possible threatened flora and fauna and ecological communities, and mature / established vegetated areas. Particular care would be placed upon locating drill sites in the defined EEC to ensure that impacts within these area are minimised to the greatest extent practicable..
- Earthworks to form drill pads, etc. would be minimised at those sites where natural slopes are <10°. In terrain with slopes >10°, drill pads would be shaped through earthmoving works to provide a near horizontal slope.
- Identification and avoidance of underground service cables and overhead power lines.
- The orientation of the drill rig and ancillary equipment, where possible, to minimise noise impacts upon surrounding residents.

In general, the exploration activities would be undertaken with reference to the following documents.

- *Exploration Code of Practice: Community Consultation – March 2016.*
- *Exploration Code of Practice: Environmental Management – July 2015.*
- *Exploration Code of Practice: Rehabilitation – July 2015*
- *NSW Minerals Industry Exploration Handbook: Leading Practice for NSW Explorers – 2013 Edition.*





**Plate 1:** Reverse circulation drilling rig in operation  
(Ref: DCN-1134)

**Plate 2:** Diamond drilling rig in operation  
(Ref: Picture 001)



**Plate 3:** Typical diamond drill core  
(Ref: E429M\_076)

**Plate 4:** Typical excess reverse circulation sample bag storage on drill pad  
(Ref: DSC\_0045)



### **3.2.2 Access**

The proposed drilling program would require access tracks to be constructed and/or upgraded to provide access to the nominated drill hole collar locations. Wherever possible, access would be obtained from the existing road/track network. Track construction would be minimised in areas where natural slopes are <10°. It is anticipated that approximately 3.2km of new or upgraded access tracks would be required. Approximately 50% or 1.6km of the tracks would require vegetation and soil removal although the past practice of avoiding substantial trees would continue.

The construction of new tracks would incorporate drainage channels and, if topography becomes a safety issue, windrows constructed from cut material. All new tracks would be constructed in the manner outlined in the Water, Erosion and Sediment Control Management Plan (WESCMP) (see **Appendix 3**) and would avoid mature / established trees wherever possible. Sediment traps are also incorporated into the design where erosional runoff is likely to occur and would either involve coarse rocky material being placed in the drainage channels at regular intervals or the construction of silt-stop fencing as dictated by the track's length and slope. Sediment basins would be constructed at the base of hillside tracks to collect sediment from runoff water. A conceptual cross-sectional view and plan view of the proposed tracks are shown in **Figure 14**.

While the Company would endeavour to confine access to the nominated access tracks, the locations of some tracks may need to be modified pending unforeseen field practicalities or safety issues.

### **3.2.3 Drilling Operations**

#### **3.2.3.1 Preparation of Drill Pads**

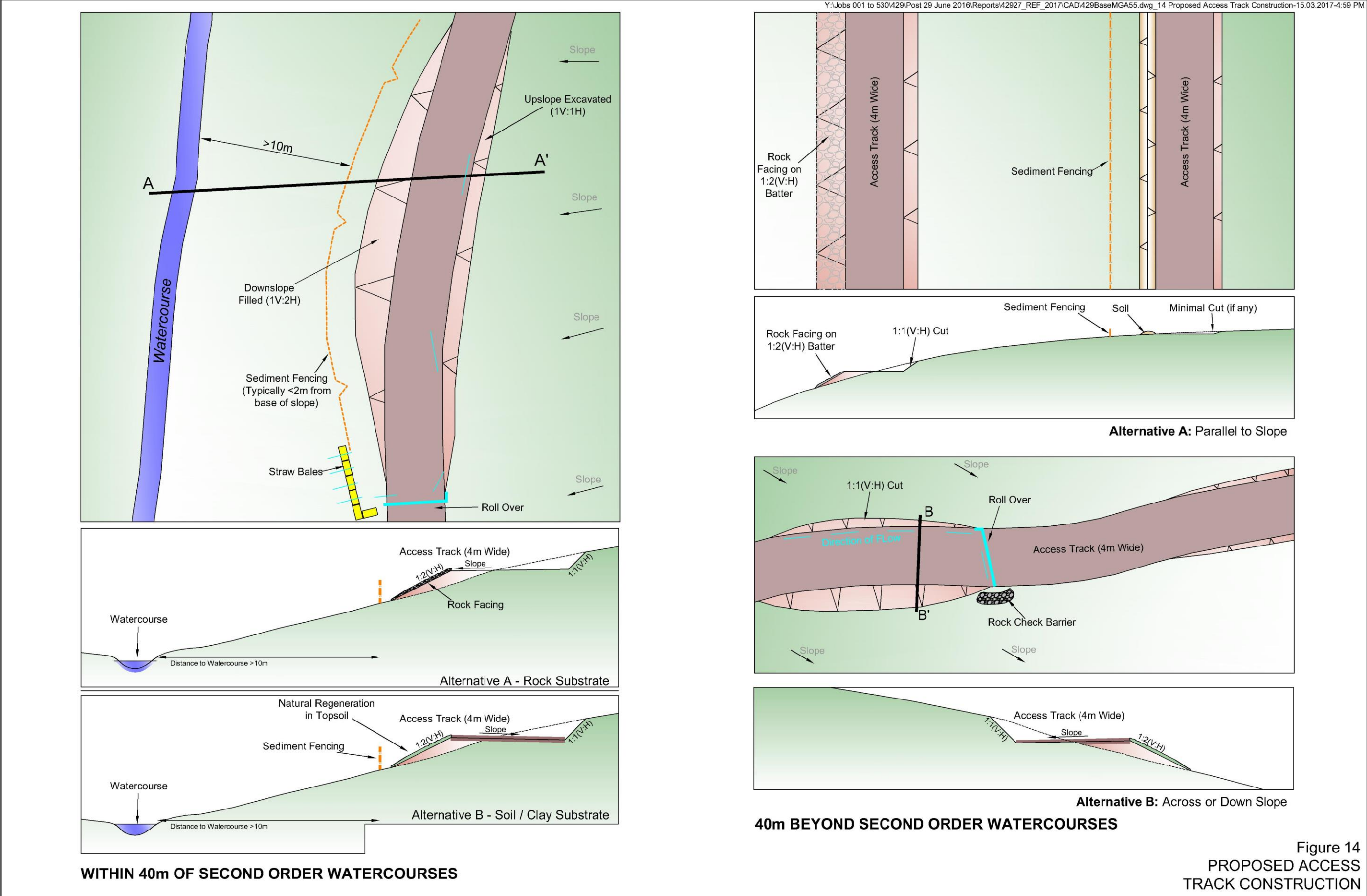
Both RC and diamond core drilling would require the operations to be undertaken within an area typically 20m x 20m (approximately). This area is typically referred to as a "drill pad". **Figures 15** and **16** display the typical layouts of drill pads for both types of drilling on both near flat ground or a moderate slope.

Preparation of each new drill pad would initially involve delineation of the area of disturbance and an evaluation of the extent of vegetation clearing and levelling earthworks required. Preparatory activities would involve clearing of vegetation, stripping of soil material and, if necessary, cut and fill works to provide a level pad. Where required, vegetation would preferentially be cut using chainsaws or broken using an excavator or tracked tractor just above ground level to enable re-shooting at a later date. All vegetation removed would be stockpiled immediately adjacent to the drill pad, preferably on the downslope side. In addition to the use of existing access tracks, it is expected that a total of 3.0ha of disturbance would be required as follows.

- Drill pads – 50 pads at 400m<sup>2</sup> each ..... 2.0ha.
- Access tracks – 1.6km at 4m wide plus 50% to allow for road-side disturbance ..... 1.0ha

Where present in recoverable thicknesses, stripped topsoil and subsoil would be stockpiled adjacent but separately on the drill pad to heights of no more than 2m.







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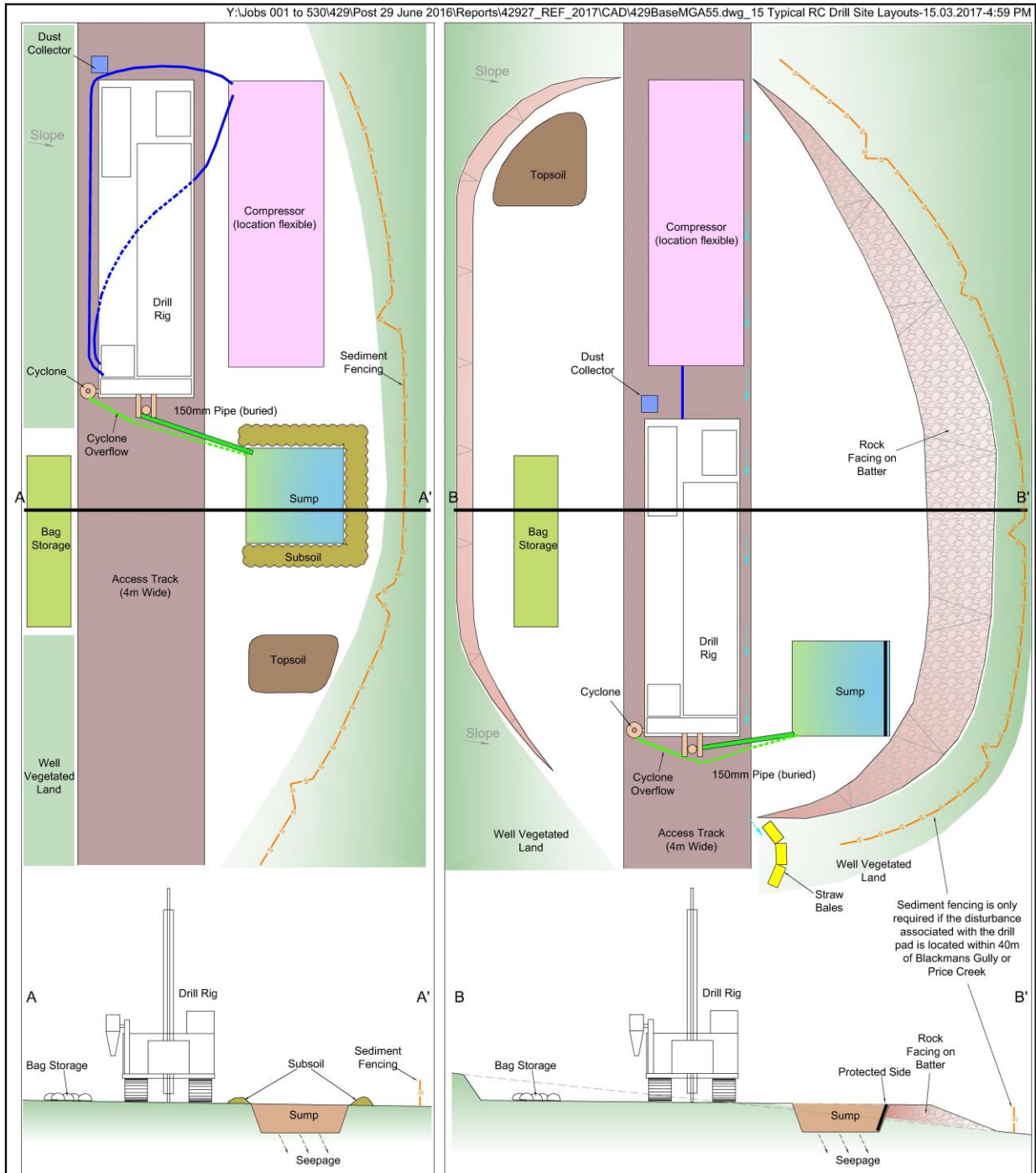
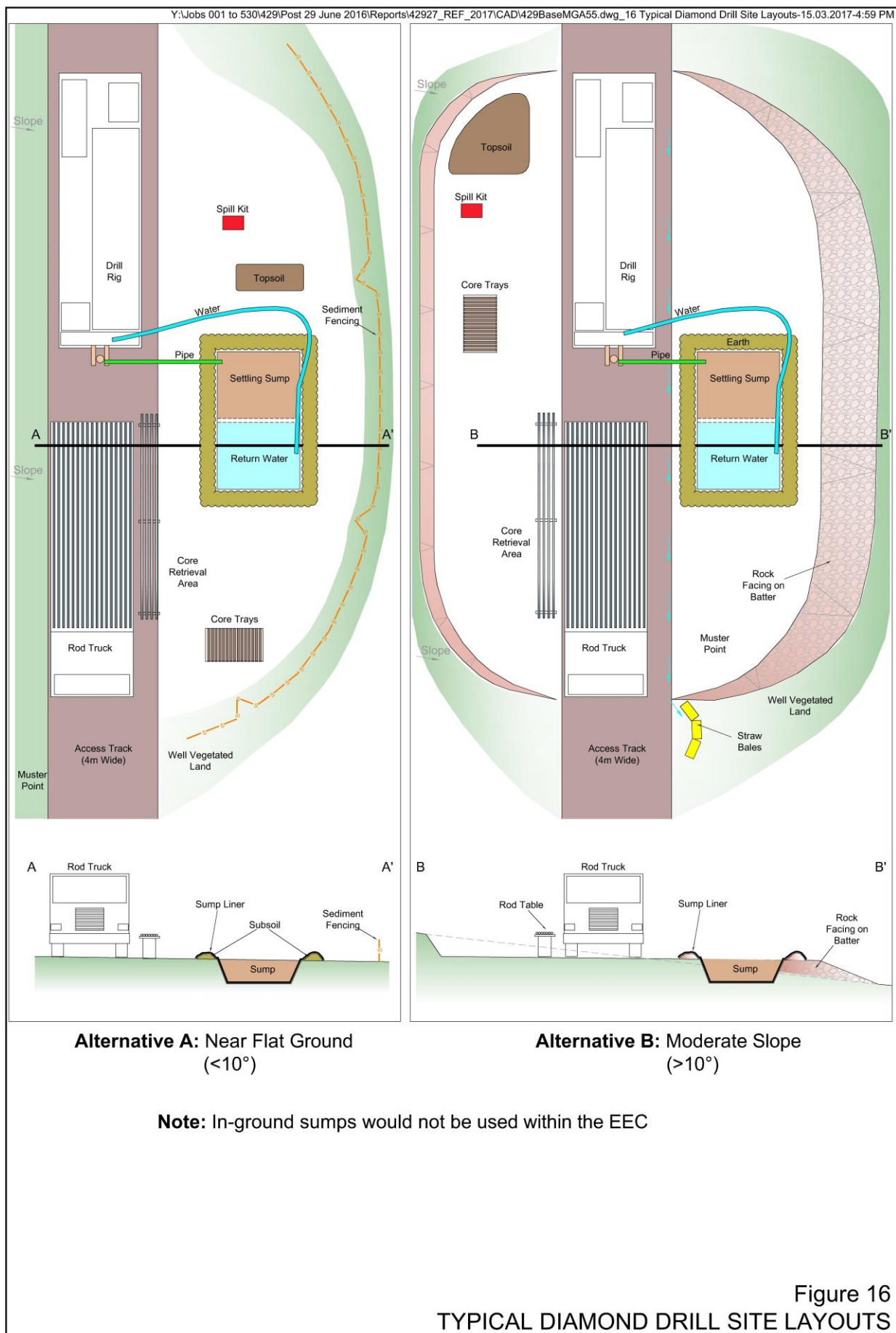


Figure 15  
TYPICAL RC DRILL SITE LAYOUTS





### 3.2.3.2 RC Drilling

RC drilling involves the use of compressed air to drive a slowly rotating percussion drill bit, which operates in a similar manner to a jack hammer. The percussion drill bit is typically fitted with numerous, hardened protrusions that crush the rock at the bottom of the hole. The crushed material is brought to the surface with the returning air through the centre of the drill rods. This drilling method is relatively fast compared with diamond drilling methods. Typically, this drilling method requires multiple vehicles, including a drill rig (truck or track-mounted vehicle), compressor (truck or track-mounted vehicle) and support truck, as well as one or more light vehicles. RC drill holes would typically range in diameter between 100mm and 150mm. The planned depths of the RC drill holes vary from 50m to 200m with most in excess of 150m.

### 3.2.3.3 Diamond Core Drilling

Diamond core drilling involves the use of a rapidly rotating, diamond impregnated drill bit and water with drilling additives to cool and lubricate the drill bit. As the drill rods and drill bit spin, the diamonds grind away the face of the hole leaving a cylinder of rock in the centre of the drill barrel. As the drill rods advance, the cylinder of remaining rock (core) gradually becomes enveloped by the drill rods. The drilling is stopped at regular intervals (commonly 1.5m, 3m or 6m) and the resulting drill core from that run is brought to the surface by a wireline retrieval tool operating within the drill pipe. All recovered drill core is placed in drill trays (see **Plate 3**).

Drilling fluids returning to the surface contain fine ground-up rock which settles out in either an above-ground or in-ground sump. Typically this drilling method requires a truck or track mounted drill rig, a support truck and a number of light vehicles. Diamond core drill holes would typically range in diameter between 75mm and 120mm. The planned depths of the diamond drill holes vary from 240m to 450m.

Based on experience from the Stage 1 and Stage 2 exploration programs, it is anticipated that an average of 40 000L of ‘makeup water’ would be required for each diamond core drill hole. Makeup water would be sourced, where available from existing dams on Company-owned land within and surrounding the Gumarooka Exploration Area. Makeup water not available on Company-owned land will be sourced off site from a licenced water vendor. It is expected that there would be minimal produced water from diamond core drill holes and an average of 5 000L produced per RC drill hole. Further information regarding produced water is outlined in Section 3.5.2.

### 3.2.4 Sample Management

A proportion of the drilled materials (‘drill cuttings’) from each RC drill hole to be sent to a laboratory for assay would be directly placed into calico bags, sealed in polyweave plastic bags and transported in heavy duty “Bulka Bags” and/or plastic Sample Tubs. The samples would be despatched approximately weekly from site to the contracted laboratory.

The drilled material that is not used for the initial assay (estimated 75% to 94% of the drilled material) would be kept on or immediately adjacent to the drill pad, in their calico or plastic bags, until it is no longer required (see **Plate 4**). At that time, the materials would be disposed of on-site through placement into empty sumps.

The diamond drill core would be stored in core trays (see **Plate 3**) and transported to a sample storage shed adjacent to the “Bowden” residence (see **Figure 2**) at the end of each day or following completion of each hole. Selected sections of core would be sawn longitudinally to provide core for assay and reference material to be retained on site.

The core saw used to cut diamond core would continue to be positioned on the southern end of the sample storage shed. The saw would be positioned inside a confined shed to reduce potential for noise impacts. All cuttings and fluids are captured by a primary drum and excess water drained to a small lined sump and allowed to evaporate. All cuttings are stored in drums for disposal, in the manner discussed in Section 3.5.4.

### **3.2.5 Exploration Equipment**

The proposed exploration activities would involve the use of the following additional mobile equipment/vehicles (or similar).

#### **Drill Rig**

- 1 or 2 x UDR650 track mounted drill rigs or similar.

#### **Drill Support Equipment/Vehicles (additional to Stage 2 exploration activities)**

- 2 x Toyota Land Cruiser diesel tray backs or similar.
- 1 x (8 x 8) MAN truck or similar.
- 1 x (4 x 4) Mercedes truck with 10 000L water tank or similar.
- 1 x (4 x 4) Mercedes support truck (incl. booster, auxiliary and fuel) or similar.

In addition, the following equipment current in use for the Stage 2 exploration activities would also be used for the Gumarooka exploration activities.

#### **Earthmoving Equipment**

- 1 x 2007 Kolbelco SK2008 excavator (and rock hammer) or similar.
- 1 x 2002 Komatsu D65E6 tracked tractor or similar.
- 1 x 1995 Komatsu WA420 loader or similar.
- 1 x 1990 Ford LTL 9000 tip truck or similar.
- 1 x 1980 12G Caterpillar grader (occasional use) or similar.

#### **Transport Vehicles**

- 4 x Toyota Land Cruiser diesel tray backs.
- 1 x Great Wall petrol single cab utility
- 1 x Toyota Land Cruiser diesel station wagon.

### 3.2.6 Hours of Operation and Program Timeline

Drilling and related activities would be undertaken between the hours of 7:00am and 7:00pm Monday to Sunday, consistent with the Stage 2 Exploration Program. It would remain the Company's practice to aim to complete all drilling before 6:00pm on Monday to Saturday with the provision of the time between 6:00pm and 7:00pm as a buffer to conclude activities, if necessary. Maintenance activities would continue to be undertaken principally during Saturday afternoons and Sundays.

It is expected that approximately 100m to 150m of RC drilling could be completed each day. Therefore, typically one or two RC drill holes could be completed each day. For diamond drilling, an estimated 50m could be completed each day requiring between 5 and 8 days to complete each hole.

The Company anticipates that the proposed Gumarooka exploration activities would be undertaken in two phases, with the number of holes drilled during the second phase dependent on the results of the first phase. Phase 1 drilling is scheduled to start during April or May 2017, with Phase 2 expected to commence in late 2017.

### 3.2.7 Exploration Personnel

Anticipated exploration personnel requirements during drilling campaigns is summarised in **Table 7**. In total, there would typically be up to 18 full-time and 7 part-time exploration personnel on site at any one time, an increase of 4 fulltime personnel.

**Table 7**  
**Anticipated Exploration Personnel**

Personnel	Stage 2 Exploration		Additional Gumarooka Exploration Personnel	
	Full Time	Part Time	Full Time	Part Time
Caretaker	1	-	-	-
Field assistant	6	-	-	2
Field geologist	2	-	1	-
Senior geologist	-	1	-	-
Field supervisor	-	1	-	-
Driller	2	-	1	-
Drill offsider	3	-	2	-
Drilling supervisor	-	1	-	-
Plant operator	-	2	-	-
<b>Total</b>	<b>14</b>	<b>5</b>	<b>4</b>	<b>2</b>
Source: Bowdens Silver Pty Limited				

The exploration personnel would be supported by the Company's Community Liaison Officer and periodically by other Company personnel and visiting consultants.



### **3.2.8 Ancillary Activities**

As for the Stage 2 Exploration Program, the drilling contractor would utilise the existing facilities at the “Bowden” residence<sup>1</sup>. Existing facilities at the “Bowden” residence include:

- sleeping quarters (sufficient for 7 people);
- ablutions facilities, including showers and septic toilets;
- cooking facilities;
- offices;
- core sawing and sample storage; and
- a workshop.

Additional “overflow” accommodation would be sought from surrounding suppliers, including potentially in Mudgee Lue or Rylstone.

Equipment servicing, fuel storage and sample storage would occur at the workshop. Potable water supply would also be supplied from rainwater tanks at the “Bowden” residence and would be topped up as required via water tanker.

### **3.2.9 Decommissioning and Rehabilitation**

Rehabilitation of areas disturbed during the drilling programs would be undertaken in the following three stages.

#### **1. Following Construction Works**

Following construction works for access tracks and each drill pad, all constructed embankments created adjacent to tracks or drill pads would either be rock armoured or covered with fresh topsoil and allowed to revegetate naturally. If necessary, the placed soil would be seeded with a suitable seed mix to facilitate stabilisation of the placed topsoil. Silt-stop fencing would be positioned downslope from all constructed embankments until they are adequately stabilised. Appropriate drainage controls, if required, would be constructed to protect disturbed areas. The rehabilitation works undertaken would be consistent with the measures outlined within the WESCMP (see **Appendix 3**).

#### **2. Following Completion of Drilling**

Once all drilling activities are completed on each drill pad, the need for temporary rehabilitation would be reviewed on and adjacent to each pad and the access track to the drill pad. The key factor influencing the decision whether temporary rehabilitation is undertaken would centre on the likelihood of natural revegetation or excess sediment loss until the drill pad or pad(s) are either permanently rehabilitated or incorporated within an approved mine. For those drill pads and access tracks where excess sediment loss is likely, those areas would either be lightly scarified and seeded with a suitable seed mix to stabilise the soil or rock armoured.

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<sup>1</sup> Exploration personnel will include local contractors which do not require on-site lodging.

### 3. Long Term Rehabilitation

In the event that the proposed mine does not receive approval or within a period of 2 years after the exploration activities conclude (whichever occurs later), the Company would undertake a program of final rehabilitation to provide for a stable long term landform in those areas disturbed by exploration.

Long term rehabilitation would involve the following component activities.

- i) Re-shaping the drill pads to remove their geometric shape and creating slopes comparable with those natural slopes around the pads.
- ii) Replacing topsoil set aside during pad construction onto the final landform.
- iii) Installation of any required surface water management structures to protect the disturbed area, including silt-stop fencing.
- iv) Spreading of any cleared vegetation.
- v) Revegetation of the entire disturbed area with a native or pasture seed mix, if necessary.

All revegetated areas would be inspected at least every 6 months for a period of up to 2 years and following any substantial storm events to identify whether there is a need for any maintenance activities.

All PVC drill collars would be retained as long as the holes are required to be open and available for further tests or groundwater monitoring. In the unlikely event the mine does not proceed, and the exploration licence is relinquished, the drill collars would be cut to a level approximately 1m below the ground surface and a metal plate positioned on the hole before the hole is backfilled to ground level.

### 3.3 STAKEHOLDER CONSULTATION

The Company has reviewed the *Exploration Code of Practice: Community Consultation* dated March 2016 and assigned the Activity Impact Assessment scores as outlined within the guideline (see **Table 8**).

In summary, with a Consultation Assessment Score of 19, the consultation category is classified as “Medium Impact” for which the *Exploration Code of Practice: Community Consultation* defines the following relevant stakeholders.

- |  |  |
|--|--|
| • Landholders and residents/tenants at the site of the activity. | • Local government.  |
| • Native title holders or claimants.                             | • Landholders, residents and businesses within 5km <sup>2</sup> of the operational area. |
| • Relevant local community and environment groups.               | • Local Aboriginal Land Council.   |
|  | • NSW Government local Member of Parliament.   |

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<sup>2</sup> This consultation with the wider community would be undertaken through an advertisement in the Mudgee Guardian and communications through the Community Liaison Group.

**Table 8**  
**Activity Impact Assessment Scoring for Consultation**

Assessment Component	Level of Impact	Score
Level of community interest	Medium – Intermediate level of interest with locally known community members and groups.	8
Activity type	High – The proposed activities do not meet the common exploration activities criteria as defined by <i>ESG5: Assessment Requirements for Exploration Activities</i> (DRE, 2015).	8
Population Density	Medium – Intermediately populated <sup>3</sup> .	1
Location – dwellings	Low – Less than 100 dwellings within 2km.	0
Location – sensitive receivers (excluding dwellings)	Low – No other sensitive receivers (e.g. school, church, etc.) known within 2km.	0
Cumulative impact	Low – No other mining or extractive industry projects known within 5km.	0
Temporal impact	High – Activity will occur for more than 12 months.	2
<b>Consultation Assessment Score</b>		<b>19</b>

In accordance with the requirements of *Exploration Code of Practice: Community Consultation* and *Condition 34* of EL 5920, the Company has / would undertake the following consultation prior to commencing exploration activities.

- Landowners within the Gumarooka Exploration Area – the Company is negotiating an access agreement with the only non-company related freehold landowner within the Gumarooka Exploration Area (see **Figure 2**). The landowner will be informed about the planned drilling activities on their land in accordance with the terms of any agreement reached. In the event that an agreement cannot be reached, exploration activities would not be undertaken on that land.
- Surrounding Landowners – All landowners and occupants within a 2km radius of the Gumarooka Exploration Area (see **Figure 10**) will be notified to give them an overview of the planned activities for the Gumarooka Exploration Program. It is planned to contact all adjoining landowners and occupants personally and the remaining landowners and occupants through a newsletter, Company website update or advertisement in the Mudgee Guardian to notify them of the commencement of the Gumarooka drilling activities.
- Wider Community / Non-residential Stakeholders – The wider community and non-residential stakeholders will be advised of the Gumarooka Exploration Program by a personalised mail out and an update on the Company website. The Company has also employed a Community Liaison Officer who is a resident in the district. Contact details of the Community Liaison Officer will be distributed with the mailout and are available on the company website.

<sup>3</sup> Mid-Western Regional (A) Statistical Local Area – Population 18 977 (ABS, 2011).



- Community Consultation Committee – the Company has established an Exploration Community Consultation Committee (CCC) comprising an independent chair, and representatives from the Lue community, Mid-Western Regional Council, Mudgee, Kandos, Rylstone and the Company. The CCC is designed to be the primary formal focus of information exchange between community members and the Company.
- Local Indigenous Communities – Contact with Aboriginal stakeholder groups was previously managed through the consulting archaeologist conducting the Aboriginal Cultural Heritage assessment for the Bowdens Silver Project. All identified artefacts which could be disturbed by exploration activities have also previously been recovered. The Managing Director of Bowdens Silver has been in contact with all Local Indigenous communities and would remain a point of contact. The Community Liaison Officer has contacted all registered Indigenous stakeholder groups and provided contact information. The Company has established relationships with the Murong Gialinga and Buudang Aboriginal stakeholder groups.
- Native Title – Native Title has been extinguished on all lands within the Gumarooka Exploration Area. However, consultation with relevant Native Title Claimants for the area has been undertaken as part of the consultation with all local Indigenous communities.
- Mid-Western Regional Council – Council has been briefed regarding the planning for the proposed Gumarooka Exploration Program.
- Local Members – The offices of the NSW local members for the Upper Hunter, Michael Johnsen, and NSW local member for Dubbo, Troy Grant will be informed of the proposed Gumarooka Exploration Program.
- Division of Resources and Energy – Discussions have been held with DRE officers regarding the planning for the proposed Gumarooka Exploration Program and the required approach to the REF preparation.

### 3.4 ACCESS ARRANGEMENTS

In accordance with requirements of the *NSW Mining Act 1992*, the *NSW Mining Amendment Act 2008* and the *Mining and Petroleum Legislation Amendment (Land Access) Act 2010*, the Company is negotiating a written access agreement with the owner of Lot 1, DP1118167 (**Figure 2**). Those negotiations are ongoing and no exploration would be undertaken on that land without a signed agreement.

The key commitments that the Company has made in other access agreements are as follows.

- The Company will compensate the landowner for exploration disturbances carried out on the property, as stipulated in the signed access agreement.

- The Company will repair, re-instate, rehabilitate, make good or pay compensation in respect of any damage to fences, gates, buildings, crops, stock, dams, and other improvements, arising from its exploration activities.
- The Company will consult the landowner prior to commencing any drilling program so as to minimise any interference with the landowner's farming or other activities.
- The Company will notify the landowner within 14 (fourteen) days of completion of each identifiable phase of work.
- The Company will ensure adequate public liability cover is maintained by itself or its contractors to satisfy all eventualities including drilling areas, workings and sumps.

### **3.5 MITIGATION STRATEGY**

#### **3.5.1 Water Management Strategy**

The Company would implement the following strategies to ensure compliance with the requirements of the *Water Management Act 2000*.

- Identify all areas of waterfront land, as defined under the *Water Management Act 2000*, namely land within 40m of the top bank of a watercourse (see **Figure 9**), would be identified as a Controlled Area or sensitive land and the management measures as identified in the WESCMP (**Appendix 3**) would be implemented.
- Cement the porous section of any holes that intersect more than one aquifer to ensure no cross contamination of aquifers.
- Following the completion of exploration drilling activities, casing would be securely capped as further testing may need to be undertaken.

The Company would also implement the following strategies to ensure that the potential risk of contamination of water is minimised and activities are compliant with those requirements of the *Protection of the Environment Operations Act 1997*.

- Use lined drilling sumps for diamond core drill holes to ensure no seepage of drilling fluids. Two connected sumps, each providing approximately 9 000L storage, would be utilised to provide a settling sump and return water sump allowing effective recirculation of water.
- Use existing tracks and avoiding the creation of additional watercourse crossings, wherever possible.
- Construct, where practicable, drill sites in a manner that would divert clean water away from the drill site and would retain potentially contaminated or sediment-laden water within the drill site.

- Construct surface water structures, where required, including silt-stop fences, to limit the transport of suspended sediment from disturbed areas.
- Line the underside of drill rigs with plastic and / or hessian to collect any spilt hydrocarbons.
- Store all hydrocarbons and other chemicals in bunded containers or on a bunded pallet / tray on the support vehicles.
- Maintain hydrocarbon spill kits at all active drill sites.

### 3.5.2 Produced Water Management Strategy

It is expected that water would be produced during drilling, principally for RC drill holes, and would be managed as follows.

- Produced water generated from RC drill holes would be contained in a sump excavated within the drill pad (to provide approximately 9 000L capacity). As no drilling fluids are utilised for RC drilling, no lining of the sump would be required.
- The level of water in each sump would be kept at least 200mm below the lowest edge of the sump. In the event that excess volumes of water are encountered and cannot be managed within the sump, drilling would cease until either an additional sump is constructed or stored water is pumped into the 10 000L water truck for irrigation on internal tracks to aid in dust suppression. In order to ensure irrigated water does not result in surface water pollution, water would not be irrigated within 40m of a watercourse or during wet conditions.
- Should artesian conditions be encountered, which is considered unlikely, drilling would cease and the hole would be grouted.

Given the relatively small volumes of produced water that is expected, i.e. 5 000L per RC drill hole for a total of 0.25ML, management of the produced water in this manner is considered to be an acceptable approach.

### 3.5.3 Hydraulic Fracturing (Well Stimulation)

This section does not apply to proposed mineral exploration activities.

### 3.5.4 Waste and Chemical Management Strategy

**Table 9** presents the hydrocarbons and chemicals that the drilling contractor would be likely to use during drilling operations. These would be stored in bunded containers / trays / storage units or, in the case of bulk diesel, within the self-bunded mobile fuel tanker.



**Table 9**  
**Indicative Drilling Chemicals**

Product	Use	Hazardous	Biodegradable
Cement	To cement drill casings.	No	No
ZN50	Lubrication of Pipe threads.	No	No
Rod Grease	Lubrication of drilling rods.	No	NA
EP Bit Lube	Lubrication of drill rods.	No	Yes
DD5000	Lubrication of drill rods.	No	Yes
Tuff CRP	Flocculation agent added to drill sumps.	No	NA
Tuff Foam Ultra	Foaming agent used for stabilising drill collars.	No	Yes
Tuff Gel Extra	Used in drilling fluids and cement slurries for drill casings.	Yes	NA
Tuff Pac R	Used for hole stabilisation	No	NA
Tuff Plug B	Polyurethane foam polyol blend	Yes	Yes
Tuff Pol	Drilling fluid additive	No	NA
Tuff Set	High strength gypsum cement, formulated to set as a strong plug in various set times	No	NA
Note: Equivalent products with different names, may be used			
Source: Bowdens Silver Pty Limited			

**Table 10** identifies the waste management strategy that would be implemented during the exploration program.

**Table 10**  
**Waste Management Strategy**

Page 1 of 2

Waste Type	Storage	Estimated Volume	Removal
General waste (including food scraps and used sample bags).	A small bin would be located within the general area of the drilling site footprint for the collection of general wastes.  Used and empty sample bags would be collected in other used sample bags.	60 litre bin per day during drilling campaigns.	The bin would be taken off site for disposal at an appropriately licenced facility.  Sample bags would be removed following completion of required sample analysis.
Waste oils and greases.	Placed within bunded storage container within the drilling site footprint.	Approximately 1L to 30L per week depending on holes drilled <sup>1</sup> .	Wastes would be collected as required during drilling and transported to an appropriately licensed facility for recycling or reuse.
Reagent and Chemical Containers.	All containers would be stored in a bunded area.	Up to 10 containers per week depending on the type of holes drilled.	Empty containers would be removed following the completion of drilling activities and either returned to the supplier or disposed of at a licenced facility.
Sump waste (liquid component).	Within excavated and lined drill sumps and/or above ground tanks.	Variable. Likely 5 000L per RC drill hole and negligible for DD holes.	If required, irrigated to internal access tracks for dust suppression.

**Table 10 (Cont'd)**  
**Waste Management Strategy**

Page 2 of 2

Waste Type	Storage	Estimated Volume	Removal
Sump waste (solid component).	Within excavated and lined drill sumps and / or above ground tanks.	Variable.	Allowed to dry out and, if no additives have been used, buried within an in-ground sump or placed down the drill hole. If considered 'contaminated', sediments and residues from drilling would either be remediated on site or removed for off-site disposal at an appropriately licenced facility.
Sump liners and any hydrocarbon contaminated plastic or hessian.	Rolled up tightly to minimise rain collection	Variable. Approximately 60m <sup>2</sup> of plastic liner per DD hole.	Removed for off-site disposal at an appropriately licenced facility.
Note 1: Equipment servicing would principally be undertaken off site. As a result, the anticipated amount of waste oil and grease is likely to be very limited			
Source: Bowdens Silver Pty Limited			

The Company would implement the following general mitigation strategies to manage the risk of contamination or inappropriate chemical or waste management.

- Ensure all equipment and containers/drums used are regularly inspected and maintained, including scheduled replacement of hydraulic hoses to minimise the risk of hydrocarbon spills.
- Place appropriate plastic liners, hessian or other absorbent materials in areas of potential hydrocarbon and chemical leaks or spills, including drill rigs and pumps.
- Ensure that all exploration personnel, including contractors, are trained and aware of the procedures and requirements of hydrocarbon and chemical materials management prior to the exploration program commencing.
- Ensure that all exploration personnel, including contractors, are trained and aware of waste storage and disposal requirements.

All of the above mitigation strategies will be the subject of internal audits conducted throughout the Gumarooka exploration activities.

### 3.5.5 Noise Management Strategy

The following mitigation measures would be implemented in order to manage the risk of adverse noise-related impacts.

- Consultation with the surrounding residents regarding noise-related impacts prior to and during periods when drilling operations are planned and underway.
- Strict enforcement of the hours of operation.
- Use noise mitigated drilling and other equipment, such as silenced generators and compressors and rubber mallets instead of metal hammers where possible.

- Where practicable, drilling rigs will be orientated to enable the side of the rig with the quietest sound power level usually to be directed towards the closest residence.
- Education and training of drillers and other on-site personnel in quiet work methods and locations of nearby residents.

In the event that a noise complaint is received, it would be promptly responded to and, if necessary, additional mitigation measures implemented, e.g. use of temporary noise barriers such as hay bales.

The Company's Environmental Officer will regularly monitor noise levels both qualitatively and quantitatively to ensure that the relevant criteria are being satisfied and/or potentially affected residents consulted.

### **3.5.6 Air Quality Management Strategy**

The following mitigation measures would be implemented in order to reduce potential dust emissions.

- Minimise surface disturbance to that required for the safe access, safe operation of drilling equipment and installation of necessary environmental management controls.
- Use a cyclone dust extraction system on RC drill rigs.
- Enforce a 40km/h speed limit at which all Company personnel and contractors travel on unsealed roads accessing the "Bowden" property and within the Gumarooka Exploration Area in order to minimise wheel generated dust.
- Covering (or removal if required) of drilling residues once dried.

### **3.5.7 Bush Fire Management Strategy**

The Company would implement the following management strategies to manage the risk of bush fire, in consultation with the Lue Rural Fire Service, as required.

- Maintain and operate machinery in a manner that would minimise the potential to start a fire. This would include ensuring spark-free exhausts are fitted and all fuel, electrical and braking systems are maintained in good order.
- Permit smoking only within designated, cleared areas.
- Ensure appropriate fire extinguishers and other firefighting equipment is fitted on all Company vehicles operating within the Gumarooka Exploration Area to manage any fire-related incidents associated with the proposed exploration activities.
- Ensure all employees are aware of fire risk and mitigation, and company representatives are trained in the proper use of firefighting equipment.
- Monitor and comply with the daily bush fire hazard category.



- Modify on-site activities during high fire danger periods (in accordance with hazard category notifications).
- Prepare an evacuation plan in the event of bush fire.

### 3.5.8 Aboriginal Cultural and Historic Heritage

The Company would implement the following mitigation measures to ensure that objects of Aboriginal heritage significance are protected and that it complies with its obligations under the *National Parks and Wildlife Act 1974*.

- Ensure that surface disturbance is limited to the proposed Gumarooka Exploration Area.
- Undertake an assessment of all drill sites that have not been the subject of a formal heritage assessment for the application for development consent in accordance with the *NSW Minerals Industry Due Diligence Code of Practice for the Protection of Aboriginal Objects*.
- Ensure that all personnel are aware of the location of the known Aboriginal objects and their obligations under the *National Parks and Wildlife Act 1974* to protect Aboriginal objects.
- Ensure that in the event that an object of suspected Aboriginal heritage significance is identified during the proposed exploration activities, that the site is protected and the advice of the Office of Environment and Heritage is sought.

### 3.5.9 Ecological Management Strategy

The following general ecological management measures would be implemented.

- Wherever possible, existing access tracks and cleared areas would be utilised.
- Where additional access tracks are required, these would be selected to, wherever practicable, avoid the need to clear vegetation, particularly mature trees.
- Any cleared vegetation would be utilised within the rehabilitation process to minimise the loss of habitat resources.
- All vehicles, machinery and equipment would be inspected and cleaned prior to arriving on site to prevent the spread of weed species.
- Prior to clearing of any mature trees, a pre-clearance inspection would be completed and recorded to determine if any threatened species are nesting within the tree or if hollow-bearing fauna are present. In the event fauna are utilising hollows or threatened species are present, the tree would be retained and levelling works completed with a 2m to 5m setback from the base of the tree. If the tree cannot be retained, the tree would be marked and surrounding vegetation cleared several days prior to the removal of the marked tree.

In addition to these measures, given that the mapped vegetation community boundaries are indicative (having been interpreted from survey quadrats and aerial photography), drill sites located in close proximity to the boundary of the identified EEC would be inspected and recorded prior to any ground disturbance in those areas. In the event that the area is confirmed to be EEC, the Company would determine if the drill site can be relocated a short distance in order to avoid the EEC.

### **3.6 JUSTIFICATION OF ACTIVITY AND ANALYSIS OF ALTERNATIVES**

#### **3.6.1 Justification of the Activity**

##### **3.6.1.1 Introduction**

Sustainable practices by industry, all levels of government and the community are recognised to be important for the future prosperity and well-being of the world.

Throughout the planning of the proposed Gumarooka exploration activities, the Company has endeavoured to address each of the principles of Ecologically Sustainable Development. Section 3.2 describes the proposed activities in detail, while the following sub-sections draw together the features of the proposed activities that reflect the four principles of sustainable development, namely:

- the precautionary principle;
- the principle of intergenerational equity;
- the principle of the conservation of biodiversity and ecological integrity; and
- the principle for the improved valuation, pricing and incentive mechanisms.

##### **3.6.1.2 Precautionary Principle**

Examples of matters relating to the precautionary principle that were considered during the planning of the exploration program are listed below.

- Utilisation of existing disturbance areas wherever possible to minimise the risk of serious or irreversible environmental damage. Further details of the impact assessment are provided in Section 4.
- An assessment of environmental impacts was undertaken to determine the implications of the proposed exploration. The consequences of the exploration activity were rated **low**.

##### **3.6.1.3 Intergenerational Equity**

The Company recognises that all members of the local and surrounding community should benefit appropriately from the activity either directly or indirectly. In order to ensure a realistic distribution of benefits, the Company would continue to consult with the local community and

maintain a pro-active approach to issues of interest. This dialogue would also include a system to record, manage and respond to any complaints relating to the Gumarooka Exploration Program.

In terms of Aboriginal heritage, intergenerational equity has been considered in terms of the cumulative impacts to Aboriginal objects and places in a region. Given that no additional disturbance to the defined Aboriginal sites would occur, the impact of the proposed activity is assessed to be **low**.

#### **3.6.1.4 Conservation of Biological Diversity and Ecological Integrity**

The Company is committed to undertake all activities in an environmentally responsible manner, and recognises the need to ensure that changes to natural components of the environment do not adversely affect biological diversity or ecological integrity. As such, the activity has been designed to minimise impacts on the flora and fauna by using a number of mitigation measures, avoidance of large mature trees and the re-use of cleared vegetation during rehabilitation activities to enhance natural regrowth while providing habitat for fauna species.

#### **3.6.1.5 Improved Valuation and Pricing of Environmental Resources**

The principles of this strategy would be applied to all exploration activities including the recycling of materials during drilling, segregation of waste materials and the disposal at designated waste facility at the cost of the Company.

#### **3.6.1.6 Conclusion**

The proposed exploration activities are essential to provide sufficient geological confidence in the resource and information on the metallurgical characterisation of the mineralisation, an application to the NSW Government to support an application to develop a mine within the area centred on the Gumarooka Exploration Area. Given that the anticipated residual environmental impacts of the proposed exploration activities would be limited to minor short-term impacts and that no long-term impacts are anticipated as a result, it is considered that the proposed activities are justified.

### **3.6.2 Analysis of Feasible Alternatives**

In consideration of minimising impacts, the Company reviewed a number of alternatives to develop greater confidence in the resource and gather further information on the metallurgical characterisation of the mineralisation. These alternatives included:

- the use of different drilling techniques to further assess the geology at depth; and
- the placement of drill sites to minimise environmental impacts.

It was concluded that there was no other effective method of further assessing the resource and metallurgical characterisation of the mineralisation at depth other than drilling and collection of either drill core or drill cuttings.



The drill hole sites for the Gumarooka Exploration Program were selected with due consideration given to a range of environmental aspects including ecology, heritage, agricultural potential and access arrangements. It was also concluded that the selected sites would minimise any environmental and social impacts to the extent feasible whilst still targeting the mineralised area to collect the data required by the DRE.

Given the results of Stage 1 and 2 Exploration Programs and the regulatory framework for public reporting of mineral resources, the Company contends that there are no feasible alternatives to the proposed drilling program to provide sufficient geological confidence in the resource and information on the metallurgical characterisation of the mineralisation to support an application to develop of a mine.

### **3.6.3 Consequences of Not Carrying Out the Activity**

The proposed exploration activities are essential to further the progression of the Bowdens Silver Project which includes the possible eventual development of an economic mining operation. The data collected as a result of the exploration program is needed to satisfy the requirements of DRE before a mine is developed. Without completion of the proposed drilling program, future mining and associated benefits to the local community, to the State and to the Company may not eventuate.

## 4. IMPACT ASSESSMENT

### 4.1 ASSESSMENT OF PHYSICAL AND POLLUTION IMPACTS

#### 4.1.1 Air Impacts

The principal air pollutant that would be generated by the proposed Gumarooka Exploration Program is particulate matter. The potential for adverse impacts from particulate matter would be negligible given:

- the implementation of the mitigation measures outlined in Section 3.5.6; and
- the separation distance to surrounding residences, with the closest residence located approximately 1 000m south of the closest identified drill collar (Residence 10 – **Figure 10**) and approximately 500m to the south of the TSF/WSD Drilling Area (Residence 36 – **Figure 10**).

The proposed activities do not involve any venting, flaring or other significant generators of greenhouse gas. The only sources of greenhouse gas would be from burning of diesel fuel for the operation of the drill rigs and support vehicles. Given the extent and duration of the drilling program, these emissions would be minimal.

No toxic or radioactive emissions would result from the proposed activities.

As a result, air quality impacts are expected to be **negligible**.

#### 4.1.2 Water Impacts

In relation to surface water, with the implementation of the proposed management measures (see Section 3.5.1 and **Appendix 3**), including erosion and sediment controls, the proposed activities would not result in:

- the noticeable redirection of flow or changes to flow rates or volumes in local watercourses;
- any noticeable changes to the area, volume or flow rates within local watercourses;
- pollution of waters; or
- any changes to the local flood regime.

As identified in Section 3.2, the Gumarooka Exploration Area is not located within a drinking water catchment and the local community does not rely upon surface water flows from the Gumarooka Exploration Area for drinking water supply.

The irrigation of minor quantities of groundwater recovered from some drill holes to the land surface, principally unsealed internal access tracks (to aid in dust suppression), would not have any measurable impact on surface water.

As a result, surface water impacts are expected to be **negligible**.

The potential impacts to groundwater quality include the following.

- The possibility of cross contamination of aquifers (e.g. brackish or saline water being introduced to a fresh water aquifer via the drilling process).
- The possibility of contamination of the aquifers by drilling muds / fluids.
- Seepage of drilling mud, drilling additives and/or hydrocarbons (oils / lubricants, etc.) to shallow groundwater beneath the rig at exploration sites.

During the drilling of diamond exploration holes, the circulating drilling mud will establish a wall cake (low permeability “skin” around the wall of the hole) and also maintain a positive head (pressure) on the various aquifers intercepted. This will prevent both the ingress of groundwater to the hole (and any possible mixing or discharge to the surface) and also limit the ingress of drilling mud into the aquifers to the immediate vicinity of the exploration holes.

During the drilling of RC exploration holes, no drilling muds or other additives are necessary.

Based upon the experience gained during the Stage 1 and 2 Exploration Programs, no artesian pressures are anticipated and therefore the potential for pressurised groundwater reaching the surface is considered negligible.

Any minor changes in groundwater levels due to the removal of small quantities of produced water would not impact upon the few bores within 2km to 3km of the Gumarooka Exploration Area, the majority of which are situated on land owned by the Company, nor any groundwater dependent ecosystem.

With the implementation of the proposed management measures outlined in Sections 3.5.1 and 3.5.2, the potential impacts to groundwater are considered **negligible**.

#### **4.1.3 Soil and Stability Impacts**

With the implementation of the proposed erosion and sediment control measures (Section 3.5.1 and **Appendix 3**) and rehabilitation strategy (Section 3.2.9), the proposed activities would not result in:

- any contamination, salinisation or acidification of soil;
- any significant soil erosion or loss of soil structural integrity;
- any increase in land instability; or
- induced seismicity or ground movements due to fracture stimulation or injection / extraction of groundwater.

Where disturbance may lead to sedimentation, appropriate erosion and sediment controls would be installed. Previous exploration drilling activities have been successfully rehabilitated and revegetated with the same strategies proposed for this program. **Plates 5 to 8** display examples of previous rehabilitation of both drill pads and tracks.

As a result, soil and stability impacts are expected to be **negligible**.





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**Plate 5:** Rehabilitated drill pad  
(Category 4 - Woodland with slopes  $>10^\circ$ )  
(Ref: BSPL\_170816\_020)

**Plate 6:** Rehabilitated drill pad  
(Category 3 - Woodland with slopes  $<10^\circ$ )  
(Ref: BSPL\_170816\_031)



**Plate 7:** Rehabilitated track  
(Category 4 - Woodland with slopes  $>10^\circ$ )  
(Ref: BSPL\_170816\_017)

**Plate 8:** Rehabilitated drill pad  
(Category 3 - Woodland with slopes  $<10^\circ$ )  
(Ref: BSPL\_170816\_016)





#### 4.1.4 Noise and Vibration Impacts

The principal noise sources would include the following plant and corresponding  $L_{Aeq}$  sound power level (SWL).

- Site preparatory works, e.g. the use of a small bulldozer – 113dB(A).
- Drilling activities:
  - reverse circulation – 100dB(A).
  - diamond core – 88dB(A).

An evaluation of the potential noise from the operations of the bulldozer, reverse circulation and diamond core drilling operations has previously been undertaken for the Stage 1 Exploration Program by SLR Consulting under calm and adverse weather conditions. Given the similar location of the Gumarooka Exploration Program drill holes to the ‘resource area’ drilling completed as part of the Stage 1 Exploration Program, this evaluation remains appropriate for the Gumarooka Exploration Program, albeit that the drills to be used would be noticeably quieter (approximately 6dB(A)) than those used in the Stage 1 Exploration Program.

The assessment of noise impacts has been assessed as a “construction activity” in accordance with the ‘*Interim Construction Noise Guidelines*’ given the comparatively short duration of the drilling activities in areas closest to the surrounding residences. The guidelines nominate a noise management level of rating background level plus 10dB(A), i.e. 40dB(A) for activities that occur during standard hours<sup>4</sup> and plus 10dB(A), i.e. 35dB(A) outside standard hours. For much of the Gumarooka exploration program, drilling activities would be undertaken at considerably greater distances (and in topographically shielded areas) for much of the time than relied upon in the noise assessment.

**Table 11** presents the results of the noise assessment relied upon for the Stage 2 Exploration Program, with the nominated distances consistent with the minimum distance between the closest drill site and the residence nominated in that assessment. The Company contends that the assessment is conservative for the following reasons.

- The minimum distance between the proposed Gumarooka Exploration Program drill collars and the closest non-Project related residence is approximately 1 100m (**Figure 2**) compared with the minimum 730m assessed for the Stage 2 Exploration Program.
- In all cases, with one exception, a substantial ridgeline exists between the proposed Gumarooka Exploration Program drill collars and surrounding non-Project related residence. The single exception is the western-most Plines Drill collar which is located approximately 1 400m from Residence 35.
- Cumulative noise impacts are unlikely to be significant, because the concurrent Stage 2 exploration drilling activities would be located further from the closest non-Project related residences, with the Western Ridge providing substantial acoustic shielding.

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<sup>4</sup> Standard hours are 7:00am to 6:00pm Monday to Friday and 8:00am to 1:00pm Saturdays

Table 11  
Calculated Sound Pressure Levels

Distance (m)	Calm	Adverse 3m/s wind (in all directions)
<b>RC Drilling Operations</b>		
730	38	<b>43</b>
1 150	37	<b>42</b>
1 220	35	40
1 280	29	34
<b>RC Drilling &amp; Komatsu Dozer Operations</b>		
730	<b>41</b>	<b>46</b>
1 150	39	<b>44</b>
1 220	38	<b>43</b>
1 280	31	36
Bold figures exceed the 40dB(A) criterion		

In summary, a minor 1dB(A) exceedance under calm conditions would be expected at a distance of 730m. However, with increasing distance, actual noise levels at surrounding non-Project related residences would be expected to be substantially lower. As a result no exceedances of the identified criteria are anticipated under calm conditions.

Under adverse conditions, namely gentle source-to-received winds, exceedances of the relevant criteria may be experienced. However, as indicated in **Figure 3**, winds in the vicinity of the Gumarooka Exploration Area are strongly topographically controlled. As a result and taking into account intervening ridgelines, these conditions are not anticipated to occur regularly.

It is concluded, based upon the above and the experience gained during the Stage 1 and 2 Exploration Programs that surrounding residents may be aware of the noise from the drilling operations from time to time however, the noise levels would invariably less than the relevant criterion. Notwithstanding the predicted low level of impacts, the Company would remain in regular contact with surrounding residents about the drilling operations and, wherever practicable, program drilling to reduce noise impacts for surrounding residents.

Based upon the above it is assessed that the noise impacts from the proposed preparatory activities and drilling operations would be **low adverse**.

#### 4.1.5 Other Physical or Pollution Impacts

The Company has considered other potential physical and pollution impacts and notes the following.

- Coastal Processes and Coastal Hazards.

The Gumarooka Exploration Area is not located within proximity to the coast and the proposed activities would not affect or be affected by coastal processes or coastal hazards.



- **Hazardous Substances or Chemicals.**  
The likely drilling chemicals that may be utilised are outlined in Section 3.5.4. These chemicals would be stored and transported in accordance with the relevant Material Safety Data Sheets and are commonly used within exploration drilling without resulting in pollution of the environment.
- **Generation and Disposal of Waste.**  
Section 3.5.4 outlines the likely wastes to be generated, expected volumes and disposal methods. The wastes that would be generated are typical of exploration drilling and would be collected, stored and disposed of in accordance with relevant policies and guidelines and records will be kept.

The potential impacts upon other physical parameters are considered to be **negligible**.

## **4.2 ASSESSMENT OF BIOLOGICAL IMPACTS**

The disturbance to ecological values from the proposed Gumarooka Exploration Program can be classified into the following categories.

### **Category 1 – Open areas <10° requiring no levelling (Plate 9)**

No clearing of trees or shrubs would be required in Category 1 areas. Some trimming of branches of nearby large trees may be necessary (for safety reasons) or moving of fallen timber by hand may be required. Small shrubs would be driven over, if required, preserving the root stock to facilitate later regrowth. Existing slopes are less than 10° and therefore require no levelling other than potentially minor earthworks with soil stripping limited to the area directly around the drill collar and to adjust any minor undulations. Above-ground sumps would be utilised within the EEC and in-ground sumps beyond the EEC. The estimated disturbance per Category 1 drill site is 20m<sup>2</sup> (within the EEC) and 50m<sup>2</sup> (beyond the EEC).

### **Category 2 – Open areas >10° requiring levelling (Plate 10)**

No clearing of mature trees is required in Category 2 areas, however, due to slopes exceeding 10° disturbance of any shrubs and groundcover is required in order to construct each drill pad. Soil (incorporating shrubs and groundcover) would be stripped, stockpiled and respread over disturbed areas during rehabilitation. The site would be assessed to determine appropriate sump usage (above or inground sump). Above ground sumps will be utilised where possible in EEC. The maximum area of disturbance at each Category 2 drill site would be 400m<sup>2</sup> with an average of 300m<sup>2</sup>.

### **Category 3 – Woodland Areas <10° requiring clearing (Plate 11)**

Category 3 areas are located in woodland areas which will require removal of trees within the drill pad area. However, as far as practicable, no standing trees with a diameter at breast height of greater than 20cm would be removed, with the shape and orientation of the drill pad adjusted, if possible, to avoid these trees. The removed vegetation would be pushed to one side and then pushed back over the pad area after the pad is no longer required. Existing slopes are less than 10° and therefore require no levelling other than potentially minor earthworks with soil stripping limited to the area directly around the drill collar and to adjust any minor





undulations. The site would be assessed to determine appropriate sump usage (above or inground sump). Above ground sumps will be utilised where possible in EEC. The maximum area of clearance at each Category 3 drill site would be 400m<sup>2</sup> with an average area of disturbance of approximately 300m<sup>2</sup>. Of this area, only approximately 50m<sup>2</sup> of disturbance would involve removal of groundcover and soil material.

#### **Category 4 – Woodland areas >10° requiring clearing and levelling (Plate 12)**

Category 4 areas are located in woodland areas which require removal of trees and, due to slopes exceeding 10°, disturbance of any shrubs and groundcover in order to construct a level drill pad. As far as practicable, no standing trees with a diameter at breast height of greater than 20cm would be removed with the shape and orientation of the drill pad adjusted, if possible, to avoid these trees. Soil (incorporating shrubs and groundcover) would be stripped, stockpiled and replaced during rehabilitation. The site would be assessed to determine appropriate sump usage (above or inground sump). Above ground sumps will be utilised where possible in EEC. The maximum disturbance at each Category 4 drill site would be 400m<sup>2</sup> with an average area of disturbance of approximately 300m<sup>2</sup>.

#### **Access Tracks**

New or upgraded access tracks would be classified as either Category 2, 3 or 4 and have an average 5m width of disturbance. No access tracks would be required within Category 1 areas.

When considering potential ecological impacts, consideration has been given to the proposed disturbance located within the area of identified EEC and the area of other native vegetation.

#### **EEC Disturbance**

Of the proposed identified 35 drill holes, none are located within the EEC, with one located in close proximity to the mapped boundary of the EEC. For the purpose of this assessment, this drill hole has been assumed to as occurring within the EEC, on land with a slope of more than 10°.

As described in Section 3.2.3, a further 15 drill holes are proposed within the TSF/WSD Drill Area. The location of these drill holes is uncertain at this stage. For the purpose of this assessment each of these holes has been assumed to occur within the EEC. As these drill holes would be designed to collect geotechnical information for a potential Tailings Storage Facility or Water Storage Dam, the slopes of all drill sites would be less than 10°.

Finally, for the purposes of this assessment approximately 50% of the access tracks requiring vegetation removal have been assumed to be within the EEC.

In light of the above, the likely disturbance of EEC would be as follows.

- Category 3 = 15 holes totalling 4 500m<sup>2</sup> of tree clearing of which approximately 750m<sup>2</sup> would involve ground disturbance.
- Category 4 = 1 hole totalling 300m<sup>2</sup> of ground disturbance with limited clearing of mature trees.
- Approximately 400m of access tracks totalling 2 000m<sup>2</sup> of ground disturbance with limited clearing of mature trees.



Total disturbance within the EEC would be approximately 0.68ha, of which only 0.1ha would require groundcover disturbance with limited clearing of mature trees. This purposeful selection of drill location to avoid disturbance to the EEC and, where avoidance is not possible, minimisation of tree clearing, would result in minimal impact to the EEC in the short term and negligible impacts following completion of rehabilitation.

### Other Native Vegetation Disturbance

As indicated previously, of the 35 identified drill holes, one has been assumed to be located within EEC, with the remaining 34 located within areas of non threatened native vegetation.

- Category 3 = 16 holes totalling 4 800m<sup>2</sup> of tree clearing of which approximately 800m<sup>2</sup> would involve ground disturbance.
- Category 4 = 16 holes totalling 4 800m<sup>2</sup> of ground disturbance with limited clearing of mature trees.
- Approximately 400m of internal access tracks totalling 1 600m<sup>2</sup> of ground disturbance with limited clearing of mature trees.

Total disturbance within native vegetation would be approximately 1.12ha, of which only 0.72ha would be groundcover disturbance with limited clearing of mature trees. In summary, whilst short-term impacts are expected as a result of clearing of groundcover and a limited amount of shrubs and trees, with the implementation of the proposed management measures, including pre-clearance inspections, the overall biological impacts are considered to be **low adverse**.

## 4.3 ASSESSMENT OF RESOURCE USE IMPACTS

### 4.3.1 Community Resources

The proposed activities would result in direct employment by the Company of approximately 3 persons on a full-time basis. Employees would be either locally based or accommodated within quarters at the “Bowden” residence. No additional facilities would need to be constructed.

The proposed activities would also require a limited use of community services with consumables and maintenance relying upon existing drilling and civil contractors. The proposed activities would also not generate significant volumes of waste, all of which could be readily accommodated by existing waste facilities within the Mid-Western Regional Local Government Area.

Given the above, it is expected that the proposed activity would not result in the degradation of or a significant increase in demand for services and infrastructure resources to the local or broader community. Therefore impacts on community resources would be **negligible**.

### 4.3.2 Natural Resources

The proposed activities would not significantly deplete natural resources with water and soils being protected and clearing of vegetation minimised as far as practicable.

The drilling program itself would not deplete natural resources. Rather it would better define important minerals for future beneficial exploitation.

Therefore, as the proposed activities would not significantly disrupt, deplete or destroy natural resources, the impact would be **negligible**.

#### **4.4 ASSESSMENT OF COMMUNITY IMPACTS**

##### **4.4.1 Social Impacts**

Given the small workforce and relatively short-term nature of the activities, potential impacts upon the demographic structure of the community would not be significant. It is also considered that the environmental impacts would not cause any substantial change or distribution to the community, loss of facilities or loss of community identity. As a result, social impacts would be **negligible**.

##### **4.4.2 Economic Impacts**

Given the employment of 3 full-time persons for a limited period, it is expected that there would be a **positive** economic impact from the wages paid, purchase of consumables, payment of accommodation, fuel and food etc.

Local contractors would be engaged to prepare drill sites and conduct rehabilitation activities following completion of the program. If available, all drilling consumables would also be sourced through local supplies.

The improved definition of the ore body for the Bowdens Silver Project would underpin the substantial economic benefits that would accrue from the development of a mine centred on the defined resource.

No adverse economic impacts are anticipated from the Gumarooka exploration activities.

##### **4.4.3 Heritage Impacts**

With the implementation of the mitigation measures outlined in Section 3.5.8, the identified historic heritage sites would be protected. Therefore, the potential historic heritage impacts are also considered **negligible**.

##### **4.4.4 Aesthetic Impacts**

The proposed activities do not involve any venting or flaring of gas and, with the implementation of the proposed air quality measures, would not result in significant visible dust generation.

Whilst the proposed activities would not be visible from the village of Lue or from Lue Road, some motorists travelling on local roads would periodically observe the drilling activities when

these are activities in progress close to the public road network. It is also likely that some residents would periodically observe drilling activities from neighbouring properties. However, as the activities at each drill site would invariably be short-lived, night time operations are not proposed and the intervening topography and vegetation would largely shield or obscure the activities, the impacts would be **negligible**.

#### **4.4.5 Cultural Heritage Impacts**

The proposed activities would not result in any additional disturbance to known Aboriginal objects. Additionally, the mitigation strategies outlined in Section 3.5.8 would ensure that currently unidentified Aboriginal objects are protected. With the implementation of these measures, the potential Aboriginal heritage impacts are considered negligible.

#### **4.4.6 Land Use Impacts**

The Company has consulted with the owner of surrounding properties regarding potential disruption of current land uses and has determined that the proposed activities would not result in any major changes to land use or significant curtailment of the uses of the property during the Gumarooka Exploration Program. The proposed activities would also not result in any significant impact upon property values with land use implications.

No land within or adjoining the Gumarooka Exploration Area is identified as Strategic Agricultural Land and no agricultural activities would be impacted.

Therefore, potential land use impacts are considered negligible.

#### **4.4.7 Transportation Impacts**

The exploration program would generate approximately up to eight vehicle movements per day, Monday to Saturday within the Gumarooka Exploration Area through the use of one to two light vehicles for personnel transport and the use of associated drilling equipment. Reduced vehicle movements would occur on Sundays, when maintenance activities are undertaken. The water truck used on site and occasional delivery vehicles would periodically travel on the public roads approaching and within the Gumarooka Exploration Area.

Whilst the increased level of traffic activity would be noticeable, given the low volume of existing traffic and low volumes that would be generated by the proposed activities, transportation impacts are expected to be negligible.

### **4.5 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE – EPBC ACT**

The ESG2 Guideline requires the Company to establish whether the proposed activity is likely to impact on matters of national environmental significance under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999*.



Two Matters of National Environmental Significance have been recorded within the Gumarooka Exploration Area, namely: White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland listed as a Critically Endangered Ecological Community (CEC); and the Large-eared Pied Bat listed as Vulnerable.

Total ground disturbance within the CEC would be approximately 0.68ha. Of this, approximately 0.1ha would include clearing of trees and shrubs. It is considered that the proposed activities are very unlikely to have any significant impact upon the CEC given the following.

- The proposed return of stripped soil material which would result in re-establishment of the native groundcover in the short term.
- The overall very minor extent (0.1ha) and nature of impact to the CEC compared to the preliminary mapping of approximately 525ha of CEC within and surrounding the Gumarooka Exploration Area.

The Large-eared Pied Bat is found in well-timbered areas containing gullies and probably forages for small, flying insects below the forest canopy (OEH Threatened Species Profile). The total disturbance from the proposed activities is approximately 1.8ha of which 0.82ha would involve ground disturbance. This represents a negligible proportion of the available foraging habitat available within the surrounding area.

The Large-eared Pied Bat roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (OEH Threatened Species Profile). None of these features would be disturbed by the proposed activities. Additionally, removal of mature trees would be avoided wherever possible. In any event, any mature trees that need to be removed would be inspected for any nesting / roosting fauna prior to clearing. As a result, no significant impact to the roosting habitat of the Large-eared Pied Bat is anticipated.

Therefore, it is considered that the proposed Gumarooka exploration activities are unlikely to have any significant impact upon the Large-eared Pied Bat.

#### **4.6 ASSESSMENT OF CUMULATIVE IMPACTS**

No other non-Company-related existing or proposed activities that could result in cumulative impacts with the proposed activities are known within the vicinity of the Gumarooka Exploration Area. It is noted that Authority 286, held by the Secretary of the NSW Department of Industry, Skills & Regional Development for Group 9 resources (i.e. coal), overlaps with EL 5920. However, no activities associated with Authority 286 are known to be planned during the Gumarooka Exploration Program.

The Company would, however, undertake the approved Stage 2 Exploration Program in parallel with the proposed Gumarooka Exploration Program. In particular, proposed Gumarooka Exploration Program would result in the following additional cumulative impacts.

- An additional 1.8ha of disturbance, of which 0.82ha would involve ground disturbance. This would be additional to the approved 4.9ha of which 2.0ha would

involve ground disturbance. The additional disturbance, taking into account the area that would remain undisturbed, is considered to be negligible.

- An additional one or two drill rigs. Given the proposed noise and air quality management measures and the distances to surrounding non-Project related residences, the cumulative impact is considered to be negligible.

As a result, cumulative impacts would be **low adverse**.

## 5. SUMMARY OF IMPACTS

**Table 12** provides a summary of the anticipated environmental impacts associated with the proposed activities and the overall ranking of potential significance. In summary, the proposed activities would have a **negligible** impact across the majority of physical, biological and community parameters. In fact, the bulk of the impacts would largely be confined within the Gumarooka Exploration Area. However, a **low adverse** ranking has been adopted given the rankings for noise and biological impacts, including as a result of cumulative impacts.



**Table 12**  
**Summary of Potential Impacts**

Page 1 of 2

Impacts	Size	Scope	Intensity	Duration	Level of Confidence in predicting impacts	Resilience of environment to cope with impacts?	Level of reversibility of impacts?	Ability to manage or mitigate impacts	Ability of the impacts to comply with standards, plans or policies?	Level of public interest	Requirement for further information on the impacts of the activity or mitigation	Ranking of potential significance
<b>Physical or Pollution Impacts</b>												
Air	Small scale	Localised	Low One drill rig operating for a limited period	Short Drilling program completed within 1 year	High	High	Impacts reversible	Effective mitigation measures available (Section 3.5.6)	Compliance almost certain	Moderate	High level of understanding and information on the impact based on prior experience on site	Negligible
Water	Small scale	Localised No significant surface water resources to be traversed and no direct discharges to surface water No sensitive aquifers, groundwater dependent ecosystems or groundwater users	Low Limited water take (<3ML/y)	Short Drilling program completed within 1 year	Moderate to High	High	Impacts reversible	Effective mitigation measures available (Sections 3.5.1 and 3.5.2)	Compliance almost certain	Low	High level of understanding and information on the impact based on prior experience on site	Negligible
Soil and Stability	Medium scale	Localised	Low Disturbance to be limited to existing disturbance as far as practicable	Short Drilling program completed within 1 year	High	High	Impacts reversible	Effective mitigation measures available (Sections 3.2 & 3.5.1)	Compliance almost certain	Low	High level of understanding and information on the impact based on prior experience on site	Negligible
Noise and Vibration	Small scale	Localised	Low One drill rig operating during day only	Short Drilling program completed within 1 year	High	High	Impacts reversible	Effective mitigation and management measures available (Section 3.5.5)	Short-term non-compliance possible with minor exceedances of criteria at nearby residences	Moderate	High level of understanding and information on the impact based on prior experience on site	Low adverse
Coastal Processes and Hazards	Issue not relevant											
Hazardous Substances and Chemicals	Small scale	Localised Drilling chemicals and hydrocarbons only	Low Small quantities stored in banded containers	Short Drilling program completed within 1 year	High	High	Impacts reversible	Effective mitigation measures available (Section 3.5.4)	Compliance almost certain	Low	High level of understanding and information on the impact based on prior experience on site	Negligible
Wastes	Small scale	Localised Wastes removed regularly	Low Small quantities of waste generated	Short Drilling program completed within 1 year and wastes removed from site regularly	High	High	Impacts reversible	Effective mitigation measures available (Section 3.5.4)	Compliance almost certain	Low	High level of understanding and information on the impact based on prior experience on site	Negligible
<b>Biological Impacts</b>												
Flora and Fauna	Small scale	Localised Total disturbance of approximately 1.8ha of which approximately 0.82ha would be ground disturbance without tree clearing	Low Limited disturbance and minimal removal of mature trees	Short Drilling program completed within 1 year	Moderate to High	High Scale of disturbance small in context of remaining habitat	High Natural vegetation likely to re-establish quickly	Effective mitigation measures available (Section 3.5.9)	Significant impacts unlikely	Low to moderate	Moderate to high understanding based on previous flora and fauna surveys. Refining of EEC/CEC boundary to be determined where drill holes located near boundary	Low adverse
Ecology	Small scale	Localised Total disturbance of approximately 1.8ha of which approximately 0.82ha would be ground disturbance without tree clearing	Low Limited disturbance and minimal removal of mature trees	Short Drilling program completed within 1 year	Moderate to High	High Scale of disturbance small in context of remaining habitat	High Natural vegetation likely to re-establish quickly	Effective mitigation measures available (Section 3.5.9)	Significant impacts unlikely	Low to moderate	Moderate to high understanding based on previous flora and fauna surveys. Refining of EEC/CEC boundary to be determined where drill holes located near boundary	Low adverse

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Table 12 (Cont'd)  
Summary of Potential Impacts

Page 2 of 2

Impacts	Size	Scope	Intensity	Duration	Level of Confidence in predicting impacts	Resilience of environment to cope with impacts?	Level of reversibility of impacts?	Ability to manage or mitigate impacts	Ability of the impacts to comply with standards, plans or policies?	Level of public interest	Requirement for further information on the impacts of the activity or mitigation	Ranking of potential significance
<b>Resource Use Impacts</b>												
Community	Small scale	Localised Proposed activity is unlikely to increase the demand for services or degrade those that are currently available	Low	Short Drilling program completed within 1 year	High	High	Impacts reversible	Effective mitigation measures available	No standards, plans or policies apply	Low	High level of understanding and information on the impact based on prior experience on site	Negligible
Natural Resources	Small scale	Localised Proposed activity is unlikely to disrupt, deplete or destroy natural resources	Low	Short Drilling program completed within 1 year	High	High	Impacts reversible	Effective mitigation measures available	No standards, plans or policies apply	Low	High level of understanding and information on the impact based on prior experience on site	Negligible
<b>Community Impacts</b>												
Social Factors	Small scale	Localised Proposed activity is unlikely to effect the demographic structure of the community or disrupt or disadvantage any particular component of the community	Low	Short Drilling program completed within 1 year	High	High	Impacts reversible	Effective mitigation measures available	No standards, plans or policies apply	Low	High level of understanding and information on the impact based on prior experience on site	Negligible
Economic Factors	Small scale	Localised Proposed activity is likely to generate economic activity and income for the community	Low	Short Drilling program completed within 1 year	High	High	Impacts reversible	Effective mitigation measures available	No standards, plans or policies apply	Low	High level of understanding and information on the impact based on prior experience on site	Positive to Negligible
Heritage Impacts	Small scale	Localised Proposed activity will not impact on items of historic heritage	Low	Short Drilling program completed within 1 year	High	High	Impacts irreversible	Effective mitigation measures available	Compliance almost certain	Low	High level of understanding and information on the impact based on prior experience on site	Negligible
Aesthetic Impacts	Small scale	Localised	Low	Short Drilling program completed within 1 year	High	High	Impacts reversible	Effective mitigation measures available	No standards, plans or policies apply	Low	High level of understanding and information on the impact based on prior experience on site	Negligible
Cultural Impacts	Small scale	Localised Proposed activity will not result in any additional disturbance to Aboriginal objects	Low	Short Drilling program completed within 1 year	High	High	Impacts irreversible	Effective mitigation measures available	Compliance almost certain	Low	High level of understanding and information on the impact based on prior experience on site	Negligible
Land Use	Small scale	Localised	Low	Short Drilling program completed within 1 year	High	High	Impacts reversible	Effective mitigation measures available	No standards, plans or policies apply	Moderate	High level of understanding and information on the impact based on prior experience on site	Negligible
Transportation	Small scale	Localised	Low	Short Drilling program completed within 1 year	High	High	Impacts reversible	Effective mitigation measures available	Compliance almost certain	Low	High level of understanding and information on the impact based on prior experience on site	Negligible
<b>Ranking of Activity as a Whole</b>												
Generally the proposed activities would have a <b>negligible</b> impact across the majority of physical and community parameters. However, a low adverse ranking has been adopted given the rankings for biological impacts which have been assessed in consideration of the total potential disturbance of 1.8ha and the potential cumulative impacts												Low Adverse



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## **6. CONCLUSIONS**

The Company contends that the proposed activities would:

- be unlikely to have a significant effect on the environment, threatened species, population, ecological communities or their habitats;
- not affect critical habitat;
- not result in permanent and adverse changes to the environment; and,
- not result in unacceptable impacts to land that is already stressed or cumulative impacts that would be unacceptable.

Furthermore, the Company contends that there is a high level of confidence in relation to the determined impacts and that the proposed activities would not, therefore, result in unacceptable impacts.

## 7. STATEMENT OF COMMITMENTS

**Table 13** provides a description of the Statement of Commitments for the proposed exploration activities.

**Table 13**  
**Statement of Commitments**

Page 1 of 4

Item	Commitment
Activity Type	Exploration activity comprising the following. <ul style="list-style-type: none"> <li>• Construction of up to 1.6km of new or upgraded access tracks.</li> <li>• Drilling of approximately 50 drill holes.</li> <li>• Construction of drill sites up to approximately 20m x 20m in size.</li> <li>• Rehabilitation of completed drill sites and access tracks.</li> </ul>
Activity Location	Within EL 5920, Lue NSW.
Activity Scope (including any ancillary activities)	Limited vegetation clearing for access and drill sites. Operation of drill rigs and ancillary support equipment. Rehabilitation of areas disturbed by the proposed activities. Operation of workshop, office and lodging facilities within Company-owned property.
Hours of Operation	7:00am to 7:00pm up to 7 days per week.
Activity Duration	Approximately 1 year.
Proposed Commencement Date	April/May 2017.
Proposed Completion Date	May 2019.
Maximum Area of Disturbance	1.8ha of additional disturbance as follows of which approximately 0.82ha would involve ground disturbance only.
Rehabilitation Commitments and Timeframes	Progressively throughout drilling program and completion of rehabilitation audit following drilling program.
<b>Management Measures</b>	
General	<ul style="list-style-type: none"> <li>• Undertake operations generally in accordance with the following. <ul style="list-style-type: none"> <li>– <i>Exploration Code of Practice: Environmental Management.</i></li> <li>– <i>Exploration Code of Practice: Produced Water Management, Storage and Transfer.</i></li> <li>– <i>Exploration Code of Practice: rehabilitation.</i></li> <li>– <i>Exploration Code of Practice: Community Consultation.</i></li> </ul> </li> </ul>
Air Quality	<ul style="list-style-type: none"> <li>• Surface disturbance to be minimised as much as practicable.</li> <li>• Dust extraction systems to be used on RC drill rigs.</li> <li>• Restriction of the speed limit which all Company personnel and contractors travel on unsealed roads.</li> <li>• Removal or covering of drilling residues once dried.</li> </ul>



**Table 13 (Cont'd)**  
**Statement of Commitments**

Page 2 of 4

Item	Commitment
<b>Management Measures (Cont'd)</b>	
Protection of Surface Water Sources	<ul style="list-style-type: none"> <li>• Erosion and sediment controls to be installed as required and in accordance with the Water, Erosion &amp; Sediment Control Management Plan.</li> <li>• Any excess water /drilling fluids encountered will be contained in the sump and/or reused on site for drilling, dust suppression or land irrigation purposes.</li> <li>• Drill residues from the RC drilling will be collected in the sump and subsequently buried.</li> <li>• Produced water to be irrigated onto internal access tracks for dust suppression. No application of produced water within 40m of a watercourse.</li> <li>• Implementation of appropriate hydrocarbon and chemical storage and handling practices.</li> </ul>
Protection of Groundwater Sources	<ul style="list-style-type: none"> <li>• The drilling sumps for the diamond drill holes will be lined with plastic.</li> <li>• In the unlikely event artesian conditions are encountered, drilling would cease and the hole would be grouted.</li> <li>• Following the completion all exploration drilling activities, each exploration drill hole casing would be securely capped in the short term as further testing may need to be undertaken.</li> </ul>
Erosion and sediment controls	<ul style="list-style-type: none"> <li>• Install sediment and erosion control measures, including silt stop fencing, in accordance with Managing Urban Stormwater.</li> <li>• Utilise existing tracks wherever possible and avoid crossing drainage lines where possible.</li> <li>• Surface disturbance to be minimised as much as practicable.</li> <li>• Site access to be restricted to defined access tracks.</li> <li>• Topsoil and subsoil from areas disturbed would be separated and replaced during rehabilitation.</li> </ul>
Noise and vibration	<ul style="list-style-type: none"> <li>• Use of noise mitigated drilling and other equipment, such as silenced generators and compressors and rubber hammers where possible.</li> <li>• Education and training of drillers and other on-site personnel in quiet work methods and locations of nearby residents.</li> <li>• Adherence to hours of operation.</li> </ul>
Use of chemicals, fuels and lubricant	<ul style="list-style-type: none"> <li>• Ensure all equipment is regularly inspected and maintained, including scheduled replacement of hydraulic hoses to minimise the risk of hydrocarbon spills.</li> <li>• Place appropriate plastic liners or other absorbent materials in areas of potential hydrocarbon leaks.</li> <li>• Ensure that all exploration personnel, including contractors, are trained and aware of the procedures and requirements of hydrocarbon and chemical materials management prior to the exploration programme commencing.</li> <li>• Ensure that all hydrocarbons and chemicals are stored in accordance with Australian Standard AS 1940-2004: <i>The Storage and Handling of Flammable and Combustible Liquids</i>.</li> </ul>
Waste	<ul style="list-style-type: none"> <li>• Ensure that all exploration personnel, including contractors, are trained and aware of waste storage and disposal requirements.</li> </ul>

**Table 13 (Cont'd)**  
**Statement of Commitments**

Page 3 of 4

Item	Commitment
<b>Management Measures (Cont'd)</b>	
Aboriginal cultural and historic heritage	<ul style="list-style-type: none"> <li>• Ensure that all identified heritage sites within the Gumarooka Exploration Area are marked on the ground using flagging tape or high visibility fencing.</li> <li>• Undertake an assessment of all drill sites that have not been the subject of a formal heritage assessment for the application for development consent in accordance with the NSW Minerals Industry Due Diligence Code of Practice for the Protection of Aboriginal Objects.</li> <li>• Ensure that all personnel involved in ground disturbance are trained in locating, identifying and avoiding Aboriginal objects and their legislative protection under the <i>National Parks and Wildlife Act 1974</i>.</li> <li>• Ensure that ground disturbing activities are contained to the proposed areas.</li> </ul>
Ecology, fauna and livestock	<ul style="list-style-type: none"> <li>• Ensure existing tracks and disturbance areas are used where possible.</li> <li>• Ensure the route of new access tracks are selected to avoid the need to clear mature trees, wherever practicable.</li> <li>• Keep clearing at drill sites to the minimum extent necessary and avoid mature trees wherever practicable.</li> <li>• If a mature tree is required to be removed, ensure a pre-clearance inspection is undertaken by an appropriately trained or qualified person.</li> <li>• Utilise any cleared vegetation within the rehabilitation process to minimise the loss of habitat resources.</li> <li>• Ensure all vehicles, machinery, equipment and work boots are inspected and cleaned prior to arriving on site to prevent the spread of weed species.</li> </ul>
Weeds, pests and diseases	<ul style="list-style-type: none"> <li>• Ensure that all vehicles, machinery, equipment and work boots are inspected and cleaned prior to arriving on site.</li> </ul>
Rehabilitation commitments and timeframes	<ul style="list-style-type: none"> <li>• Complete stage rehabilitation following: construction work; completion of drilling; and long-term rehabilitation.</li> <li>• Any protruding PVC collar pipe would be cut off approximately 1cm below the surface. The PVC pipe would then be capped with a metal plate before the hole is backfilled to ground level.</li> <li>• Backfill drill sumps and re-shaping the drill pads to remove their geometric shape and create slopes comparable with those natural slopes around the pads.</li> </ul>
Rehabilitation commitments and timeframes (Cont'd)	<ul style="list-style-type: none"> <li>• Replace subsoil and topsoil set aside during pad construction and install any required surface water management structures to protect the disturbed area, including silt-stop fencing.</li> <li>• Spreading of any cleared vegetation and revegetation with a native or pasture seed mix, if necessary.</li> </ul>
Other regulatory approvals required.	<ul style="list-style-type: none"> <li>• None.</li> </ul>
Community consultation	<ul style="list-style-type: none"> <li>• Ensure that consultation is undertaken in accordance with the <i>Exploration Code of Practice: Community Consultation</i> and <i>Condition 34</i> of EL 5920.</li> </ul>
Complaint management	<ul style="list-style-type: none"> <li>• Implement the Company's Complaints Management Procedure and provide contact details to all those consulted.</li> <li>• Ensure at least one Company representative is available to be contacted seven days a week and that an after-hours message service is available.</li> </ul>

**Table 13 (Cont'd)**  
**Statement of Commitments**

Page 4 of 4

Item	Commitment
<b>Management Measures (Cont'd)</b>	
Incident management	<ul style="list-style-type: none"> <li>• Implement the Company's Incident Management Procedure in the event of an incident.</li> <li>• Notify relevant government agencies, including the DRE, as required.</li> </ul>
Monitoring	<ul style="list-style-type: none"> <li>• Ensure that activities undertaken are documented daily through drillers logs and project manager diary notes.</li> <li>• Ensure that site inspections and checklists are completed before, during and after exploration, activities, including photographs.</li> </ul>
Continuous Improvement	<ul style="list-style-type: none"> <li>• No additional measures identified.</li> </ul>
Reporting	<ul style="list-style-type: none"> <li>• Ensure that reporting is completed in accordance with the requirements of EL 5920.</li> </ul>
Other	<ul style="list-style-type: none"> <li>• Ensure appropriate fire extinguishers and other firefighting equipment is available to manage any fire-related incidents associated with the proposed activities.</li> <li>• Ensure all employees are trained in the proper use of firefighting equipment.</li> <li>• Modify on-site activities during high fire danger periods (in accordance with hazard category notifications).</li> </ul>



## **8. REFERENCES**

**Australian Bureau of Statistics (ABS), 2011.** *2011 Census of Population and Housing.*

**Appleton, J. (1996).** *Proposed Bowdens Silver Project Aboriginal Heritage Assessment.* Report to R. W. Corkery and Co. Pty Limited.

**Division of Resources and Energy (DRE), 2015.** *ESG2: Guideline for Preparing a Review of Environmental Factors.*

**Division of Resources and Energy (DRE) 2015.** *ESG5: Assessment Requirements for Exploration Activities.*

**Office of Environment and Heritage (OEH) 2011.** *NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining.*

**Office of Environment and Heritage (OEH), 2012.** *Land and Soil Capability Mapping of NSW, version 2.5.*

**Maynard, D. (1998).** *Aboriginal Archaeological Survey of Bowdens Silver Deposit at Lue, Central West NSW.* Report to R.W. Corkery and Co. Pty Limited.

# Appendices

(Total No. of pages including blank pages = 124)

- Appendix 1    ESF4 – Exploration Activities Application Form (44 pages)
- Appendix 2    Agricultural Impact Statement (34 pages)
- Appendix 3    Water, Erosion & Sediment Control Management Plan (44 pages)



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# Appendix 1

## ESF4 – Exploration Activities Application Form

(Total No. of pages including blank pages = 44)

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Department  
of Industry  
Resources & Energy

Form ESF4

# Application to conduct exploration activities

For assessable prospecting operations

*Mining Act 1992 and Petroleum (Onshore) Act 1991*

September 2016 | v2.4

## More information

For help with lodging this application, or for more information  
about environmental assessment conditions in New South Wales, contact:

Division of Resources and Energy

**Environmental Sustainability Unit**

**Phone +61 2 4931 6590**

[minres.environment@industry.nsw.gov.au](mailto:minres.environment@industry.nsw.gov.au)

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The information contained in this publication is based on knowledge and understanding at the time of writing. However, because of advances in knowledge, users are reminded of the need to ensure that information upon which they rely is up to date and to check currency of the information with the appropriate officer of the NSW Department of Industry, Skills and Regional Development or the user's independent advisor.

### Privacy statement

This information is collected by the Department of Industry, Skills & Regional Development (NSW Department of Industry) for the purposes of assessing an application for an authorisation or associated with an authority as required by the *Mining Act 1992*, *Mining Regulation 2016*, *Petroleum (Onshore) Act 1991* and *Petroleum (Onshore) Regulation 2016*.

This information may also be used by the department to confirm applicant details in the event that subsequent applications are made, and may also be used to establish and maintain databases to assist the department with its work generally.

Except for purposes required by law, the information will not be accessed by any third parties in a way that would identify the person without the consent of that person.

The department may make the information in the Form and any supporting information available for inspection by members of the public, including by publication on the department's website or by displaying the information at any of its offices. If you consider any part of your application to be confidential, please provide that part in a separate addendum clearly marked "Confidential".

The department may also provide the information to other government agencies for the purposes of its assessment. You may apply to the department to access and correct any information the department holds if that information is inaccurate, incomplete, not relevant or out of date.

NSW Department of Industry, Division of Resources and Energy  
**ESF4 Application to conduct exploration activities**

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## When to use this form

Complete this form if you are applying for approval to conduct assessable prospecting operations in New South Wales.

You **do not** need to complete this form if you are conducting prospecting operations identified as exempt development under [State Environmental Planning Policy \(Mining, Petroleum Production and Extractive Industries\) 2007](#).

This form has been prepared and approved in accordance with the *Mining Act 1992*, *Mining Regulation 2016*, *Petroleum (Onshore) Act 1991* and *Petroleum (Onshore) Regulation 2016*. The information requested in this form may not be specifically referenced in the *Mining Act 1992*, *Mining Regulation 2016*, *Petroleum (Onshore) Act 1991* and *Petroleum (Onshore) Regulation 2016*, however its inclusion in the approved form validates the authority of the NSW Department of Industry, Division of Resources and Energy (the department) to request it.

If there is insufficient room in the fields please provide the information as an attachment.

## Important notes

Any information or template that is required to accompany this application should be lodged within **10 business days of the lodgement date**. Failure to supply the information within this timeframe may be considered as grounds for refusing the application according to [Schedule 1B, Clause 6\(d\)](#) of the *Mining Act 1992*.

If this application is lodged by any party other than the authority holder (ie. an agent), the department may seek confirmation of that authority and any limits of that authority (*Mining Act 1992* [Section 163F](#) and *Mining Regulation 2016* [Clause 97](#)).

The department may make the information in the form and any supporting information available for inspection by members of the public, including by publication on the department's website or by displaying the information at any of its offices. **If you consider any part of your application to be confidential, please provide that part in a separate addendum clearly marked "Confidential".**

## Before you complete this form

Please read the following guides before completing this form:

- [ESG5: Assessment Requirements for Exploration Activities](#).
- [ESG2: Guideline for preparing a Review of Environmental Factors](#)
- [Guideline for Agricultural Impact Statements at the Exploration Stage](#).

## Exploration in exempted areas

Exempted areas are defined in the *Mining Act 1992* and the *Petroleum (Onshore) Act 1991* as lands set aside for public purposes. Exempted areas include travelling stock routes, road reserves, water supply reserves, state forests, state conservation areas and public reserves/commons.

The Minister's consent is required before the department can approve exploration activities in exempted areas.

**This application cannot be processed until Ministerial consent has been obtained.**

To apply for approval to prospect in an exempted area, contact the Titles Services office by phone: (02) 4931 6500 or email: [titles.services@industry.nsw.gov.au](mailto:titles.services@industry.nsw.gov.au).

## Exploration in State Conservation Areas

The [Office of Environment and Heritage](#) is responsible for management of [State Conservation Areas](#) (SCAs) under the [National Parks and Wildlife Act 1974](#). **This application cannot be processed until approval from the Office of Environment and Heritage has been obtained.** If you are applying to carry out activities in a State Conservation Area, you must first obtain the following before your application can be processed by the department:

- approval from the Minister administering the *National Parks and Wildlife Act 1974* ([Section 47J\(7\)](#))
- a Review of Environmental Factors (REF) approved by the Office of Environment and Heritage.

Requests for approval to prospect in a SCA are to be submitted to the relevant regional office of the [National Parks and Wildlife Service](#).



NSW Department of Industry, Division of Resources and Energy  
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## **Surface Disturbance Notice**

The conditions of some older authorities require authority holders to provide a Surface Disturbance Notice before carrying out exploration activities. This application is regarded as a Surface Disturbance Notice (SDN) for the notification of exploration activities.

## **How to submit this form**

- **By email:** Send an electronic copy of the form including any attachments to [minres.environment@industry.nsw.gov.au](mailto:minres.environment@industry.nsw.gov.au)
- **By mail:** Mail your form and attachments to: Division of Resources and Energy, Environmental Sustainability Unit, PO Box 344, Hunter Region Mail Centre NSW 2310.
- **In person:** Submit your application in person at the Division of Resources and Energy's Environmental Sustainability Unit, 516 High Street, Maitland, New South Wales. Office hours are 9.30am to 4.30pm.

## **How this application will be processed**

Once your application has been registered and checked, it will be assessed by the department. The Minister for Resources and Energy (or their delegate) will consider the department's recommendation and all relevant information, and may propose to grant or refuse the application.

NSW Department of Industry, Division of Resources and Energy  
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## 1 Authority details

Exploration licence (EL) or Assessment lease (AL) number	EL 5920	Act	1992
Authority expiry date	29/1/2017 renewal sought		

## 2 Authority holder/s details

Provide the full name of authority holder/s and if applicable, the ACN or ARBN (for foreign companies).

Name	Bowdens Silver Pty Limited
ACN / ARBN	009 250 051
Registered street address	Level 11, 52 Phillip Street Sydney NSW 2000
Postal address	<input type="checkbox"/> Same as above <input checked="" type="checkbox"/> GPO Box 225 Sydney NSW 2000

Name	
ACN / ARBN	
Registered street address	
Postal address	<input type="checkbox"/> Same as above <input type="checkbox"/> Enter here if different

Name	
ACN / ARBN	
Registered street address	
Postal address	<input type="checkbox"/> Same as above <input type="checkbox"/> Enter here if different

### Additional authority holders

Provide the full name, ACN or ARBN (for foreign companies), registered street address and postal address details of additional authority holders.

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NSW Department of Industry, Division of Resources and Energy  
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### 3 Contact for this application

Any correspondence relating to this application will be sent to this person.

Contact name	Anthony McClure
Position held	Managing Director
Company	Silver Mines Limited
Postal address	GPO Box 225 Sydney NSW 2000
Phone (inc. area code)	02 8316 3997
Mobile	
Email	anthonymcclure@silvermines.com.au

#### Your preferred contact method

- ☒ Email (For companies – provide a generic company email address which is regularly monitored rather than an individual employee's email address.)
- ☐ Mail

### 4 Exempted areas

Exempted areas are defined in the *Mining Act 1992* and *Petroleum (Onshore) Act 1991* as lands set aside for public purposes, which includes travelling stock routes, road reserves, water supply reserves, state forests, state conservation areas and public reserves/commons. Exempted areas require Ministerial consent – **this application cannot be processed until Ministerial consent has been obtained.**

#### 4.1 Will the activity include prospecting in an exempted area?

- ☒ No. ▶ Go to **Question 5**
- ☐ Yes. ▶ Continue to **Question 4.2**

#### 4.2 Prospecting in exempted areas

##### 4.2.1 Minister's consent

Attach a copy of the Minister's consent to prospecting in exempted areas. To apply for approval to prospect in an exempted area, contact the Titles Services office by phone (02) 4931 6500 or email [titles.services@industry.nsw.gov.au](mailto:titles.services@industry.nsw.gov.au).

- ☐ I have attached a copy of the Minister's consent to prospect in an exempt area.

NSW Department of Industry, Division of Resources and Energy  
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#### 4.2.2 Identify exempted areas

Identify the exempted areas where prospecting activities will take place:

Insert a map in the field above or enter your text here

## 5 State Conservation Areas

If you are applying to conduct prospecting activities in a [State Conservation Area](#), you must obtain the approvals below (Question 5.2) before your application can be processed by the department. Requests for approval to prospect in a State Conservation Area are to be submitted to the relevant regional office of the [National Parks and Wildlife Service](#).

### 5.1 Will the activity include prospecting in a State Conservation Area?

- ☒ No. ▶ Go to Question 6
- ☐ Yes. ▶ Complete Questions 5.2, 6, 8, 16, 17 and 18 only.

### 5.2 Prospecting in a State Conservation Area

#### 5.2.1 Minister's consent

If you are applying to carry out activities in a State Conservation Area, you must obtain approval from the Minister administering the *National Parks and Wildlife Act 1974* ([Section 47J\(7\)](#)).

- ☐ I have attached a copy of the Minister's consent to prospect in a State Conservation Area.



NSW Department of Industry, Division of Resources and Energy  
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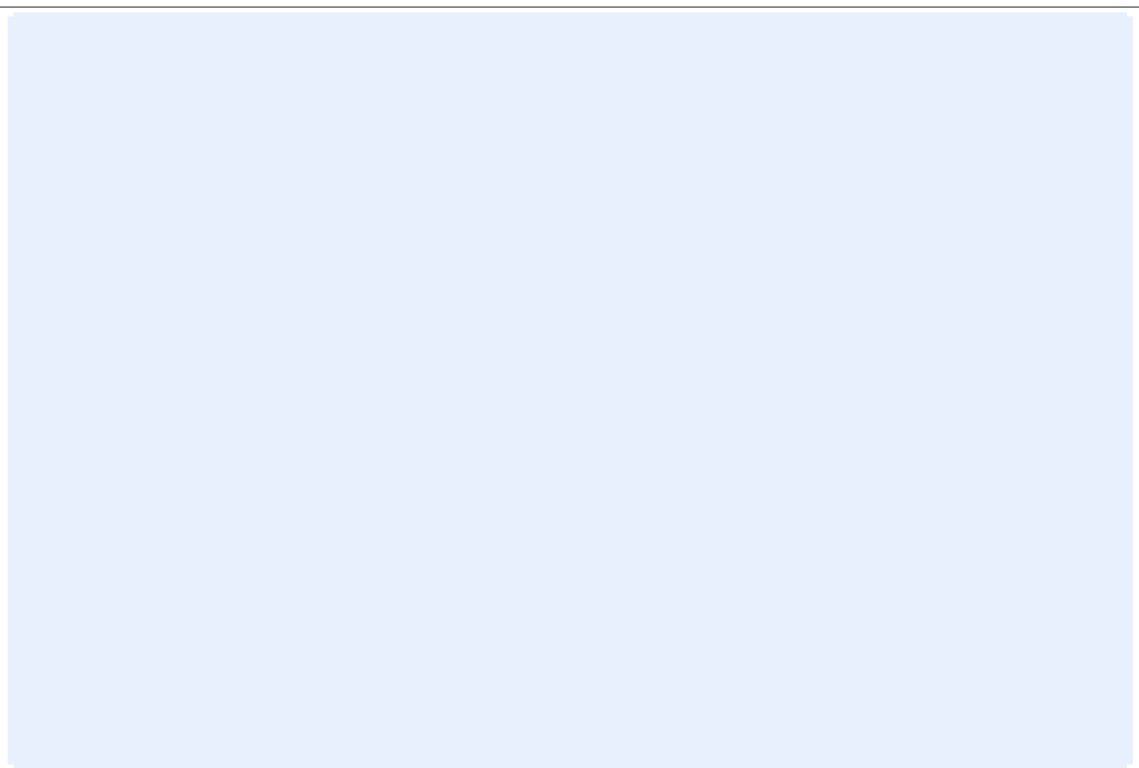
### 5.2.2 Review of Environmental Factors

The [Office of Environment and Heritage](#) manages State Conservation Areas under the [National Parks and Wildlife Act 1974](#). If you are applying to conduct prospecting activities in a State Conservation Area, you must provide the department with a [Review of Environmental Factors](#) which has been approved by the Office of Environment and Heritage.

- ☐ I have attached a copy of the Review of Environmental Factors approved by the Office of Environment and Heritage.

### 5.2.3 Identify the State Conservation Area

Identify the State Conservation Area/s where prospecting activities will take place.



Insert a map in the field above or enter your text here

NSW Department of Industry, Division of Resources and Energy  
**ESF4 Application to conduct exploration activities**

---

## 6 New application or modification of approved exploration activities

To modify an already approved exploration activity, the modification must be consistent with the existing approval and have environmental impacts consistent with those already assessed and approved. Otherwise, a new application for the entire activity must be made.

### 6.1 Is this a new application for approval or an application to modify an existing approved activity?

<input checked="" type="checkbox"/>	<b>New application for approval.</b> Complete the details below, then go to <b>Question 7</b> .
Project name	Bowdens Gumarooka Exploration Program
Project location	Via Lue, NSW

OR

<input type="checkbox"/>	<b>Modification of an approved application.</b> Complete the details below, then continue to <b>Question 6.2, 9, 16, 17 and 18 only</b> .
Approved project or activity name	
Date of previous approval	
Reason for modification	

### 6.2 Modification of an approved application

Describe the modification to the approved application and the environmental impacts.

--

## 7 Application type and assessment requirements

Environmental assessment requirements vary depending on whether a proposed activity is a 'Common Exploration Activity' or a 'Non-Common Exploration Activity'. Refer to Section 4 of [ESG5 Assessment Requirements for Exploration Activities](#) to determine whether a proposed activity is a Common Exploration Activity or a Non-Common Exploration Activity.

An activity can only be assessed under the Common Exploration Activity pathway if all boxes in Questions 12 and 13 have been ticked as 'No' and none of the impact thresholds and criteria in Question 13 have been exceeded.

Petroleum exploration activities are **not** eligible to be assessed under the Common Exploration Activity assessment pathway.

Select one application type and assessment pathway only.

☐

### Common Exploration Activity (minerals or coal authorities only)

Complete all questions in this form, apart from **Questions 8, 10 and 15**.

*Note: Information provided in this form regarding an activity which meets the Common Exploration Activity criteria will be taken to be a Review of Environmental Factors for the purposes of any authority conditions which require the submission of a Review of Environmental Factors.*

OR

☒

### Non-Common Exploration Activity (minerals or coal authorities only)

Select one of the options below.

☐

**Option 1:** Complete all questions in this form to provide a Targeted Review of Environmental Factors.

☒

#### Option 2:

- Complete only **Questions 1–9** and **Questions 16–18** of this form
- Attach a Guideline Review of Environmental Factors prepared in accordance with [ESG2 Guideline for preparing a Review of Environmental Factors](#).

OR

☐

### Petroleum Exploration Activity (petroleum authorities)

- Complete only **Questions 1–9** and **Questions 16–18**
- Attach a Guideline Review of Environmental Factors prepared in accordance with [ESG2 Guideline for preparing a Review of Environmental Factors](#).

NSW Department of Industry, Division of Resources and Energy  
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## 8 Agricultural Impact Statement

Under the [NSW Strategic Regional Land Use Policy](#), certain Non-Common Exploration Activities must be accompanied by an Agricultural Impact Statement. When preparing an Agricultural Impact Statement, you should refer to the [Guideline for Agricultural Impact Statements at the Exploration Stage](#). An Agricultural Impact Statement may be included as part of a Guideline Review of Environmental Factors.

### 8.1 Project area location

Is any part of the project area located on, or within, 2 km of [Strategic Agricultural Land](#) or directly on [Land and Soil Capability Classes 1, 2 or 3](#)?

- ☐ Yes. Attach an Agricultural Impact Statement. ▶ **Go to Question 9**
- ☒ No. Continue to **Question 8.2**

### 8.2 Entire project area

#### 8.2.1 Indicate where the entire project area is located

The entire project area is located (check one or multiple boxes)

- ☐ A. Within a [State Forest](#), [Nature Reserve](#) or [State Conservation Area](#) or
- ☐ B. on existing residential, village, business or industrial zoned land under a [Local Environment Plan](#) (LEP), or
- ☐ C. within an existing [mining lease](#), or
- ☐ D. on [Land and Soil Capability Classes](#) 7 or 8
- ☐ E. and 500 metres or further inside the boundary of the areas listed above.



If you checked boxes A or B or C or D and E above, go to **Question 9**

If not, continue to **Question 8.2.2**

#### 8.2.2 Agricultural Impact Statement

If you **did not** check the relevant boxes in **Question 8.2.1**, you will need to attach an Agricultural Impact Statement.

- ☒ I have attached an Agricultural Impact Statement. Enter any additional comments below.

Please refer to Appendix 2 of the attached Review of Environmental Factors



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## 9 Site plan and location details

Attach site plans and/or maps at an appropriate scale showing the following (as relevant):

- boundaries of the authority
- lot/DP numbers and boundaries
- topographic contours
- location of the proposed activity (including location of key features of the activity using MGA94 co-ordinates)
- layout of the proposed activity (using dimensions and alignments where appropriate)
- major regional features
- existing and proposed access tracks
- existing structures and infrastructure (including dimensions and alignments where relevant)
- nearby sensitive receptors (including residences, educational establishments, hospitals, places of worship, etc)
- location of Aboriginal and European heritage sites (including AHIMS search) (refer to **Question 10.11** and **10.10**, respectively)
- location of identified sensitive land (refer to **Question 12**)
- location of threatened species, populations or ecological communities, or their habitats (refer to **Question 13.4**).

*Note: The site plans and/or maps required here can be included in a Guideline Review of Environmental Factors.*

### 9.1 Identify the area

Identify the map sheet, block number/s and unit letter/s within which the activities are proposed. These details are referenced on your authority conditions.

Name of map sheet	Block number	Unit letter/s
Canberra	575	m, n, r, s

### 9.2 Site plan/s and map/s

List the site plans and maps you have attached to this application, including relevant plan/map title, dates, reference numbers.

	Reference No.	Name/title	Date
1	Figure 1	Locality, Regional Topography and Drainage	Mar 2017
2	Figure 2	Gumarooka Exploration Area Boundary, Land Titles and Land Ownership	Mar 2017
3	Figure 3	Bowdens and Lue Annual Wind Roses	Mar 2017
4	Figure 4	Local Topography and Drainage	Mar 2017

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	Reference No.	Name/title	Date
5	Figure 5	Gumarooka Exploration Area Topography and Drainage	Mar 2017
6	Figure 6	Soil Mapping	Mar 2017
7	Figure 7	Land and Soil Capability	Mar 2017
8	Figure 8	Services and Public Infrastructure	Mar 2017
9	Figure 9	Sensitive Land	Mar 2017
10	Figure 10	Gumarooka Exploration Area Boundary, Land Titles and Land Ownership	Mar 2017
Figure 11	Threatened Ecology	Mar 2017	
Figure 12	Cultural Heritage	Mar 2017	
Figure 13	Proposed Drill Sites	Mar 2017	
Figure 14	Proposed Access Track Construction	Mar 2017	
Figure 15	Typical RC Drill Site Layouts	Mar 2017	
Figure 16	Typical Diamond Drill Site Layouts	Mar 2017	

**9.3 Photographs of all sites to be disturbed**

Attach photographs of all sites to be disturbed. List all the photographs attached, including relevant photograph titles, site locations and dates. Include a plan illustrating where the photographs were taken from and their aspect.

	Photo number /reference	Photo name/description
1	Plate 9	Category 1 Area
2	Plate 10	Category 2 Area
3	Plate 11	Category 3 Area
4	Plate 12	Category 4 Area
5		
6		
7		
8		
9		
10		
Add additional references and notes here		

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## 10 Site description and existing environment

For help answering this question, refer to Sections 1 and 2 of [ESG2 Guideline for preparing a Review of Environmental Factors](#).

### 10.1 Existing land uses

Provide details of existing land uses that may be affected by the proposed activity and any proposed changes (temporary or otherwise) to the current land use/s during the activity.

### 10.2 Sensitive receptor/s

Describe the location, type and distance to the nearest sensitive receptor/s (including residences, educational establishments, hospitals, places of worship).

### 10.3 Soil types and properties

Describe the soil types and properties (including susceptibility to compaction, erosion and dispersion; presence of acid sulfate soils and potential acid sulfate soils). Refer to [Strategic Agricultural Land Maps](#), [Land and Soil Capability Class Maps](#) and [Acid Sulfate Soils Maps](#).

### 10.4 Surface water sources

Provide details of the existing surface water sources in the area that are likely to be affected by the activity. Provide details of the nearest watercourse/s and the distance between the proposed disturbance area/s and the nearest watercourse/s.

### 10.5 Groundwater sources

Provide details of any existing groundwater sources that occur in the area that are likely to be affected by the activity.

### 10.6 Vegetation cover

Describe the vegetation cover type, density and condition.

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## 10.7 Critical habitat

Provide details of any critical habitat that is likely to be affected by the activity including:

- areas declared as critical habitat under the *Threatened Species Conservation Act 1995* as listed in the [Critical Habitat Register](#) maintained by the Office of Environment and Heritage.
- areas declared as critical habitat under the *Fisheries Management Act 1994* as recorded in the Department of Primary Industries [register of critical habitat](#).

## 10.8 Threatened species records search (wildlife and vegetation)

Attach copies of any relevant threatened species records kept by the Office of Environment and Heritage according to the *Threatened Species Conservation Act 1995*. Refer to [www.environment.nsw.gov.au](http://www.environment.nsw.gov.au) or [www.bionet.nsw.gov.au](http://www.bionet.nsw.gov.au) for this information. Ensure searches are relevant to the proposed disturbance areas.

- ☐ A copy of the Atlas NSW Wildlife Search is attached (refer to [NSW BioNet](#))
- ☐ A copy of Atlas' Vegetation Information System is attached (refer to [NSW BioNet](#))

## 10.9 Aquatic habitat species record search

Attach copies of any relevant [threatened and protected species records for aquatic habitats](#) kept by the Department of Primary Industries according to the *Fisheries Management Act 1994*.

- ☐ A copy of the threatened and protected species records for aquatic habitats search is attached.

## 10.10 Historic cultural or natural heritage items

### 10.10.1 Record searches

Attach copies of record searches for any historic cultural or natural heritage items that may be impacted by the activity. As a minimum, identify if any of the following are impacted. For any of the items below, only attach copies of relevant heritage searches.

- ☐ Items listed on the [World Heritage List](#)
- ☐ Items listed on the [Commonwealth Heritage List](#)
- ☐ Items listed on the [National Heritage List](#)
- ☐ [State Heritage Register](#)
- ☐ Items listed in the heritage schedule of an [environmental planning instrument](#), such as a local council's Local Environment Plan

### 10.10.2 Describe any items of historic cultural or natural heritage that may be impacted by the activity.



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## 10.11 Aboriginal heritage sites

### 10.11.1 Describe the nearest Aboriginal sites or any sites that may be affected.

Describe the location, type and distance to the nearest Aboriginal heritage sites and any impact the proposed activity will have on Aboriginal heritage sites (Aboriginal objects and places).

### 10.11.2 AHIMS search

For exploration activities, the [National Parks and Wildlife Act 1974](#) requires you to exercise due diligence to check if Aboriginal sites will be harmed.

The Office of Environment and Heritage maintains the [Aboriginal Heritage Information Management System](#) (AHIMS) which you can use to undertake due diligence. The AHIMS includes:

- information about Aboriginal objects that have been reported to the Director General, Department of Premier and Cabinet
- information about Aboriginal Places which have been declared by the Minister for the Environment to have special significance with respect to Aboriginal culture
- archaeological reports.

Attach your [AHIMS](#) search to support that you have undertaken due diligence for this application.

☐ I have attached a copy of the AHIMS search.

## 11 Description of the exploration activity

For guidance answering this question, refer to Section 3 [ESG2 Guideline for preparing a Review of Environmental Factors](#).

### 11.1 Stages of the activity

Describe all stages of the activity, including before, during and after exploration, including decommissioning.

### 11.2 Exploration methods

Describe the exploration methods, including machinery and equipment to be used (including what equipment will be operating at any one time).

### 11.3 Total surface disturbance

Provide the total surface disturbance (in square metres/hectares) for the proposed exploration program.

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#### **11.4 Earthworks or vegetation clearing**

Detail any earthworks or vegetation clearing, including the re-use and disposal of cleared material (including use of spoil-on-site).

#### **11.5 Timing and phasing of the activity**

Describe the timing and any phasing of the activity (including anticipated commencement dates and anticipated completion dates for all activities).

#### **11.6 Proposed sealing/suspension of drill holes/wells**

Describe the proposed sealing/suspension of drill holes/wells, including details of any well head suspension, security, maintenance and monitoring programs.

#### **11.7 Venting, flaring or re-use of gases**

Describe any proposed venting, flaring or re-use of gases, including details of the system design and venting/flaring/re-use processes.

#### **11.8 Access to exploration activities**

Describe the means of access to the various exploration activities. Describe any upgrading of existing access tracks and any construction of new access tracks.

#### **11.9 Ancillary activities**

Provide details of any activities which are ancillary to the proposed exploration activities including requirements for water storage, ancillary infrastructure, temporary accommodation.

*Note: Certain ancillary works and activities (such as accommodation camps and environmental assessment activities) do not constitute an 'exploration' or 'prospecting' activity under the Mining Act 1992 or the Petroleum (Onshore) Act 1991 and therefore cannot be approved by the department. The authority holder should obtain their own advice, and/or make their own enquiries with the relevant local council, Crown Lands controlling authority or the landholder regarding separate consent or approvals required under the Environmental Planning and Assessment Act 1979 and/or Local Government Act 1993.*

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### 11.10 Proposed hours of operation

Provide details of the proposed hours of operation.

### 11.11 On-site employee or contractor numbers

Provide an estimate of on-site employee or contractor numbers.

### 11.12 Surface water management

Describe how surface water will be managed (including water sources, water usage, water storage and water disposal/reuse).

*Note: for guidance answering this question, refer to Section 3.5 of [ESG2 Guideline for preparing a Review of Environmental Factors](#).*

### 11.13 Groundwater management

Describe how groundwater will be managed (including water produced, stored and disposed of/reused during exploration).

*Note: for guidance answering this question, refer to Section 3.5 of [ESG2 Guideline for preparing a Review of Environmental Factors](#).*

### 11.14 Waste and excess material management

Describe the type, quantities and management of any [waste](#) and excess materials (including drill cuttings, waste water, solid wastes, radioactive material, hazardous wastes, restricted wastes or special wastes).

*Note: for guidance refer to Section 3.5 of [ESG2 Guideline for preparing a Review of Environmental Factors](#).*

### 11.15 Chemical management

Detail the handling, use, storage and transportation of any chemicals and hydrocarbons.

*Note: for guidance refer to Section 3.5 of [ESG2: Guideline for preparing a Review of Environmental Factors](#).*

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### 11.16 Noise management

Describe how noise will be managed to minimise impacts on any nearby sensitive receivers.

Note: for guidance refer to Section 3.5 of [ESG2: Guideline for preparing a Review of Environmental Factors](#).

### 11.17 Air quality management

Describe how air quality will be managed, including measures to minimise impacts resulting from any dust generation, venting, flaring and fugitive emissions.

Note: for guidance refer to Section 3.5 of [ESG2: Guideline for preparing a Review of Environmental Factors](#).

## 12 Sensitivity of land to be disturbed

Advise whether the activity will occur on any of the types of land listed below. All sections must be completed. Explanatory notes are provided in Section 7.1 of [ESG5: Assessment Requirements for Exploration Activities](#) to assist authority holders in identifying land to which these location restrictions apply.

An activity can only be assessed under the Common Exploration Activity assessment pathway if all boxes have been ticked as 'No'. Some of these areas are also 'exempted areas' under the *Mining Act 1992* and *Petroleum (Onshore) Act 1991* (refer to **Question 4**).

If you answer 'yes' to any of the questions below, provide an assessment of impacts by completing **Question 15**.

### 12.1 Conservation areas

Land	Yes	No
Land reserved under the <i>National Parks and Wildlife Act 1974</i>	<input type="checkbox"/>	<input type="checkbox"/>
Land acquired by the Minister for the Environment under Part 11 of the <i>National Parks and Wildlife Act 1974</i>	<input type="checkbox"/>	<input type="checkbox"/>
Land subject to a 'conservation agreement' under the <i>National Parks and Wildlife Act 1974</i>	<input type="checkbox"/>	<input type="checkbox"/>
Land declared as an aquatic reserve under the <i>Marine Estate Management Act 2014</i>	<input type="checkbox"/>	<input type="checkbox"/>
Land declared as a marine park under the <i>Marine Estate Management Act 2014</i>	<input type="checkbox"/>	<input type="checkbox"/>
Land within State Forests set aside under the <i>Forestry Act 2012</i> for conservation values, including Flora Reserves or Special Management (and other) Zones	<input type="checkbox"/>	<input type="checkbox"/>
Land reserved or dedicated under the <i>Crown Lands Act 1989</i> for the preservation of flora, fauna, geological formations or other environmental protection purposes	<input type="checkbox"/>	<input type="checkbox"/>



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Land identified as wilderness or declared a wilderness area under the <i>Wilderness Act 1987</i>	<input type="checkbox"/>	<input type="checkbox"/>
Land subject to a biobanking agreement under the <i>Threatened Species Conservation Act 1995</i>	<input type="checkbox"/>	<input type="checkbox"/>

## 12.2 Drinking water catchment protection areas

Land	Yes	No
Land declared to be a 'controlled area' or a 'special area' under the <i>Water NSW Act 2014</i>	<input type="checkbox"/>	<input type="checkbox"/>
Land declared to be a 'special area' under the <i>Water Management Act 2000</i> or <i>Hunter Water Act 1991</i>	<input type="checkbox"/>	<input type="checkbox"/>

## 12.3 Sensitive areas

Note: The upgrade or use of existing access tracks on waterfront land can still be assessed as a Common Exploration Activity, refer to Sections 7.1 and 7.2 of [ESG5 Assessment Requirements for Exploration Activities](#).

Land	Yes	No
Land declared as critical habitat under the <i>Threatened Species Conservation Act 1995</i> or Part 7A of the <i>Fisheries Management Act 1994</i>	<input type="checkbox"/>	<input type="checkbox"/>
Wetlands of international significance listed under the Ramsar Wetlands Convention	<input type="checkbox"/>	<input type="checkbox"/>
Land designated as a nationally important wetland in the Directory of Important Wetlands	<input type="checkbox"/>	<input type="checkbox"/>
Land mapped under <i>State Environmental Planning Policy No. 14 – Coastal Wetlands</i>	<input type="checkbox"/>	<input type="checkbox"/>
Land mapped under <i>State Environmental Planning Policy No. 26 – Littoral Rainforests</i>	<input type="checkbox"/>	<input type="checkbox"/>
Coastal waters of the State as defined in the <i>Coastal Protection Act 1979</i> and the <i>Coastal Protection Regulations 2011</i>	<input type="checkbox"/>	<input type="checkbox"/>
Land identified in an environmental planning instrument as being of biodiversity significance or zoned for environmental conservation	<input type="checkbox"/>	<input type="checkbox"/>
Waterfront land defined under the <i>Water Management Act 2000</i> *	<input type="checkbox"/>	<input type="checkbox"/>
Land with a slope greater than 18 degrees measured from the horizontal	<input type="checkbox"/>	<input type="checkbox"/>

## 12.4 Land with potential for soil and water contamination

Land	Yes	No
Land mapped as Actual Acid Sulfate Soils (AASS) or Potential Acid Sulfate Soils (PASS) on the Acid Sulfate Soils Risk Maps for NSW	<input type="checkbox"/>	<input type="checkbox"/>

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## 12.5 Heritage protection areas (Aboriginal and European)

Land	Yes	No
Land declared as an Aboriginal place under the <i>National Parks and Wildlife Act 1974</i>	<input type="checkbox"/>	<input type="checkbox"/>
Land listed on the World Heritage List, National Heritage List or Commonwealth Heritage List	<input type="checkbox"/>	<input type="checkbox"/>
Land, places, buildings or structures listed on the NSW State Heritage Register	<input type="checkbox"/>	<input type="checkbox"/>
Land identified in an environmental planning instrument (such as a State Environmental Planning Policy, Regional Environment Plan or Local Environment Plan) as being of Aboriginal or European heritage significance	<input type="checkbox"/>	<input type="checkbox"/>

## 12.6 Critical Industry Clusters

Land	Yes	No
Land identified as Critical Industry Cluster under <i>State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007</i>	<input type="checkbox"/>	<input type="checkbox"/>

## 12.7 Community land

Land	Yes	No
Public land classified as community land under the <i>Local Government Act 1993</i>	<input type="checkbox"/>	<input type="checkbox"/>

## 12.8 Other areas

Land	Yes	No
Land identified on the authority as environmentally sensitive land	<input type="checkbox"/>	<input type="checkbox"/>

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## 13 Impact thresholds and criteria

Provide details relating to the impact thresholds and criteria outlined below. These include cumulative impact thresholds from existing approved activities that have not yet been undertaken/rehabilitated to the satisfaction of the department. Explanatory notes are provided in Section 7.2 of [ESG5 Assessment Requirements for Exploration Activities](#) to assist authority holders in completing these details.

*Note: An activity can only be assessed under the Common Exploration Activity assessment pathway if all boxes have been ticked as 'no' and none of the impact thresholds and criteria have been exceeded. A previously approved/undertaken activity must be counted unless the department has acknowledged in writing that the area has been satisfactorily rehabilitated.*

**All questions, tick boxes and values must be completed - even if the value is zero.**

### 13.1 Vegetation clearing

#### 13.1.1 Will cumulative vegetation clearing and/or removal of tree canopy exceed more than 1,000 square metres in any single hectare?

- ☐ Yes. Provide assessment of impacts by completing Question 15.
- ☐ No

Clearing proposed	<input type="text"/>	m <sup>2</sup>
Clearing previously approved/undertaken	<input type="text"/>	m <sup>2</sup>
Total Clearing (existing and proposed)	<input type="text"/>	m <sup>2</sup>

#### 13.1.2 Will cumulative vegetation clearing and/or removal of tree canopy exceed more than 1 hectare in any single unit of the authority (or every 250 hectares in the case of authorities which do not align to unit boundaries)?

- ☐ Yes. Provide assessment of impacts by completing Question 15.
- ☐ No

Clearing proposed	<input type="text"/>	ha
Clearing previously approved/undertaken	<input type="text"/>	ha
Total Clearing (existing and proposed)	<input type="text"/>	ha

#### 13.1.3 Will cumulative vegetation clearing and/or removal of tree canopy exceed more than 5 hectares in any single authority?

- ☐ Yes. Provide assessment of impacts by completing Question 15.
- ☐ No

Clearing proposed	<input type="text"/>	ha
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Clearing previously approved/undertaken	<input type="text"/>	ha
Total Clearing (existing and proposed)	<input type="text"/>	ha

### 13.2 Surface disturbance and excavations

#### 13.2.1 Will cumulative surface disturbances exceed a total of 1 hectare within any single unit of an authority (or every 250 hectares in the case of authorities which do not align to unit boundaries)?

- ☐ Yes. Provide assessment of impacts by completing Question 15.
- ☐ No

Disturbance proposed	<input type="text"/>	ha
Disturbance previously approved/undertaken	<input type="text"/>	ha
Total disturbance (existing and proposed)	<input type="text"/>	ha

#### 13.2.2 Will cumulative surface disturbance exceed a total of 5 hectares within any single authority?

- ☐ Yes. Provide assessment of impacts by completing Question 15.
- ☐ No

Disturbance proposed	<input type="text"/>	ha
Disturbance previously approved/undertaken	<input type="text"/>	ha
Total disturbance (existing and proposed)	<input type="text"/>	ha

#### 13.2.3 Will cumulative excavations exceed 200 cubic metres within any single unit of an authority (or every 250 hectares in the case of authorities which do not align to unit boundaries)?

- ☐ Yes. Provide assessment of impacts by completing Question 15.
- ☐ No

Excavations proposed	<input type="text"/>	m <sup>3</sup>
Excavations previously approved/undertaken	<input type="text"/>	m <sup>3</sup>
Total excavations (existing and proposed)	<input type="text"/>	m <sup>3</sup>

#### 13.2.4 Will cumulative excavations exceed 1,000 cubic metres within any single authority?

- ☐ Yes. Provide assessment of impacts by completing Question 15.
- ☐ No



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Excavations proposed	<input type="text"/>	m <sup>3</sup>
Excavations previously approved/undertaken	<input type="text"/>	m <sup>3</sup>
Total excavations (existing and proposed)	<input type="text"/>	m <sup>3</sup>

### 13.3 Extraction of groundwater (produced water)

#### 13.3.1 Will cumulative extraction of groundwater from all exploration activities within the authority exceed 3 megalitres (ML) per year?

- ☐ Yes. Provide assessment of impacts by completing **Question 15**.
- ☐ No

Extraction proposed	<input type="text"/>	ML per year
Extraction previously approved/undertaken	<input type="text"/>	ML per year
Total extraction (existing and proposed)	<input type="text"/>	ML per year

### 13.4 Ecology

#### 13.4.1 Will the activity have a significant effect on threatened species or their habitats?

- ☐ No. Continue to **Question 13.4.2**
- ☐ Yes. Provide assessment impacts by completing **Question 15** and any relevant details below (and attach copies as relevant) of any supporting documentation e.g. 7-part test of significance undertaken in accordance with the criteria set out in [Section 5A](#) of the *Environmental Planning and Assessment Act 1979*.

#### 13.4.2 Will the activity have a significant effect on threatened populations or their habitats?

- ☐ No. Continue to **Question 13.4.3**
- ☐ Yes. Provide assessment impacts by completing **Question 15** and any relevant details below (and attach copies as relevant) of any supporting documentation e.g. 7-part test of significance undertaken in accordance with the criteria set out in [Section 5A](#) of the *Environmental Planning and Assessment Act 1979*.

#### 13.4.3 Will the activity have a significant effect on threatened ecological communities or their habitats?

- ☐ No. Continue to **Question 13.4.4**

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- ☐ Yes. Provide assessment impacts by completing **Question 15** and any relevant details below (and attach copies as relevant) of any supporting documentation e.g. 7-part test of significance undertaken in accordance with the criteria set out in [Section 5A](#) of the *Environmental Planning and Assessment Act 1979*.

**13.4.4 Will vegetation be removed as part of access track upgrade works in waterfront land?**

- ☐ No. Go to **Question 13.5**
- ☐ Yes. Provide assessment impacts by completing **Question 15** and relevant details of vegetation removal.

**13.5 Aboriginal heritage**

**13.5.1 Will the activity harm Aboriginal objects?**

- ☐ No. Go to **Question 13.6**
- ☐ Yes. Provide assessment impacts by completing **Question 15** and any relevant details below (and attach copies as relevant) of any supporting documentation (e.g. any Aboriginal archaeological due diligence assessments undertaken in accordance with the [NSW Minerals Industry Due Diligence Code of Practice for the Protection of Aboriginal Objects](#) (NSW Minerals Council Ltd, 2010).

**13.6 European heritage**

**13.6.1 Will the activity damage heritage items?**

- ☐ No. Go to **Question 14**
- ☐ Yes. Provide assessment impacts by completing **Question 15** and any relevant details below (and attach copies as relevant) of any supporting documentation.

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## 14 Compliance with Exploration Codes of Practice

[Exploration Codes of Practice](#) have been prepared by the department. The Codes of Practice only apply to prospecting authorities granted, renewed or transferred in respect of applications received after 1 July 2015. Exploration activities undertaken pursuant to these titles must comply with the relevant Exploration Codes of Practice to be assessed under the Common Exploration Activity pathway.

The Codes of Practice provide authority holders with information about the minimum performance requirements to ensure that exploration is undertaken to manage and minimise risks to the environment.

### 14.1 Does the authority include references to Category 1, Category 2 and Category 3 prospecting operations?

- ☐ Yes. Go to **Question 16**. (*Note: Compliance with the Exploration Codes of Practice is not required as the existing conditions of the authority will apply as the management controls*).
- ☐ No. Complete **Question 14.2**, to confirm that the proposed prospecting operations will comply with the relevant Exploration Codes of Practice.

### 14.2 Compliance requirements

Check the boxes to indicate that the proposed prospecting operations will comply with the relevant code.

<input type="checkbox"/>	<b>Environmental management</b> Yes, the activity will be undertaken in accordance with the <a href="#">Exploration Code of Practice: Environmental Management</a> .
<input type="checkbox"/>	<b>Rehabilitation</b> Yes, the activity will be undertaken in accordance with the <a href="#">Exploration Code of Practice: Rehabilitation</a> .
<b>Produced water management, storage and transfer</b>	
<input type="checkbox"/>	Yes, the activity will be undertaken in accordance with the <a href="#">Exploration Code of Practice: Produced Water Management, Storage and Transfer</a> . [For prospecting operations where produced water will need to be managed <b>and</b> a produced water storage management facility is required (in addition to any ancillary drilling sumps and tanks)].
<input type="checkbox"/>	Not applicable.

### 14.3 Further details

Provide any further details relating to the above management controls and Codes of Practice as required.

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## 15 Targeted Review of Environmental Factors for Non-Common Exploration Activities

Complete Question 15 below to provide a Targeted Review of Environmental Factors (REF). This information only needs to specify the potential environmental impacts associated with the departure(s) from the relevant Common Exploration Activities location restriction, impact threshold/criteria or management control. This would generally be appropriate for activities that do not significantly depart from the Common Exploration Activities criteria.

### 15.1 Physical and pollution impacts

For guidance refer to Section 4.1 of [ESG2 Guideline for preparing a Review of Environmental Factors](#).

#### 15.1.1 Air impacts

Is the activity likely to impact on air quality? Consider air quality impacts:

- such as dust, smoke, odours, fumes, fugitive emissions, toxic or radioactive gaseous emissions with economic, health, ecosystem or amenity considerations
- through generation of greenhouse gas emissions or release of chemicals
- on nearby sensitive receptors.

Impact level	Detail of impacts	Outline any management controls/mitigation measures
Select level...		

#### 15.1.2 Water impacts

Is the activity likely to impact on water quality and/or water quantity? Consider impacts from:

- the use of surface or groundwater
- the storage of water
- changes to natural waterbodies, wetlands or runoff patterns
- aquifer interference including changes to inter-aquifer connectivity



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- changes to flooding or tidal regimes
- changes in surface and groundwater quality and quantity

Impact level	Detail of impacts	Outline any management controls/mitigation measures
Select level...		

15.1.3 Soil and stability impacts

Is the activity likely to impact on soil quality or land stability? Consider any:

- degradation of soil quality including contamination, salinisation or acidification
- loss of soil from wind or water erosion
- increased land instability with high risks from land slides or subsidence

Impact level	Detail of impacts	Outline any management controls/mitigation measures
Select level...		

15.1.4 Noise and vibration impacts

Is the activity likely to have noise or vibration impacts on nearby sensitive receptors?

Impact level	Detail of impacts	Outline any management controls/mitigation measures
Select level...		

**15.1.5 Coastal processes and hazards**

Is the activity likely to affect coastal processes and hazards including those under projected climate change conditions?

Impact level	Detail of impacts	Outline any management controls/mitigation measures
Select level...		

**15.1.6 Hazardous substances and chemicals**

Is the activity likely to result in impacts associated with the use, generation, storage or transport of hazardous substances or chemicals?  
Consider any:

- use, storage or transport of hazardous substances
- use or generation of chemicals which may build up residues in the environment
- chemicals or radioactive material that will be reacted, returned to the surface or left in a drill hole or target formation.

Impact level	Detail of impacts	Outline any management controls/mitigation measures
Select level...		

**15.1.7 Wastes and emissions**

Is the activity likely to result in any impacts to the environment resulting from the generation or disposal of gaseous, liquid or solid wastes or emissions?

Impact level	Detail of impacts	Outline any management controls/mitigation measures
Select level...		

15.2 Biological impacts

For guidance refer to Section 4.2 of [ESG2: Guideline for preparing a Review of Environmental Factors](#).

Fauna and flora (including impact on Threatened Species, Populations or Ecological Communities or their Habitats – for the purposes of [Section 5A](#) of the Environmental Planning and Assessment Act 1979, and in the administration of Sections 111 and 112, the matters below must be taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities or their habitats.

This assessment of significance must be undertaken pursuant to the assessment guidelines issued and in force under the Threatened Species Conservation Act 1995 or the Fisheries Management Act 1994. This assessment of the significance is the first step in considering potential impacts. When a significant effect is likely, a Species Impact Statement (SIS) prepared in accordance with the Threatened Species Conservation Act 1995 or the Fisheries Management Act 1994 may be required.

15.2.1 Vegetation

Is any vegetation to be cleared or modified (including vegetation of conservation significance)?

Impact level	Detail of impacts	Outline any management controls/mitigation measures
Select level...		

15.2.2 Threatened species

Is the activity likely to have an adverse effect on the life-cycle of a threatened species such that a viable local population of the species is likely to be placed at risk of extinction?

Impact level	Detail of impacts	Outline any management controls/mitigation measures
Select level...		

**15.2.3 Endangered populations**

Is the activity likely to have an adverse effect on the life-cycle of a species that constitutes an endangered population such that a viable local population of the species is likely to be placed at risk of extinction?

Impact level	Detail of impacts	Outline any management controls/mitigation measures
Select level...		

**15.2.4 Critical habitat**

Is the activity likely to have an adverse effect on critical habitat (either directly or indirectly)? (Refer to Question 10.7)

Impact level	Detail of impacts	Outline any management controls/mitigation measures
Select level...		

**15.2.5 Endangered ecological community or critically endangered ecological community**

Select as relevant:

- ☐ The activity is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction.
- ☐ The activity is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Impact level	Detail of impacts	Outline any management controls/mitigation measures
Select level...		



**15.2.6 Habitat of a threatened species, population or ecological community**

Select as relevant:

- ☐ The extent to which the habitat is likely to be removed or modified as a result of the activity will be significant.
- ☐ The area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the activity.
- ☐ The habitat to be removed, modified, fragmented or isolated is important to the long-term survival of the species, population or ecological community in the locality.

Impact level	Detail of impacts	Outline any management controls/mitigation measures
Select level...		

**15.2.7 Recovery plan or threat abatement plan**

Is the activity consistent with the objectives or actions of any relevant plan?

Impact level	Detail of impacts	Outline any management controls/mitigation measures
Select level...		

**15.2.8 Key threatening process**

Will the activity constitute or form part of a [key threatening process](#) or is likely to result in the operation of, or increase the impact of, a key threatening process?

Impact level	Detail of impacts	Outline any management controls/mitigation measures
Select level...		

15.2.9 Barriers to movement

Does the activity have the potential to endanger, displace or disturb fauna or create a barrier to their movement?

Impact level	Detail of impacts	Outline any management controls/mitigation measures
Select level...		

15.2.10 Ecological and biosecurity impacts

Select as relevant:

- ☐ The activity is likely to cause a threat to the biological diversity or ecological integrity of an ecological community.
- ☐ The activity is likely to create a biosecurity risk or introduce modified organisms into an area.
- ☐ The activity is likely to cause a bushfire risk.

Impact level	Detail of impacts	Outline any management controls/mitigation measures
Select level...		

15.3 Resource use impacts

For guidance refer to Section 4.3 of [ESG2 Guideline for preparing a Review of Environmental Factors](#).

15.3.1 Community resources

Is the activity likely to degrade or significantly increase the demand for services and infrastructure resources?

Note: Infrastructure includes roads, power, water, drainage, waste management, educational, medical or social services.

Impact level	Detail of impacts	Outline any management controls/mitigation measures
Select level...		

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Is the activity likely to require any significant resource recycling or reuse schemes to reduce resource usage?

Impact level	Detail of impacts	Outline any management controls/mitigation measures
Select level...		

Is the activity likely to result in any diversion of resources to the detriment of other communities or natural systems?

Impact level	Detail of impacts	Outline any management controls/mitigation measures
Select level...		

15.3.2 Natural resources

Is the activity likely to disrupt, deplete or destroy natural resources?

*Note: Natural resources include land and soil, water, air and minerals.*

Impact level	Detail of impacts	Outline any management controls/mitigation measures
Select level...		

Is the activity likely to disrupt existing activities (or reduce options for future activities)?

Impact level	Detail of impacts	Outline any management controls/mitigation measures
Select level...		

Is the activity likely to result in the degradation of any area reserved for conservation purposes?

Impact level	Detail of impacts	Outline any management controls/mitigation measures
Select level...		

**15.4 Community impacts**

For guidance refer to Section 4.4 of [ESG2 Guideline for preparing a Review of Environmental Factors](#).

**15.4.1 Social impacts**

Is the activity likely to result in a change to the demographic structure of the community, including changes to workforce or industry structure of the area/region?

Impact level	Detail of impacts	Outline any management controls/mitigation measures
Select level...		

Is the activity likely to have an environmental impact that may cause substantial change or disruption to the community, including loss of facilities, reduced links to other communities or loss of community identity?

Impact level	Detail of impacts	Outline any management controls/mitigation measures
Select level...		

Is the activity likely to result in some individuals or communities being significantly disadvantaged?

Impact level	Detail of impacts	Outline any management controls/mitigation measures
Select level...		

Is the activity likely to result in any impacts on the health, safety, privacy or welfare of individuals or communities because of factors such as air pollution, odour, noise, vibration and lighting?

Impact level	Detail of impacts	Outline any management controls/mitigation measures
Select level...		



Is the activity likely to result in a change in the level of demand for community resources, including community facilities, community services and labour force?

Impact level	Detail of impacts	Outline any management controls/mitigation measures
Select level...		

15.4.2 Economic impacts

Is the activity likely to have significant economic impacts? Consider any impacts that may:

- affect economic activity (positive or negative), particularly impacts which result in a decrease to net economic welfare
- result in a decrease in the economic stability of the community
- result in a change to the public sector revenue or expenditure base.

Impact level	Detail of impacts	Outline any management controls/mitigation measures
Select level...		

15.4.3 Heritage impacts

Is the activity likely to cause impacts on localities, places, landscapes, buildings or archaeological relics of heritage significance?

Impact level	Detail of impacts	Outline any management controls/mitigation measures
Select level...		

15.4.4 Aesthetic impacts

Is the activity likely to cause impacts on the visual or scenic landscape, including any venting or flaring of gas?

Impact level	Detail of impacts	Outline any management controls/mitigation measures
Select level...		

**15.4.5 Cultural impacts**

Will the activity disturb the ground surface or any culturally modified trees?

Impact level	Detail of impacts	Outline any management controls/mitigation measures
Select level...		

Will the activity affect known Aboriginal objects or Aboriginal places?

Impact level	Detail of impacts	Outline any management controls/mitigation measures
Select level...		

Is the activity located in areas where landscape features indicate the presence of Aboriginal objects?

Impact level	Detail of impacts	Outline any management controls/mitigation measures
Select level...		

Can harm to Aboriginal objects or disturbance of landscape features be avoided?

Impact level	Detail of impacts	Outline any management controls/mitigation measures
Select level...		

Will the activity affect areas subject to native title claims, indigenous land use agreements or joint management agreement?

Impact level	Detail of impacts	Outline any management controls/mitigation measures
Select level...		

15.4.6 Land use impacts

Is the activity likely to result in major changes to land use, including any curtailment of other beneficial land uses?

Impact level	Detail of impacts	Outline any management controls/mitigation measures
Select level...		

Is the activity likely to result in any significant property value impacts with land use implications?

Impact level	Detail of impacts	Outline any management controls/mitigation measures
Select level...		

15.4.7 Transportation impacts

Is the activity likely to result in any significant impacts on transportation? Consider any:

- substantial impacts on existing transportation systems (such as road, rail, pedestrian) which alter present patterns of circulation or movement
- impacts associated with direct or indirect additional traffic.

Impact level	Detail of impacts	Outline any management controls/mitigation measures
Select level...		

**15.5 Matters of National Environmental Significance**

For guidance refer to Section 4.5 of [ESG2 Guideline for preparing a Review of Environmental Factors](#).

Is the activity likely to impact on any of the following matters of National Environmental Significance under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*? Select as relevant:

- ☐ Listed threatened species and communities
- ☐ Listed migratory species
- ☐ Ramsar wetlands of international importance
- ☐ Commonwealth marine environment
- ☐ World heritage properties
- ☐ National heritage places
- ☐ Great Barrier Reef Marine Park
- ☐ Nuclear actions
- ☐ A water resource, in relation to coal seam gas development and large coal mining development

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---

## 16 Rehabilitation Cost Estimate

All authority holders are required to lodge a security deposit with the department to cover the Government's full costs in undertaking rehabilitation in the event of default by the authority holder. A Rehabilitation Cost Estimate must be submitted with all applications. The Rehabilitation Cost Estimate is used by the department to help determine the amount of the security. Refer to [ESG1 Rehabilitation Cost Estimate Guidelines](#) and [ESB26 Rehabilitation Cost Calculation Tool](#) for more information.

The scope of the Rehabilitation Cost Estimate must include the cost of fulfilling any rehabilitation liabilities or other obligations associated with on-going previously approved exploration activities on the authority, as well as proposed exploration activities subject to this application.

### 16.1 Is your application for a Common Exploration Activity?

- ☐ Yes. Go to **Question 16.2**.
- ☒ No. Go to **Question 16.3**.

### 16.2 Will the cost of fulfilling any rehabilitation liabilities associated with the proposed Common Exploration Activity, as well as any previously approved exploration activities on the authority, exceed \$10,000?

- ☒ Yes. Go to **Question 16.3**.
- ☐ No. Go to **Question 17**. No Rehabilitation Cost Estimate needs to be lodged.

### 16.3 Have you already lodged an RCE related to this application?

- ☐ Yes. Provide the Rehabilitation Cost Estimate lodgement date and further details in text box below and **go to Question 17**.

- ☒ No. Attach a Rehabilitation Cost Estimate which evidences how the estimate is derived and complete the fields below.

Select one of the options below to confirm the methodology

Department's Rehabilitation Cost  
Schedule

☐

Other

☒

Current security held by the department

\$336,000

Total of this Rehabilitation Cost Estimate

\$335,194



NSW Department of Industry, Division of Resources and Energy  
**ESF4 Application to conduct exploration activities**

## 17 Checklist of items to be included with this application

Item		Reference
Minister's consent to prospect in exempted areas (if applicable)	<input type="checkbox"/>	Question 4
Minister's consent to prospect in a State Conservation Area (if applicable)	<input type="checkbox"/>	Question 5
A Guideline Review of Environmental Factors	<input checked="" type="checkbox"/>	Question 7 and Question 15
Agricultural Impact Statement	<input checked="" type="checkbox"/>	Question 8
Site plan/maps showing location of activities and proposed site layout	<input checked="" type="checkbox"/>	Question 9
Site photographs of the site/s prior to disturbance	<input checked="" type="checkbox"/>	Question 9
Copy of the Atlas's Vegetation Information System search	<input type="checkbox"/>	Question 10.8
Copy of the Atlas NSW Wildlife search	<input type="checkbox"/>	Question 10.8
Threatened species assessment of significance	<input type="checkbox"/>	Question 10.8 and Question 13.4
Copy of threatened and protected species records for aquatic habitats	<input type="checkbox"/>	Question 10.9
Heritage database search	<input type="checkbox"/>	Question 10.10 and Question 13.6
AHIMS search	<input type="checkbox"/>	Question 10.11
Aboriginal heritage due diligence assessment	<input type="checkbox"/>	Questions 10.11 and Question 13.5
Rehabilitation Cost Estimate	<input checked="" type="checkbox"/>	Question 16
For agents only – evidence of appointment as agent by the authority holder/s	<input type="checkbox"/>	Question 18

### 17.1 Have you lodged all the required information with this form?

- ☒ Yes
- ☐ No. I will provide outstanding information within 10 business days of lodging this application. **Note:** processing of your application will not commence until all information is received and is considered administratively complete.

Describe the additional information to be provided.

NSW Department of Industry, Division of Resources and Energy  
**ESF4 Application to conduct exploration activities**

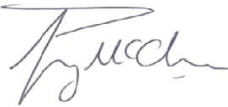
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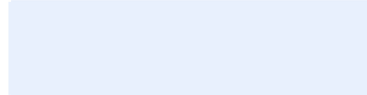
## 18 Declaration

This form should be signed by the authority holder/s or an authorised representative.

I/We certify that the information provided in this application is true and correct. I/We understand that under [Part 5A](#) of the *Crimes Act 1900*, knowingly giving false or misleading information is a serious offence; and under [Section 378C](#) of the *Mining Act 1992*, any person who provides information that the person knows to be false or misleading is guilty of an offence, for which they may be subject to prosecution.

### Declaration by authority holder/s

Authority Holder Name	Anthony McClure
Position/title	Director
Date	16 March 2017
Signature	

Authority Holder Name	
Position/title	
Date	
Signature	

Authority Holder Name	
Position/title	
Date	
Signature	

OR

### Declaration by agent authorised to act for this authority holder

Provide evidence of appointment by the authority holder.

Name	
Position/title	
Date	
Signature	

NSW Department of Industry, Division of Resources and Energy  
**ESF4 Application to conduct exploration activities**

---

## Office use only

Application received:

Time:  Date:

## Received under delegation from the Secretary

Name

Signature

## Document control

Authorised by: Executive Director, Compliance and Enforcement

RM8 Reference: PUB16/112 INT16/17754 (V15/5289#12)

### Amendment schedule

Date	Version #	Amendment
01 March 2016	2.0	New template
06 March 2016	2.1	Hyperlinks updated, minor edits
19 July 2016	2.2	Repeated note from Page 2 "Requests for approval to prospect in a SCA" at Q5
12 September 2016	2.3	Updated links to legislation; updated Q7 & Q8 clarifying that an AIS is not required for CEAs; clarifying Q15 for non-CEAs; amending Q16 so that a RCE is not required for CEAs where rehabilitation liability is less than \$10,000.

# Appendix 2

## Agricultural Impact Statement

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# Agricultural Impact Statement

for the

## Bowdens Gumarooka Exploration Activities – EL 5920(1)

*Prepared in conjunction with:*



**R.W. CORKERY & CO. PTY. LIMITED**

March 2017

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ABN: 37 009 250 051

# Agricultural Impact Statement

for the

## Bowdens Gumarooka Exploration Activities – EL 5920(1)

---

**Prepared by:**

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Ref No. 429/27

March 2017



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## **LIST OF ACRONYMS**

AHD	Australian Height Datum
AIS	Agricultural Impact Statement
BSAL	Biophysical Strategic Agricultural Land
CLG	community liaison group
DD	Diamond (core) drilling
DPI	Department of Primary Industries
DRE	Division of Resources and Energy
EL	Exploration Licence
JORC	Joint Ore Reserves Committee
LHPA	Livestock, Health and Pest Authority
RC	Reverse circulation percussion drilling
REF	Review of Environmental Factors
SMU	soil mapping unit
WESCMP	Water, Erosion and Sediment Control Management Plan

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## 1. INTRODUCTION

This Agricultural Impact Statement (AIS) has been prepared in conjunction with R.W. Corkery & Co. Pty Limited to accompany a Review of Environmental Factors (REF) that has been prepared by Bowdens Silver Pty Limited (“the Company”) to assess the likely environmental impacts of proposed mineral exploration activities within the “Gumarooka Exploration Area” of Exploration Licence (EL) 5920(1) near Lue, approximately 26km east of Mudgee, NSW (**Figure 1**). A previous REF dated 2016 (Bowdens, 2016) focussed on a separate Exploration Area (“Stage 2 Exploration Area”) which is shown in **Figure 1**, however this AIS accompanies only the activities proposed in the Gumarooka REF 2017.

This AIS has been compiled generally in accordance with the Strategic Land Use Policy – Guideline for Agricultural Impact Statements at the Exploration Stage (DPI, 2015) and addresses each of the issues to be addressed in a Level 2 Exploration AIS.

The primary objective of the proposed Gumarooka Exploration Program is to

- sterilise a number of areas that may be required for construction of infrastructure for a mining operation, should all the required approvals be received; and
- follow up on previous exploration results.

This AIS is intended to be read in conjunction with the *Review of Environmental Factors for Bowdens Gumarooka Exploration Activities – EL 5920(1)*. As the dominant agricultural activity in the Gumarooka Exploration Area is grazing with some minor cropping, the focus of this AIS has been on the soil and water resources within the area as they are considered the key agricultural resources with the potential to be impacted by the proposed exploration activities.

For the purposes of this document, the following terminology is used.

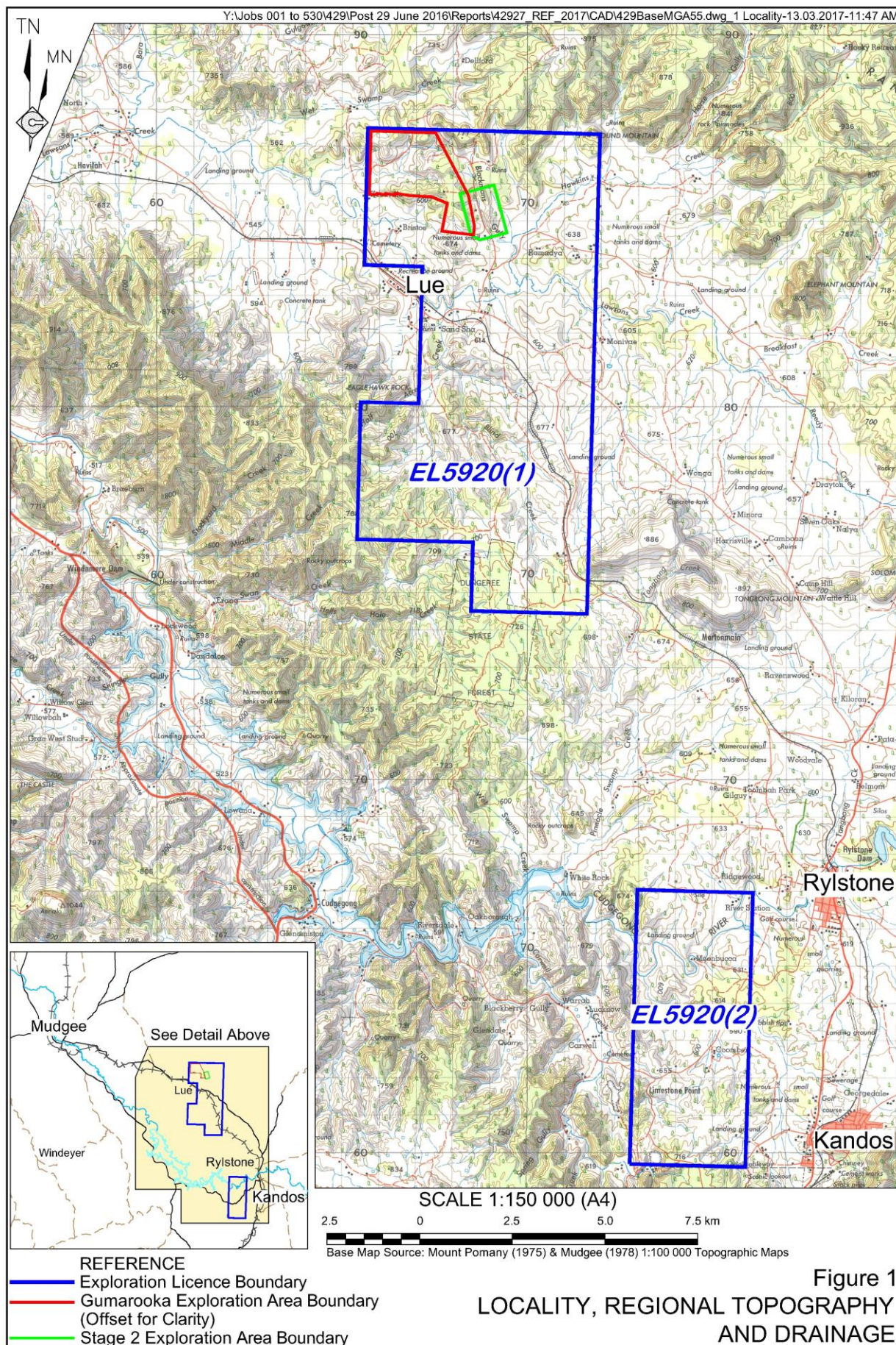
- Licence Area – the area covered by EL 5920 (see **Figure 1**).
- Gumarooka Exploration Area – an area covering approximately 483ha area in which the Gumarooka Exploration activities and sterilisation drilling would be undertaken (see **Figure 2**).

The Gumarooka Exploration Area lies generally within the centre of a 1 559ha area of land owned by the Company. The land has been purchased in recognition of the need for the development of a mine centred on the Stage 2 Exploration Area, the land required for mine-related infrastructure as well as an operational buffer between the proposed mining and related operations and the surrounding land uses.

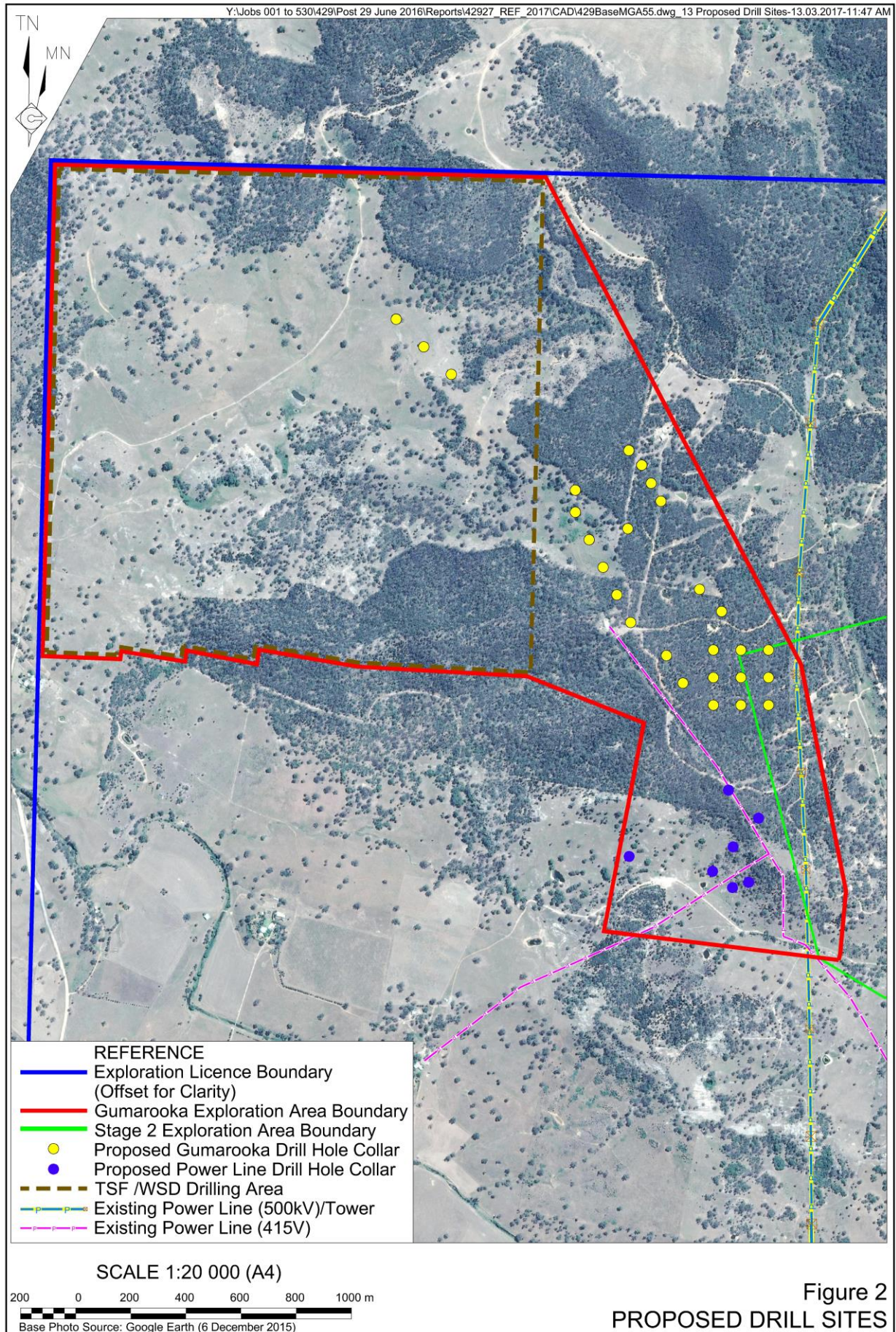
## 2. OVERVIEW OF THE PROPOSED EXPLORATION ACTIVITIES

The Company proposes to drill a total of 50 holes. All drill holes would initially be drilled using reverse circulation (RC) drill methods, with some drill holes potentially requiring a diamond core tail to reach the required depth (**Figure 2**).











**Figure 2** displays the locations of the proposed drill holes.

Details of Gumarooka exploration activities are set out in Section 3 of the REF.

### 3. CONSULTATION

The Company has reviewed the *Exploration Code of Practice: Community Consultation* dated March 2016 and assigned the Activity Impact Assessment scores as outlined within the guideline (see **Table 1**).

**Table 1**  
**Activity Impact Assessment Scoring for Consultation**

Assessment Component	Level of Impact	Score
Level of community interest	Medium – Intermediate level of interest with locally known community members and groups.	8
Activity type	High – The proposed activities do not meet the common exploration activities criteria.	8
Population Density	Medium – Intermediately populated <sup>1</sup> .	1
Location – dwellings	Low – Less than 100 dwellings within 2km.	0
Location – sensitive receivers (excluding dwellings)	Low – No other sensitive receivers (e.g. school, church, etc.) known within 2km.	0
Cumulative impact	Low – No other mining or extractive industry projects known within 5km.	0
Temporal impact	High – Activity would occur for more than 12 months.	2
<b>Consultation Assessment Score</b>		<b>19</b>

In summary, with a Consultation Assessment Score of 19, the consultation category is classified as “Medium Impact” for which the *Exploration Code of Practice: Community Consultation* defines the following relevant stakeholders.

- Landholders and residents/tenants at the site of the activity.
- Native title holders or claimants.
- Relevant local community and environment groups.
- Local government.
- Landholders, residents and businesses within 5km<sup>2</sup> of the operational area.
- Local Aboriginal Land Council.
- NSW Government local Member of Parliament.

<sup>1</sup> Mid-Western Regional (A) Statistical Local Area – Population 18 977 (ABS, 2011).

<sup>2</sup> As per REF.

In accordance with the requirements of Exploration Code of Practice: Community Consultation and Condition 34 of EL 5920, the Company has / would undertake the following consultation prior to commencing exploration activities.

- Landowners within the Gumarooka Exploration Area – the Company is negotiating an access agreement with the only non-company related freehold landowner within the Gumarooka Exploration Area (see **Figure 3**). The landowner would be informed about the planned drilling activities on their land in accordance with the terms of any agreement reached. In the event that an agreement cannot be reached, exploration activities would not be undertaken on that land.
- Surrounding Landowners – All landowners and occupants within a 2km radius of the Gumarooka Exploration Area (see **Figure 3**) will be notified to give them an overview of the planned activities for the Gumarooka Exploration Program. It is planned to contact all adjoining landowners and occupants personally and the remaining landowners and occupants through a newsletter, Company website update or advertisement in the Mudgee Guardian to notify them of the commencement of the Gumarooka drilling activities.
- Wider Community / Non-residential Stakeholders – The wider community and non-residential stakeholders will be advised of the Gumarooka Exploration Program by a personalised mail out and an update on the Company website. The Company has also employed a Community Liaison Officer who is a resident in the district. Contact details of the Community Liaison Officer will be distributed with the mailout and are available on the company website.
- Community Consultation Committee – the Company has established an Exploration Community Consultation Committee (CCC) comprising an independent chair, and representatives from the Lue community, Mid-Western Regional Council, Mudgee, Kandos, Rylstone and the Company. The CCC is designed to be the primary formal focus of information exchange between community members and the Company.
- Local Indigenous Communities – Contact with Aboriginal stakeholder groups was previously managed through the consulting archaeologist conducting the Aboriginal Cultural Heritage assessment for the Bowdens Silver Project. All identified artefacts which could be disturbed by exploration activities have also previously been recovered. The Managing Director of Bowdens Silver has been in contact with all Local Indigenous communities and would remain a point of contact. The Community Liaison Officer has contacted all registered Indigenous stakeholder groups and provided contact information. The Company has established relationships with the Murong Gialinga and Buudang Aboriginal stakeholder groups.
- Native Title – Native Title has been extinguished on all lands within the Gumarooka Exploration Area. However, consultation with relevant Native Title Claimants for the area has been undertaken as part of the consultation with all local Indigenous communities.

- Mid-Western Regional Council – Council has been briefed regarding the planning for the proposed Gumarooka Exploration Program.
- Local Members – The offices of the NSW local members for the Upper Hunter, Michael Johnsen, and NSW local member for Dubbo, Troy Grant have been informed of the proposed Gumarooka Exploration Program.
- Division of Resources and Energy – Discussions have been held with DRE officers regarding the planning for the proposed Gumarooka Exploration Program and the required approach to the REF preparation.

## **4. POTENTIALLY IMPACTED AGRICULTURAL RESOURCES OR INDUSTRIES**

### **4.1 COMPANY-OWNED LAND**

#### **4.1.1 Agricultural Resources**

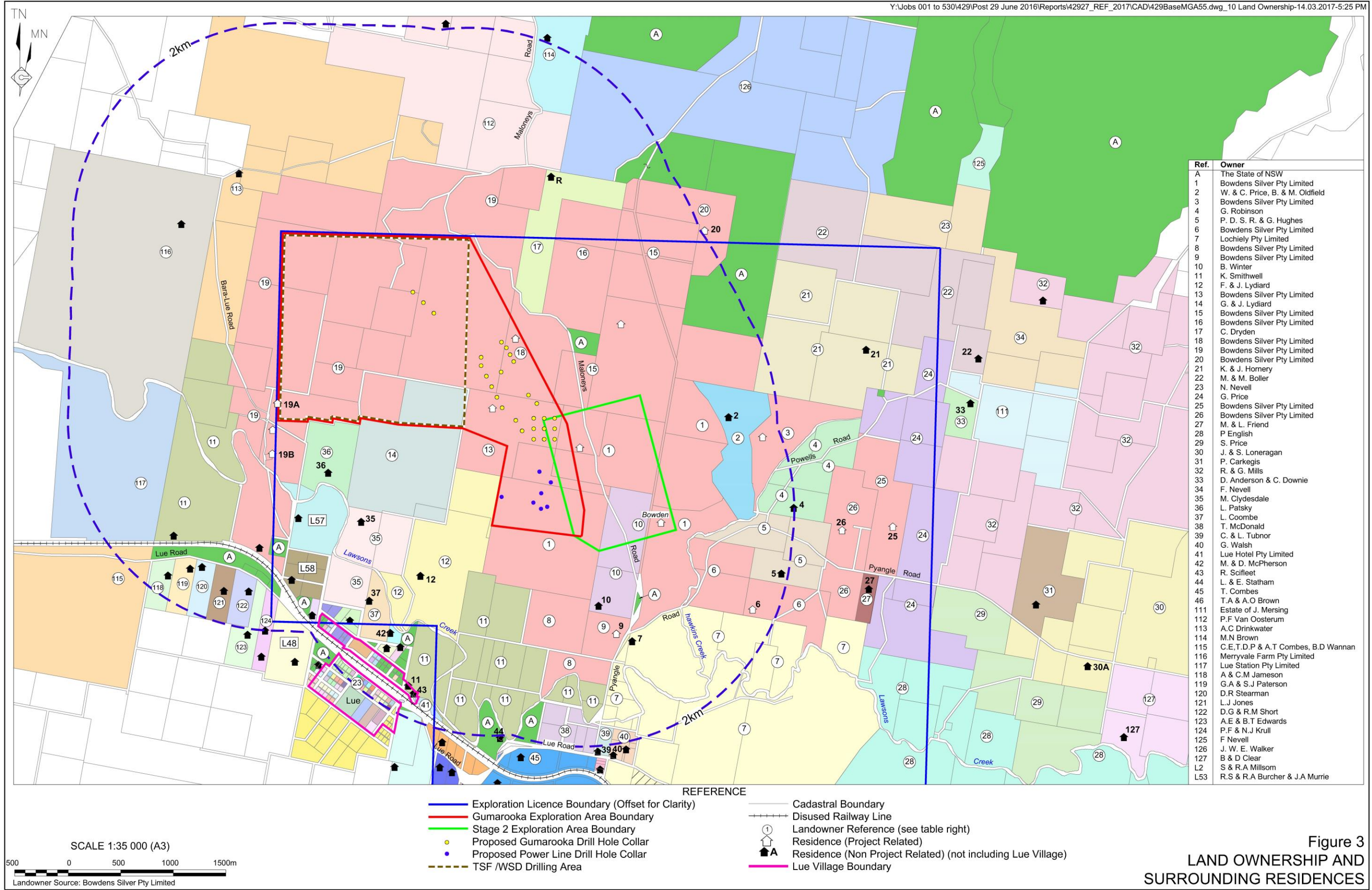
The principal historic land use within the Gumarooka Exploration Area is the grazing of cattle and sheep, with minor cropping. The Company holds approximately 1 559ha of land that is divided into a number of paddocks. Sections of the Company landholding has been subjected to clearing for the purposes of cropping and grazing activities, a majority of this cleared land is not arable, but is suitable for grazing purposes only. The remaining land is considered unsuitable for agricultural uses due to rock outcrop and tree density. Cropping activity has historically involved the periodic planting of cereal crops, legumes or pasture improvements as well as a small area being used for vegetable production. The company land is current being run as a sheep and cattle grazing operation by the company.

#### **4.1.2 Potential Impacts**

The potential impacts to the agricultural resources of the Company-owned land include:

1. loss of the soil resources as a result of disturbance associated with the establishment of drilling pads and access tracks;
2. loss of surface water resources through the take of dam water for use in the drilling program; and
3. loss of groundwater resources due to standing water level drawdown as a consequence of extraction during the drilling program.







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## **4.2 SURROUNDING LAND**

### **4.2.1 Agricultural Resources**

Existing land uses within the local area comprise primarily rural activities such as grazing and some cropping with interspersed lifestyle blocks for hobby farming. Land parcels range from grazing properties of up to 200ha to hobby farms/lifestyle blocks of <50ha. The outskirts of parts of the Lue Village are included within EL 5920(1) but are not within the Gumarooka Exploration Area.

The soil and water resources within and surrounding the Gumarooka Exploration Area are considered to be the key agricultural resources with the potential to be impacted by the proposed exploration activities. The land ownership surrounding the Gumarooka Exploration Area is shown on **Figure 3**. Land to the east, north and west of the Gumarooka Exploration Area is owned by the Company. The owners of neighbouring properties include the following.

- K Smithwell – south and southwest.
- F and J Lydiard – south.
- G and J Lydiard – south.
- L Patsky – south.
- AC Drinkwater – northwest.
- PF van Oosterum – north.
- C Dryden – northeast.

It is noted that there is no Biophysical Strategic Agricultural Land (BSAL), intensive plant agriculture such as orchards or vineyards, or intensive livestock agriculture within the Gumarooka Exploration Area.

### **4.2.2 Potential Impacts**

The potential impacts to the agricultural resources of the surrounding agricultural land include:

1. loss of access to the local groundwater resources due to standing water level drawdown as a consequence of extraction during the drilling program; and
2. increased sedimentation within local watercourses as a result of erosion at drill sites or access tracks related to the drilling activity.

## **4.3 AGRICULTURAL INDUSTRIES**

As the typical land use surrounding the Gumarooka Exploration Area comprises primarily grazing and some cropping with many blocks recognised as hobby farm/lifestyle blocks, no significant agricultural industries are present that could be impacted by the proposed exploration activity.

Although some horses are kept on the surrounding properties, it is understood that no horse studs are located either on site or surrounding the Gumarooka Exploration Area.

#### **4.4 SENSITIVE AGRICULTURAL ACTIVITIES**

Sensitive agricultural activities may include intensive plant agricultural activity (e.g. orchards or vineyards) or intensive livestock agricultural activity (e.g. piggery or feedlot) or breeding paddocks.

An assessment of available aerial imagery indicates that no intensive agricultural activities are within 3km of the Gumarooka Exploration Area, nor are any breeding paddocks located within 300m of the Gumarooka Exploration Area.

#### **4.5 BIOPHYSICAL STRATEGIC AGRICULTURAL LAND**

No biophysical strategic agricultural land (BSAL) has been mapped within the Gumarooka Exploration Area. The nearest mapped BSAL is located more than 5.5km to the northeast.

#### **4.6 AGRICULTURAL BIOSECURITY**

The biosecurity of local and regional agricultural enterprises may be affected via a number of means as a result of the proposed exploration activities. **Table 2** presents the biosecurity matters, the potential transmission methods and, if applicable, the relevant section of this AIS where mitigation measures are described.

**Table 2**  
**Biosecurity Matters**

<b>Transmission Method</b>	<b>Biosecurity Matter</b>	<b>Relevant</b>	<b>Section Addressed</b>
Livestock	Disease	No	Not Required
Vehicles	Disease, Pests, Weeds	Yes	5.6.1
Feed	Disease	No	Not Required
Water	Disease, Weeds	Yes	5.6.2
Personnel	Disease, Weeds	Yes	5.6.3
Air	Disease, Weeds	Yes	5.6.4

### **5. SOIL, LAND AND WATER RESOURCES**

#### **5.1 SOIL OCCURRENCES**

The Gumarooka Exploration Area is located within an area covered by the Dubbo 1:250 000 Soils Landscape Map (Murphy and Lawrie, 1998). The soil landscape descriptions are contained in Murphy and Lawrie (1998).

Site specific soil studies were commissioned by the previous owner of EL 5920 to support future applications for mining operations. These studies were undertaken by Geoff Cunningham Natural Resource Consultants Pty Ltd in 2012 and 2013 (Cunningham, in prep). Reliance has been placed upon the site specific soil studies for this document.

The soil survey conducted by Cunningham included a total of 46 test pits within and to the east of the Gumarooka Exploration Area targeting the main topographic features. A total of four soil mapping units (SMU) were identified, the boundaries of which are shown on **Figure 4**. A brief description of the soil units is presented below.

### **SMU 1 – Soils of the Crests and Upper Slopes**

The Australian Soil Classification for these soils is “Dermosols (Red and Yellow)”. These soils were test-excavated to a maximum depth of 115cm with some profiles reaching refusal at a depth of only 15cm. These soils are located on crests, rocky outcrops, uplands or upper slope locations. SMU1 is described as follows.

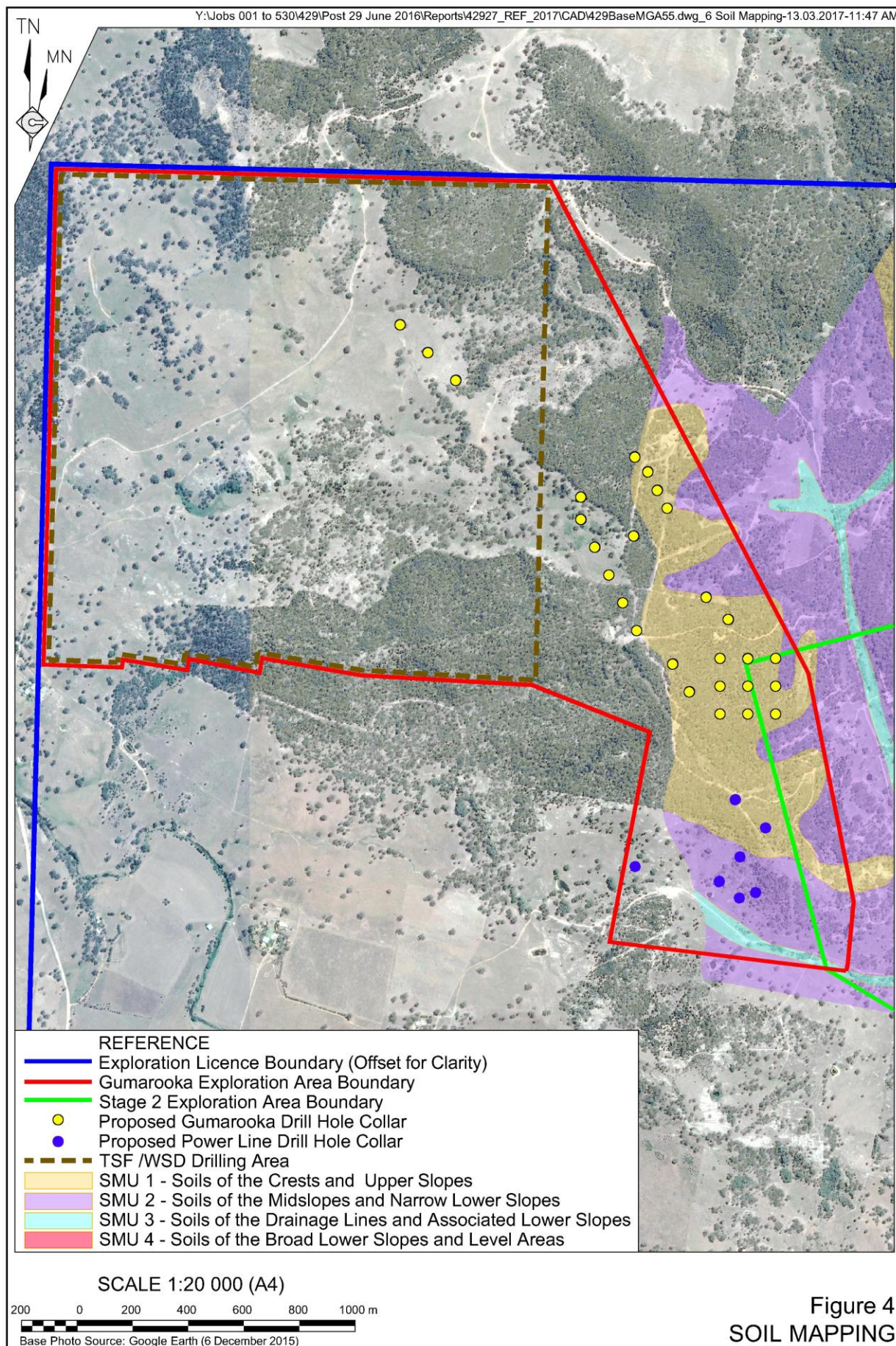
- Surface Condition – usually hardsetting, outcrops sometimes present with surface stone absent with moderate to angular gravel to 15cm to 30cm.
- Topsoil – sometimes well-structured, more usually massive. Consists of sandy loam, sandy clay loam / clay loam, light clay, gritty light to medium clay; pH rarely 4.5 to 6.5; many roots with no lime or manganese present; some to angular and/or flat gravel <5mm to 6cm to 10cm; not mottled or bleached; sometimes hydrophobic. Clear, abrupt or sharp horizon from A horizon to bedrock of B<sub>1</sub> soil horizon.
- Subsoil – comprises up to two horizons (or bedrock); fine sandy clay loam to medium to heavy clay textured; pH 4.5 to 5.5; many roots; no lime or manganese; some flat and/or rounded gravel <1cm to 10cm and to 20cm to 30cm present; not mottled; not bleached; well-structured or massive.

### **SMU 2 – Soils of the Midslopes and Narrow Lower Slopes**

The Australian Soil Classification for these soils is “Dermosols (Red and Yellow)”. These soils were test-excavated to a maximum depth of between 57cm and 250cm and are located on midslopes or lower slope locations. SMU2 is described as follows.

- Surface Condition – hardsetting, rarely firm, some rounded angular and flat gravel up to 4cm present, angular surface stone 10cm / 15cm to 40cm present, occasionally surface stone absent.
- Topsoil – A<sub>1</sub> horizon. Clayey sand / sandy loam, sandy clay loam, fine sandy clay loam, clay loam, light clay, light to medium clay, medium to heavy clay; roots common; no lime or manganese present; pH 5.5 to 7.0; some flat, angular, rounded and/or rounded / angular gravel <1cm to 5cm; rarely to 8cm; roots common; no lime or manganese present, small to moderate amounts of flat floaters 20cm to 40cm x 6cm to 8cm thick; not mottled; not bleached; sometimes hydrophobic; usually well structured; rarely massive. Usually abrupt, but sometimes sharp or clear to A<sub>2</sub> horizon.





**Figure 4**  
**SOIL MAPPING**



A<sub>2</sub> horizon – sandy loam, medium clay, sticky medium clay, medium to heavy clay; roots common, rarely few roots; no lime or manganese present; pH 5.0 to 7.5; some flat, angular, rounded and/or rounded / angular gravel <1cm to 5cm, not mottled; bleached; well structured; occasionally slightly hydrophobic.

- Subsoil – comprising two to four layers (B<sub>1</sub>, B<sub>2.1</sub> B<sub>2.2</sub> and B<sub>3</sub> horizons); generally clay textured, usually not mottled but some mottling occurs at depth in some profiles; pH 4.5 to 7.5, gravel and stones present; usually well structured, occasionally massive; usually not hydrophobic.

### **SMU 3 – Soils of the Watercourses and Associated Lower Slopes**

The Australian Soil Classifications for these soils are “Dermosols (Brown and Black) and Kandosols (Brown and Black)”. These soils were test-excavated to a maximum depth of between 180cm and 250cm and are based on watercourses, creek banks and lower slope locations. SMU3 is described as follows.

- Surface Condition – usually hardsetting, occasionally loose or firm; surface stone often absent or some angular surface stone to 15cm present.
- Topsoil – A<sub>1</sub> horizon. Sandy clay loam; sandy clay; light clay; light to medium clay; medium clay; gritty medium clay; many roots; no lime or manganese present; pH 5.5 to 7.0; some angular, rounded and rounded angular gravel <5 mm to 2cm; stones to 12cm; not mottled; not bleached; well structured; not hydrophobic.

A<sub>2</sub> horizon – Sandy clay loam; sandy clay; light clay; light to medium clay; medium clay; gritty medium clay; many roots; no lime or manganese present; pH 6.5 to 7.0; some angular, flat, rounded and rounded / angular gravel <1cm to 4cm, sometimes occasional angular stones to 15cm present; not mottled; bleached; well structured; or massive; not hydrophobic.

- Subsoil – Comprised of two to four horizons (B<sub>1</sub>, B<sub>2.1</sub> B<sub>2.2</sub> and B<sub>3</sub> horizons); clayey sand to heavy clay textured; sometimes mottled at depth; usually well structured, sometimes massive; pH generally 5.0 to 7.5; some gravel present; not hydrophobic.

### **SMU 4 – Soils of the Broad Lower Slopes and Level Areas**

The Australian Soil Classification for these soils is “Dermosols (Grey and Brown)”. These soils were test-excavated to a maximum depth of between 88cm and 250cm and are based on lower slopes and ridges, level plain location and rare rock outcrops. SMU 4 is described as follows.

- Surface Condition – usually hardsetting, rarely loose; surface stone absent or some to moderate amounts of angular, rounded and rounded angular surface stone 10cm to 20cm present.
- Topsoil – A<sub>1</sub> horizon. Sandy clay loam, sandy clay loam to clay loam, medium clay; many roots; no lime or manganese present; pH 6.0 to 7.0; some to moderate amounts of angular, rounded / angular, rounded and/or flat gravel <1cm to 3cm; not mottled; not bleached; well structured; rarely slightly hydrophobic.

A<sub>2</sub> horizon (sometimes present) – sandy loam; sandy clay loam; few roots; no lime or manganese present; pH 6.0 to 7.0; some angular gravel 1cm to 3 cm; not mottled; bleached; well structured; or massive; fabric earthy; not hydrophobic.

- Subsoil – Comprised of two to four horizons (B<sub>1</sub>, B<sub>2.1</sub> B<sub>2.2</sub> and B<sub>3</sub> horizons); variably clay textured; some to moderate amounts of gravel and stones present; some gravel and stones absent; whole coloured or mottles present; usually well structured; not hydrophobic.

## **5.2 LAND AND SOIL CAPABILITY**

The Land and Soil Capability within the Gumarooka Exploration Area has been mapped by OEH (see **Figure 5**). These classifications were supported by the soil survey completed in 2012 and 2013 by Geoff Cunningham Natural Resource Consultants Pty Ltd.

The mapped Land and Soil Capability within the Gumarooka Exploration Area are as follows.

**Class 5 Moderate – low capability land:** Land has high limitations for high-impact land uses. Would restrict land management options for regular high impact land uses such as cropping, high intensity grazing and horticulture. These limitations can only be managed by specialised management practices with a high level of knowledge, expertise, inputs, investment and technology.

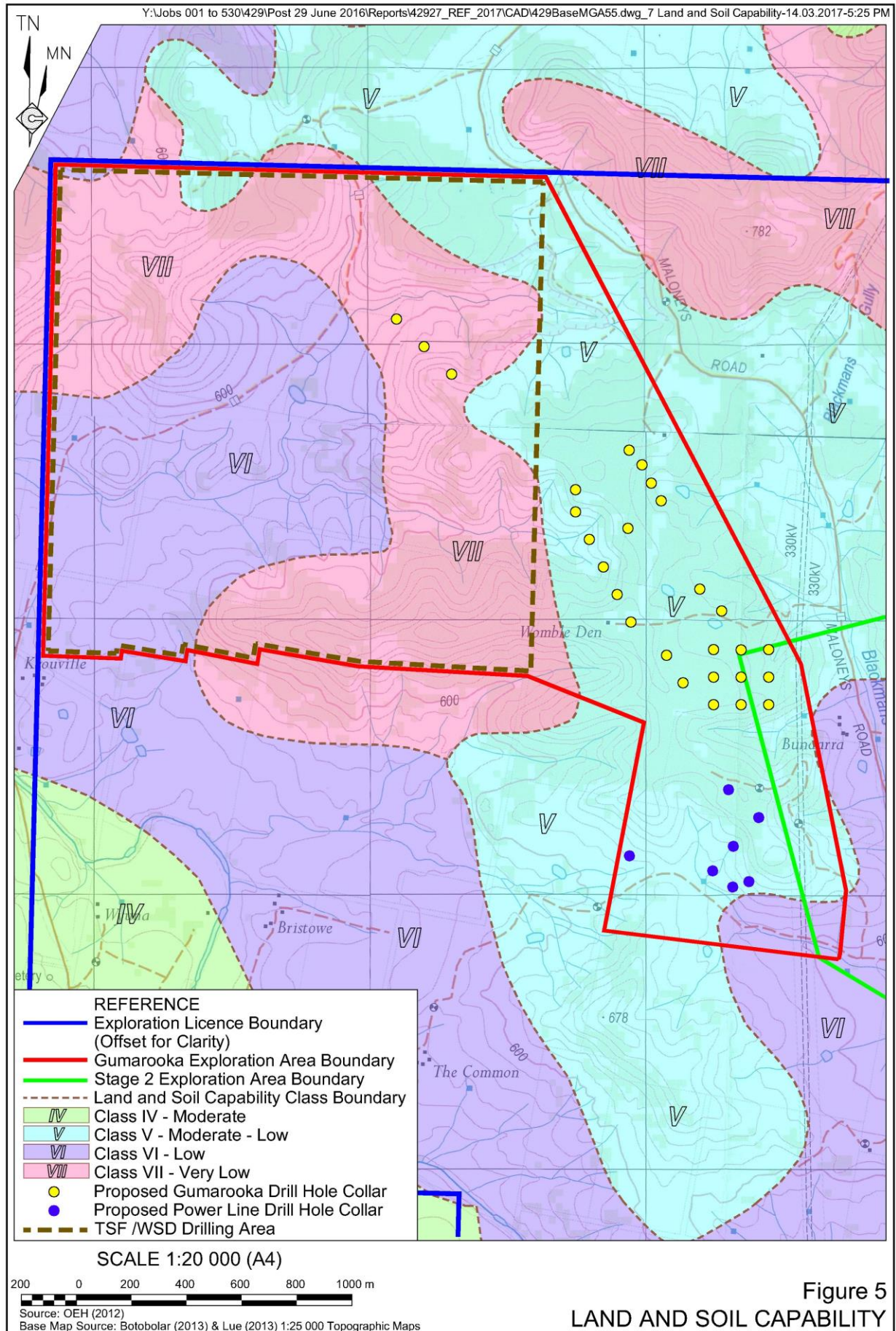
**Class 6 Low capability land:** Land has very high limitations for high-impact land uses. Land use restricted to low-impact land uses such as grazing, forestry and nature conservation. Careful management of limitations is required to prevent severe land and environmental degradation.

**Class 7 Very Low capability land:** Land has extremely severe limitations for most land uses. It is unsuitable for any type of cropping or grazing because of its limitations. The land may be suitable for commercial timber plantations or for native timber on undeveloped land.

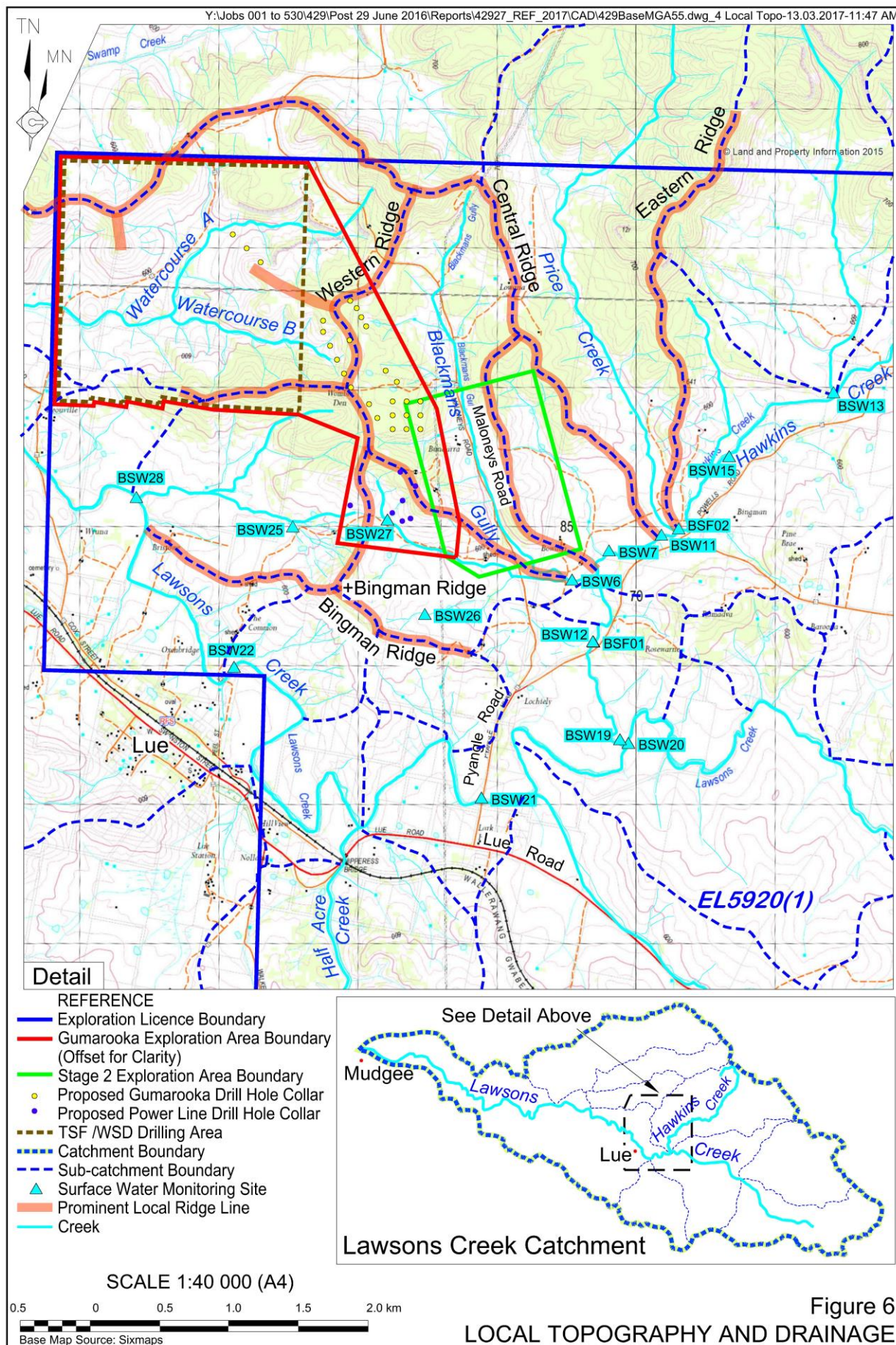
## **5.3 SURFACE WATER**

There are no permanent watercourses within or immediately adjacent to the Gumarooka Exploration Area. The principal watercourses within the Gumarooka Exploration Area are unnamed, third order watercourse (under the Strahler classification system), Watercourse A, and Watercourse B (**Figure 6**).

- Watercourse A originates in the northeastern section of the Gumarooka Exploration Area, in the topographic high of the Western Ridge. Watercourse A flows in a southwesterly direction until its confluence with Watercourse B, where after Watercourse A flows in a westerly direction.
- Watercourse B is a second order watercourse which originates in the central eastern section of the Gumarooka Exploration Area, in the topographic high of the Western Ridge, and flows in a westerly direction through the central section of the Gumarooka Exploration Area.







- Watercourse A flows into Lawsons Creek, the major regional watercourse, southwest of the Gumarooka Exploration Area approximately 1km southwest of the Gumarooka Exploration Area.
- Blackmans Gully is not situated within the Gumarooka Exploration Area. However, many of second order watercourses flow east from the Western Ridge into Blackmans Gully which flows in a southerly direction before entering Hawkins Creek.

It is noted that the second order watercourses that join to form third order watercourses typically have small catchments of between 10ha to 15ha. Because of this, Watercourse A and Blackmans Gully have characteristics more typical of a second order watercourse (i.e. they respond to rainfall events but has very little baseflow).

A total of 36 farm dams are located within the Company's landholding. These dams have an estimated combined capacity of 29ML, or approximately 47% of the Harvestable Right Dam Capacity for the Company's entire property of 62ML. Water from these dams is currently used by the beef cattle grazed on the property and drilling make up water under Bowdens Silver Stage 2 REF

Surface water resources within and surrounding the Gumarooka Exploration Area are managed under the *Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources 2012*.

## **5.4 GROUNDWATER**

Hydrogeological investigations have been conducted to date by Jacobs Group (formerly SKM) in 2014 to support future applications for mining operations. These investigations identified the presence of four hydrostratigraphic units in the area which are identified as follows.

- Alluvium.
- Sydney Basin Sedimentary Fractured Rock.
- Rylstone Volcanics.
- Ordovician Bedrock.

The Sydney Basin sedimentary fractured rock hydrostratigraphic unit is reported to occur as a thin veneer of outcropping sandstone within to the east of the Gumarooka Exploration Area, a unit that thickens to the north. Previous drilling found it to be unsaturated in the vicinity of the Stage 2 Exploration Area to the south of the Gumarooka Exploration Area, which is supported by the fact that there are no groundwater users associated with this unit within 2km of the Gumarooka Exploration Area. Jacobs (in prep) anticipate that this unit in the Gumarooka Exploration Area to be partially saturated, however due to the elevated locations of the proposed drillholes in this unit, it is unlikely that significant volumes of groundwater would be encountered.



Underlying the Sydney Basin fractured rock are the rhyolitic Rylstone Volcanics. This unit was considered by Jacobs to be a fractured rock aquifer with a reported range in thickness from 10m to 200m. The unit is reported to be comprised of breccia, ignimbrites and tuffs and generally displays a dip to the north. Jacobs conceptualised this aquifer as an extensively fractured and well-connected unit with this finding being supported by subsequent pump testing.

Groundwater quality information for the Rylstone Volcanics was collected from 10 observation bores on a monthly basis between mid-2012 and mid-2013. Electrical Conductivity (EC) readings ranged from 200 $\mu$ S/cm to 6 400 $\mu$ S/cm, with an average of 1 275 $\mu$ S/cm whilst pH values ranged from 4.5 to 8.7.

Jacobs considered that interaction between the Rylstone Volcanics fractured rock aquifer and watercourses, such as Watercourse A and Watercourse B, is likely to involve leakage of surface water to the groundwater, given the greater depth to water table in these areas.

The Ordovician Bedrock unit underlies the Rylstone Volcanics and outcrops to the south of Gumarooka Exploration Area. Jacobs reported that the results of pumping tests for this aquifer showed a wide range in hydraulic conductivity values. Four registered bores within 3km of the proposed Gumarooka Exploration Area were interpreted by Jacobs as extracting groundwater from the Ordovician Bedrock aquifer.

Groundwater quality information for the Ordovician Bedrock aquifer has similarly been collected for seven observation bores. EC readings ranged from 10 $\mu$ S/cm to 1 320 $\mu$ S/cm, with an average of 702 $\mu$ S/cm whilst pH values ranged from 4.7 to 7.7.

In summary, the hydrogeological environment is best described as a fractured rock system with superficial lenses of alluvial sediments located along minor watercourses. In the fractured rock system, groundwater is generally transmitted through faults, fractures and other openings in consolidated rocks. The effective (largely secondary) porosity of the geological units present at the site is controlled by the density and connectivity of fractures and faults that are present and the aperture dimensions of the fractures. It is conceptualised that the permeability of the fractured rock aquifers would decrease with depth as the weight of overburden rocks close the fractures thus inhibiting the movement of water.

The groundwater within the area forms part of the Lachlan Fold Belt MDB (Mudgee) Management Zone that is managed under the *Water Sharing Plan for the NSW Murray Darling Basin Fractured Rock Groundwater Sources 2011*.

## **6. MITIGATION MEASURES**

### **6.1 SOIL RESOURCES**

Erosion and sediment control measures, based upon the principles and methods incorporated in Volume 1 of Managing Urban Stormwater (Landcom, 2004) and Volume 2E Mines and Quarries (DECC, 2008) would be utilised to manage the soil resources within the Gumarooka Exploration Area. Further detail regarding the management measures to be employed, are provided in **Appendix 3** of the REF.

## 6.2 SURFACE WATER RESOURCES

The demand for water during the Gumarooka Exploration Area Program and the consequent reduction in water available for agriculture would be dependent upon the drilling method used and the successful use of strategies for water recovery and re-use during drilling operations.

The proposed drilling of 50 holes within the Gumarooka Exploration Area would be developed using the reverse circulation (RC) drilling method which does not require water. The experience gained during the Stage 1 and Stage 2 exploration programs indicates that an average of 5 000L of water would be air-lifted from the various RC drill holes throughout the Gumarooka exploration program. Overall, this would result in the accumulation of approximately 0.25ML of water which would be managed principally through reuse during drilling operations and spraying on internal roads for dust suppression or on pasture on low slopes.

Some of the 50 drill holes may require diamond drilling to reach the planned hole depth. The diamond drilling method requires the use of water typically at a rate of approximately 13 500L/100m of drilling. Water used for the purposes of diamond drilling would be delivered by tanker or pumped to each drill site and stored within a lined sump or above ground sump in a manner that maximises re-use and recovery of the resource. This water would be drawn from the water storages within the Company's property. If required, supplementary water supply may be sought from licensed water carter.

In addition to the strategies proposed in **Appendix 3** of the REF, the following measures would also be employed to ensure that the proposed activities are compliant with those requirements of the *Protection of the Environment Operations Act 1997* and the *Water Management Act 2000*.

- Identify all areas of waterfront land, as defined under the *Water Management Act 2000*, namely land within 40m of the top bank of a watercourse, as a Controlled Area and the management measures as identified in the Water, Erosion and Sediment Control Management Plan (WESCMP) (refer **Appendix 3** of the REF) would be implemented.
- Use existing tracks and avoid the creation of additional watercourse crossings, wherever possible.
- Construct drill sites, where practicable, in a manner that would divert clean water away from the drill site and would retain potentially contaminated or sediment-laden water within the drill site.
- Construct surface water structures, where required, including silt-stop fences, to limit the transport of suspended sediment from disturbed areas.
- Line the underside of drill rigs with plastic or hessian to collect any spilt hydrocarbons.
- Store all hydrocarbons and other chemicals in bunded containers or on a bunded pallet / tray on the support vehicles.
- Maintain hydrocarbon spill kits at all drill sites.

### **6.3 GROUNDWATER RESOURCES**

The Company would implement the following strategies to ensure that contamination of groundwater is minimised and activities are compliant with those requirements of the *Protection of the Environment Operations Act 1997* and the *Water Management Act 2000*.

- Monitor groundwater interceptions to ensure groundwater outflows are minimised.
- Cement the porous section of any holes that intersect more than one aquifer to ensure no cross contamination of aquifers.
- Use lined drilling sumps for diamond core drill holes to ensure no seepage of drilling fluids. Two connected sumps, each providing approximately 9 000L storage would be utilised to provide a settling sump and return water sump allowing effective recirculation of water.
- Contain produced water generated from RC drill holes in a sump excavated within the drill pad (to provide approximately 9 000L capacity) or an alternative location. As no drilling fluids are utilised for RC drilling, no lining within the sump would be required.
- Keep the level of water in each sump at least 200mm below the lowest edge of the sump. In the event that excess volumes of water are encountered and cannot be managed with the sump, drilling would cease until either an additional sump is constructed, water can be transferred to an appropriate containment structure to keep up with drilling or stored water is pumped into a 10 000L water truck for irrigation to access roads to aid in dust suppression. To ensure irrigated water does not result in surface water pollution, water would not be irrigated within 40m of a watercourse or during wet conditions.
- Should artesian conditions be encountered, which is considered unlikely, drilling would cease and the hole would be grouted.

### **6.4 REHABILITATION OF DISTURBED AGRICULTURAL LAND**

An important measure to ensure the land disturbed during the exploration activities is returned to productive agricultural land would be its rehabilitation. Rehabilitation of areas disturbed during the drilling programs would be undertaken in the following three stages.

#### **1. Following Construction Works**

Following construction works for access tracks and each drill hole, all embankments created adjacent to tracks or drill pads would either be rock armoured or covered with fresh topsoil and allowed to revegetate naturally. If necessary, the soils would be seeded with a pasture mix. Silt-stop fencing would be positioned downslope from all embankments until they are adequately stabilised. Appropriate drainage controls, if required, would be constructed to protect disturbed areas. The rehabilitation works undertaken would be consistent with the measures outlined within the WESCMP (see **Appendix 3** of the REF).

## 2. Following Completion of Drilling

Once all drilling activities are completed on each drill pad, the need for temporary rehabilitation would be reviewed on and adjacent to each pad and the access track to the drill pad. The key factor influencing the decision whether temporary rehabilitation is undertaken would centre on the likelihood of natural revegetation or excess sediment loss until the drill pad or pad(s) are either permanently rehabilitated or incorporated within an approved mine. For those drill pads and access tracks where excess sediment loss is likely, those areas would either be lightly scarified and seeded with a pasture mix or rock armoured.

## 3. Long Term Rehabilitation

In the event that the proposed silver mine does not receive approval or within a period of 2 years after the exploration activities conclude (whichever occurs later), the Company would undertake a program of final rehabilitation to provide for a stable long term landform in those areas disturbed by exploration.

Long term rehabilitation would involve the following component activities.

- i) Re-shaping the drill pads to remove their geometric shape and creating slopes comparable with those natural slopes around the pads.
- ii) Replacing topsoil set aside during pad construction onto the final landform.
- iii) Install required surface water management structures to protect the disturbed area, including silt-stop fencing.
- iv) Spreading of any cleared vegetation.
- v) Revegetate the entire disturbed area with a native or pasture seed mix, if necessary.

All revegetated areas would be inspected at least every 6 months for a period of up to 2 years and following any substantial storm events to identify whether there is a need for any maintenance activities.

All PVC drill collars would be retained as long as the holes are required to be open and available for further tests or groundwater monitoring. In the unlikely event the mine does not proceed, and the exploration licence is relinquished, the drill collars would be cut to a level approximately 1m below the ground surface and a metal plate positioned on the hole before the hole is backfilled to ground level.

## 6.5 AGRICULTURAL BIOSECURITY

The potential for biosecurity impacts is considered with respect to the relevant transmission method established in **Table 2** above. The mitigation strategies presented below are based on the principles described in “*National Farm Biosecurity Reference Manual: Grazing Livestock Production*” (Animal Health Australia, 2012).

### **6.5.1 Vehicles**

The following strategies would be employed with respect to vehicles.

- Wash down and inspect drill rigs and support vehicles prior to arrival on site to prevent introduction of weed species onto the Gumarooka Exploration Area.
- Limit movement of vehicles on and off site would to prevent unnecessary vehicle movements.

### **6.5.2 Water**

The following strategies would be employed with respect to water.

- Park vehicles at least 40m from watercourses, whenever possible.
- Cross watercourses only at defined and prepared crossings.

### **6.5.3 Personnel**

The following strategies would be employed with respect to personnel.

- Limit access to site to essential personnel only, thereby preventing unnecessary personnel movements.
- Clean and inspect personal protective equipment and clothing prior to entry to site and commencement of work.

### **6.5.4 Air**

The following strategies for the proposed exploration activities would be employed with respect to air.

- Install and maintain dust collectors on the drill rig when operating in reverse circulation mode. In the event that the dust collectors are not functioning as designed, the drill rig would be shut down until the issue can be rectified.
- Ensure that the minimum area required for safe operation of the drill rigs is disturbed when preparing drill sites.
- Limit movement of vehicles on unsealed tracks to prevent unnecessary vehicle movements.



## 7. ASSESSMENT OF IMPACTS

### 7.1 SOIL AND LAND

With the implementation of the proposed erosion and sediment control measures (refer **Appendix 3** of the REF) and rehabilitation strategy (Section 6.4), the proposed exploration activities would not result in:

- any contamination, salinisation or acidification of soil;
- any significant soil erosion or loss of soil structural integrity;
- any increase in land instability; or

Therefore the potential for impacts upon loss of the soil and land agricultural resource is considered to be **low**.

### 7.2 BIOPHYSICAL STRATEGIC AGRICULTURAL LAND

No exploration activities on BSAL are proposed. Hence, no impacts would occur.

### 7.3 SURFACE WATER

Recovery and re-use strategies would be employed within the Gumarooka Exploration Area to alleviate overall demand on the water resources on the Company's land. The total water requirement for the proposed exploration activities would be approximately 3ML. This volume is well below the maximum harvestable right dam capacity for the Company's land of approximately 1 559ha.

The adoption of the erosion and sediment control measures set out in **Appendix 3** of the REF and the approach to the management of excess water from the RC drilling would minimise impacts on the quality of water in the watercourses traversing the Gumarooka Exploration Area.

The potential impacts on the available agricultural water resource are considered to be **negligible**.

### 7.4 GROUNDWATER

During the drilling of diamond holes, the circulating drilling mud would establish a wall cake (low permeability "skin" around the wall of the hole) and also maintain a positive head (pressure) on the various aquifers intercepted. This would prevent both the ingress of groundwater to the hole (and any possible mixing or discharge to the surface) and also limit the ingress of drilling mud into the aquifers to the immediate vicinity of the exploration holes.

During the drilling of RC exploration holes, no drilling muds or other additives are necessary.

Based upon the experienced gained during the Stage 1 Exploration Program, no artesian pressures are anticipated and therefore the potential for pressurised groundwater reaching the surface is considered negligible.



The changes in groundwater levels due to the pumping of 0.25ML of water from the RC drill holes would be minor and localised and would not impact upon the few bores within 2km to 3km of the Gumarooka Exploration Area nor any groundwater dependent ecosystem.

With the implementation of the proposed management measures outlined in Section 6.3, the potential impacts to groundwater are considered **negligible**.

## **7.5 SENSITIVE AGRICULTURAL ACTIVITIES**

There are **no** sensitive agricultural activities identified in the vicinity of the Gumarooka Exploration Area.

## **7.6 BIOSECURITY**

The nature of the proposed exploration activities and the proposed activities present a low probability biosecurity risk. The proposed mitigation strategies are considered sufficient to manage any possible biosecurity risk.

The potential biosecurity impacts of the Project are considered to be **low**.

## **8. CONCLUSION**

The proposed exploration activities within the Gumarooka Exploration Area would result in minor, short term impacts to the agricultural resources of the immediate and surrounding areas. The potential agricultural impacts would be confined to the Gumarooka Exploration Area and would not place any undue demand on the local agricultural resources.

The implementation of the proposed mitigation strategies would ensure no long term loss of agricultural resources occurs as a result of the proposed Gumarooka exploration activities.

## **9. REFERENCES**

**Department of Environment and Climate Change (DECC), 2008** *Soils and Construction: Managing Urban Stormwater Vol. 2E Mines and Quarries*. NSW Government, Sydney.

**Murphy, BW and Lawrie, JW, 1998**, *Soil Landscapes of the Dubbo 1:250,000 Sheet Report*, Soil Conservation Service, Sydney.

**Landcom, 2004**, *Soils and Construction: Managing Urban Stormwater Vol. 1*. NSW Government, Sydney.

# Bowdens Silver Mine – Gumarooka Exploration Area

## Water, Erosion and Sediment Control Management Plan for Exploration Licence 5920(1)

March 2017

*Compiled by:*



**R.W. CORKERY & CO. PTY. LIMITED**

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ABN: 37 009 250 051

# Bowdens Silver Mine – Gumarooka Exploration Area

## Water, Erosion and Sediment Control Management Plan for Exploration Licence 5920(1)

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## **LIST OF ACRONYMS**

AHD	Australian Height Datum
DECC	Department of Environment and Climate Change
EL	Exploration Licence
ha	hectare
m <sup>2</sup>	Square metre
m	metre
mm	millimetre
RC	reverse circulation
V:H	vertical to horizontal ratio
<	less than
>	greater than

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## **1. INTRODUCTION**

This document has been compiled on behalf of Bowdens Silver Pty Limited (“the Company”) to record the proposed water and erosion/sediment controls to be adopted throughout the exploration activities at the proposed Bowdens Silver Project Site within EL 5920(1). **Figure 1** displays the location of EL 5920(1) and the Exploration Area in which the proposed Gumarooka Exploration program is to be undertaken. The Gumarooka Exploration Area covers an area of 483ha and incorporates a total of 50 drill hole locations (**Figure 2**).

The management of surface water and groundwater together with erosion and sediment controls for the exploration activities are effectively integrated into the overall design of the exploration program. As a consequence, this document describes the proposed controls for the key exploration activities, namely track construction, drill pad construction and drilling operations.

This document outlines the proposed controls required to manage water and sediment within the exploration area to ensure that the surface water and groundwater resources are not compromised by the proposed exploration activities. The approach to the management of water and sediment is based upon observations of previous disturbances in 1996 to 2000 (by Silver Standard Australia Pty Ltd) and the Company’s experience during the Stage 1 Exploration program.

## **2. OVERVIEW OF EXPLORATION ACTIVITIES**

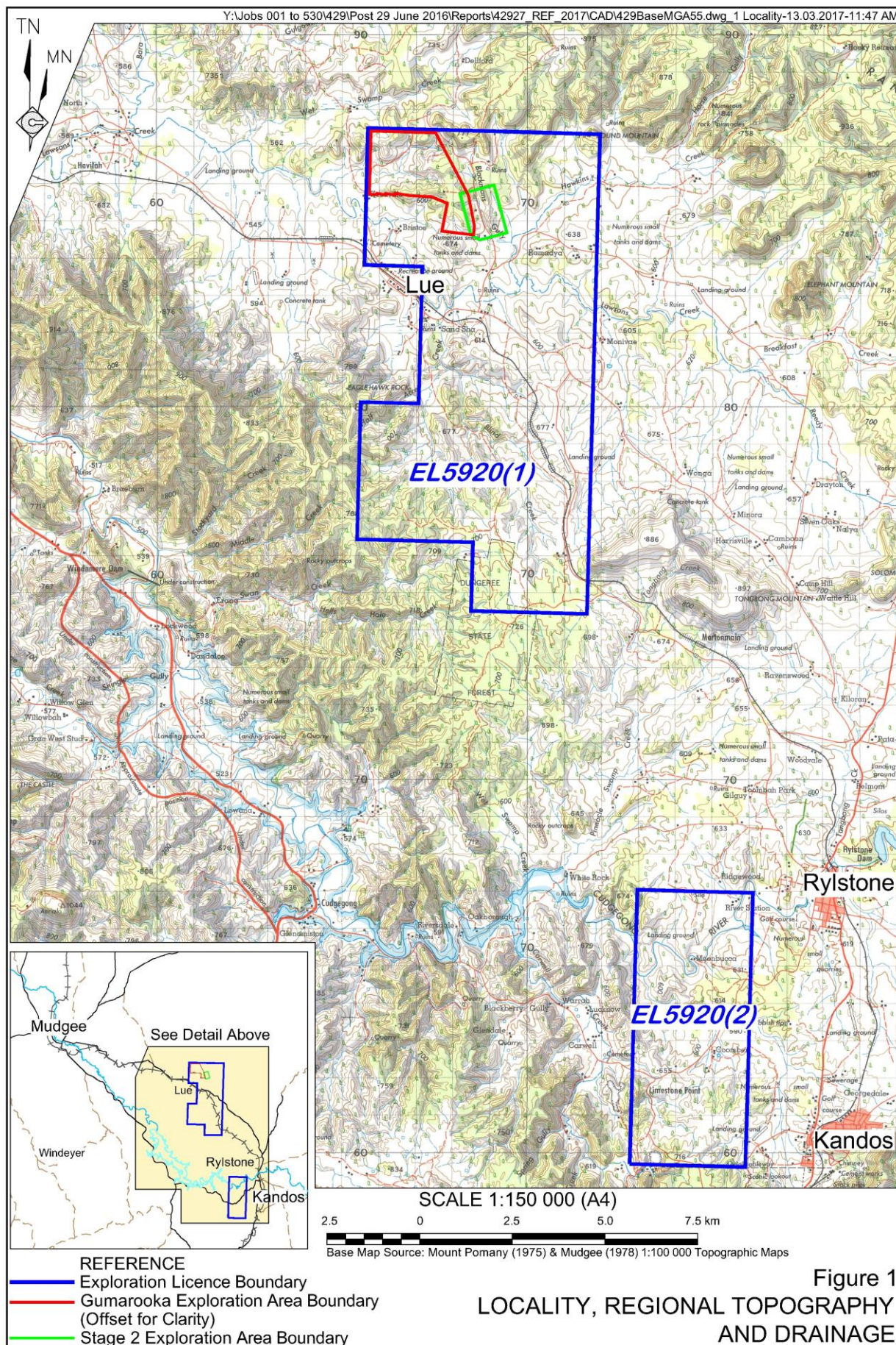
### **2.1 TRACK CONSTRUCTION AND USE**

#### **2.1.1 Track Construction**

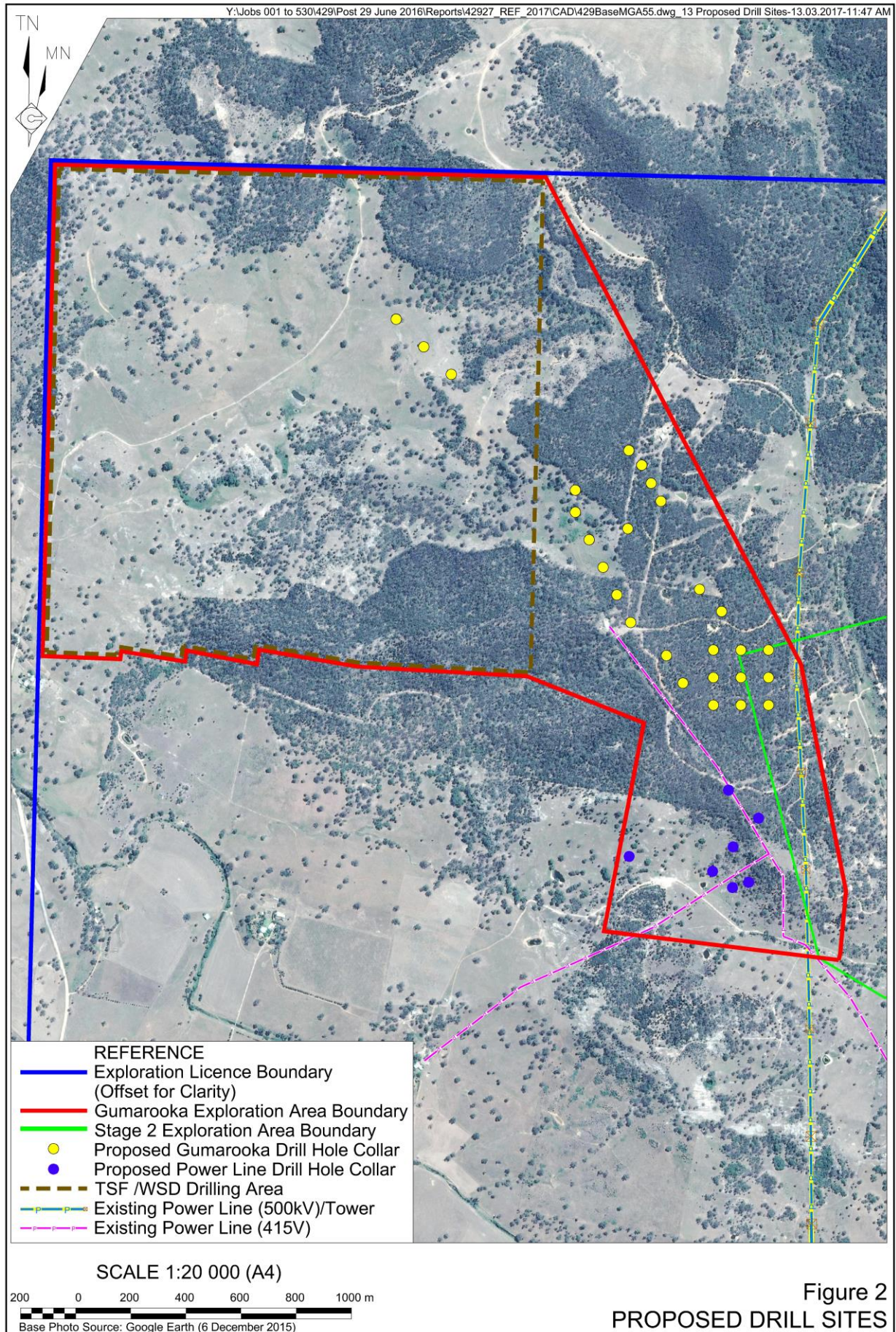
Tracks are required to provide access to the proposed drilling sites. A range of existing tracks were originally constructed by Silver Standard Australia Pty Ltd during the period 1996 to 2000. Those tracks have exhibited negligible erosion and have been substantially stabilised by natural regrowth. All new tracks are typically approximately 3m to 4m wide and constructed with a bulldozer and/or excavator. At times, the excavator is fitted with a rock hammer to break the rock which cannot be removed by the bulldozer during track construction. In some areas, on comparatively flat ground, little or no construction work is required. Tracks are constructed typically in the following manner.

1. The indicative location of each proposed track is provided to the Senior Field Assistant by the Senior Geologist for inspection/ground truthing in the field. Subject to the alignment/location of the track being assessed as appropriate, the track is marked out at 10m intervals with emphasis placed upon avoiding any mature trees and minimising/avoiding the need to use a rock hammer to break rock along the proposed track alignment.











2. Once defined, any mature trees will be inspected for hollows and the presence of nesting / roosting fauna. Vegetation is driven over or pushed over. The vegetation is preferably pushed to the downslope side of the track to act as a supplementary sediment barrier.
3. Any topsoil present within the alignment of the track is pushed downslope adjacent to the stacked trees (if present). Emphasis is placed upon pushing the topsoil into discrete stockpiles.
4. The tracks are constructed largely with a bulldozer pushing subsoil material (and rock where present) to the downslope side. Where hard rock is present that cannot be ripped, a rock hammer is used to break the required rock from within the track alignment. The broken rock is then placed upon material on the downslope side of the track.
5. Where the material pushed out by a bulldozer is erodible in nature and lies within 40m of any prescribed watercourses, sediment fencing is installed as close as practical to the downslope toe of the batter i.e. typically within 2m. Where there is adequate rock ripped or broken from the upslope side of the road, the rock is positioned on the downslope batter to protect the slope from erosion. For tracks located greater than 40m from a prescribed watercourse, sediment fencing is not required when the downslope batter is protected with broken rock and there is good vegetation cover (bush or grass) over the downslope lands.
6. The track surface would be checked to ensure runoff is directed at a gentle slope either towards the downslope batter where it is rock faced or the toe of the upslope batter where it is directed to an outlet point via a roll over diversion that directs runoff to a discharge point through a set of straw bales.

### **2.1.2 Track Use**

All tracks are used by all drilling equipment and support vehicles as required throughout the drilling program. Access is restricted during and following periods of wet weather and until they can be safely traversed.

## **2.2 DRILL PAD CONSTRUCTION AND USE**

### **2.2.1 Drill Pad Construction**

Drill pads are constructed to provide a safe working area for the drilling of either a diamond drill hole or a reverse circulation (RC) drill hole. Typically, the drill pads are approximately 20m x 20m to provide sufficient area for the following.

#### **Diamond Drill Pad**

Track-mounted drill rig.

Rod Truck.

In-ground lined sumps / above-ground sump.

#### **RC Drill Pad**

Track-mounted drill rig.

Track-mounted compressor.

In-ground or above-ground sump.

Core retrieval area & Core Trays.	Bag storage area.
Topsoil/subsoil storage (as required).	Topsoil/subsoil storage (as required).
Spill kit.	Spill Kit.

Light vehicles invariably park on the access road to the drill site or any previously disturbed area. Parking of light vehicles in undisturbed areas is avoided, wherever possible.

The principal activities involved in the construction of the drill pads are as follows.

1. The Senior Field Assistant identifies the location of each nominated drill hole through the use of the coordinates provided by the Senior Geologist.
2. Based upon the location of the drill hole, the boundary of a 20m x 20m pad is defined and marked together with the optimum location for the drill sump(s) i.e. down slope from the proposed drill hole. The drill pad is invariably orientated so that the track to (and beyond) the pad is located on solid ground and used for drilling the subject hole. An area on both sides of the track is then defined to complete the boundary of the pad. The dimensions/configuration of each pad is assessed on a site specific basis. The ultimate outlet point for runoff from the pad is identified at this stage. All components of each pad are recorded on a sketch prepared by the Senior Field Assistant. The pads are constructed typically in the following manner.
  - i) Removal of existing vegetation, if required, to one or more sides of the pad (i.e. after any mature trees with hollows are inspected). Minimal vegetation is disturbed – i.e. only that required for safe and efficient drilling.
  - ii) Where ground disturbance is necessary, recoverable topsoil is removed from the pad area and pushed to one side of the pad to create a bund around the pad area.
  - iii) For drill pads  $>10^\circ$ , the earth capable of being ripped and pushed by a bulldozer is pushed to the downslope side of the pad effectively creating a level cut and fill surface. In the event un-rippable material is present, a rock hammer is used to break the remaining rock within the footprint of the pad down to the required level. The surface of each pad would be profiled to promote a gentle slope to the pre-determined point where sediment can be captured or runoff directed onto surrounding vegetated lands.
  - iv) Where there is broken rock, this is re-located onto the outer face of the downslope batter to provide the necessary erosion protection. In the event insufficient rock is available and subsoil is present on the batters, sediment fencing is installed on the day when the batter is finalised. **Attachment 1 – Figure SD 6-8** displays the preferred configuration for the placement of sediment fencing to contain sediment from disturbed sites.



- v) The sumps are excavated within the pad (when above-ground sumps are not practicable). For a diamond drill hole, the 4m x 4m x 2m deep sump is preferably constructed in two sections, namely a sediment sump and a return water sump with an intervening barrier. For an RC hole, the 4m x 4m x 2m deep sump is excavated with the excavated material typically placed in mounds around the hole, increasing its freeboard.
- vi) Once established, the drill pad is left vacant until the drill is moved onto the pad to drill the required hole.

## **2.2.2 Drill Pad Use**

The drill pads are used to recover either solid rock core (from diamond drilling) or rock chips from the RC drilling.

### **Diamond Core Drilling**

Diamond core drilling involves the use of a rapidly rotating, diamond impregnated drill bit and water with drilling additives to cool and lubricate the drill bit. As the drill rods and drill bit spin, the diamonds grind away the face of the hole leaving a cylinder of rock in the centre of the drill barrel. The cutting face of the drill bit is lubricated using a water and additives mix. As the drill rods advance, the cylinder of remaining rock gradually becomes enveloped by the drill rods. The drill rods are stopped at regular intervals, commonly 1.5m, 3m or 6m intervals, and the resulting drill core is brought to the surface. Ground-up rock material is transported to the surface by the returning drilling fluids and is separated from the fluids in the drill sumps which are often contain two components – a sediment sump and a return water sump.

### **RC Drilling**

RC drilling involves the use of compressed air generated by a tracked compressor to drive a slowly rotating percussion drill bit, which operates in a similar manner to a jack hammer. The percussion drill bit is typically fitted with numerous, hardened protrusions that crush the rock at the bottom of the hole. The crushed material is brought to the surface with the returning air through the centre of the drill rods. This drilling method is relatively fast compared with diamond drilling methods typically drilling up to 200m per day. When drilling proceeds below the regional groundwater table, groundwater is also brought to the surface with the rock chip samples. Water management during this phase is detailed in Section 4.

## **3. EROSION AND SEDIMENT CONTROLS**

### **3.1 INTRODUCTION**

This section outlines the principles to manage soil erosion and sediment generation/collection as well as the site specific methods for the track and drill pad construction and use.

The approach to erosion and sediment control is based upon the principles and methods incorporated in Volume 1 of Managing Urban Stormwater (Landcom, 2004) and Volume 2E Mines and Quarries (DECC, 2008) together with the Company's experience/observations of the previous exploration activities.

## **3.2 PRINCIPLES**

Ten principles of erosion and sediment control need to be followed during all track and drill pad construction (Source: Landcom 2004).

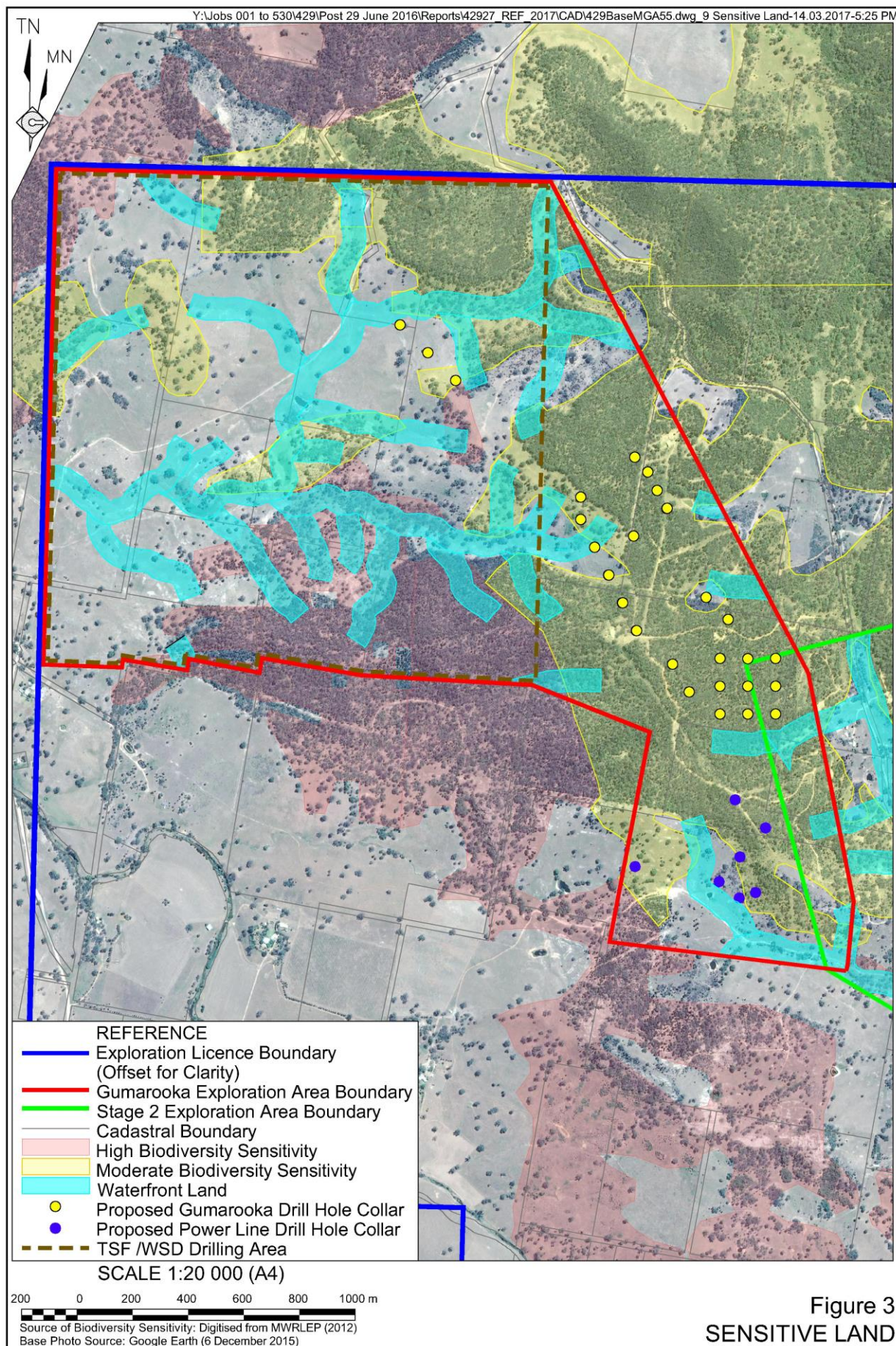
1. Assess the site for soil and water management issues when marking out the site for clearing and disturbance.
2. Plan erosion and sediment control works with the site preparation.
3. Install erosion and sediment control measures as the first step or in conjunction with the first works.
4. Plan to minimise erosion in addition to catching sediment.
5. Minimise the area of vegetation and soil disturbance.
6. Conserve all soil for revegetation.
7. Control the flow of water onto and off the disturbed areas.
8. Manage wind erosion and dust by minimising traffic movement and wetting surfaces in dry weather, minimising disturbance and by appropriate management of dust from the drill rig and other machinery.
9. Ensure that the site is in a protected state at all times and rehabilitate as soon as practicable.
10. Inspect and maintain all erosion and sediment control measures and monitor weather forecasts.

The Company's approach to satisfying each of the above principles is set out below. Use is made of an Erosion and Sediment Control Check Sheet for tracks and drill pads (**Attachment 2**) to ensure all aspects are considered and to record the completion of the various tasks required. The approach to the methods adopted reflects the risk associated with the location of the track or drill pad with respect to the prescribed watercourses on site. Clearly, a greater level of control needs to be exercised with any activity undertaken within 40m of a watercourse, which is defined as 'waterfront land' (see **Figure 3**). The Company would avoid any disturbance within 10m of either the bank of a defined channel or flow line within either Watercourse A or Watercourse B unless track construction is required (see Section 3.3).

### **1. Site Assessment.**

No work commences before the site conditions are assessed in the field and the environment and likely erosion and sediment control issues identified. Erosion and sediment Control Check Sheet for both tracks and drill pads are included as **Attachment 2**. A sketch of the proposed track or drill pad layout and other relevant environmental issues should also be recorded.







**2. Planning.**

Plan the erosion and sediment control measures to manage water movement on and around the site. Ensure adequate materials are available to implement the control measures. Allow sufficient time for the control works to be installed. The control works are to be marked out in the field and will serve to limit the vegetation and land disturbance. In some areas, the disturbance area will not be fully delineated as the slope and soil (rocky) conditions may make it difficult to determine the likely extent of disturbance. In these instances, ensure that the site erosion and control measures are installed as soon as possible and they are suitable and operative at the completion of site preparation.

**3. Installing the Control Measures.**

Install the control structures before construction of the works. If not practical or safe to do so prior to construction, it is imperative that the erosion and sediment control measures are installed and operative as soon as practicable afterwards.

**4. Priority of Erosion Control.**

The priority of control is to minimise erosion rather than simply managing the sediment after it has eroded. Minimising erosion will necessarily minimise sediment that needs management. However, it will not negate the need for sediment control works, but is likely to reduce the scope of these works.

**5. Limit the Area of Disturbance.**

The undisturbed area is usually in equilibrium with the natural processes and will not normally need protection measures. The vegetation cover is a key factor in the erosion cycle, and limiting its disturbance is a means of limiting the potential for erosion. The area of disturbance is to be limited to the minimum practical at all times and only designated vegetation will be cleared.

**6. Conserve Soil for Revegetation.**

Soil is an essential part of a landform and is necessary for revegetation of the disturbed areas. The soil is any loose material within the approximately top 20cm and can include very rocky material. Where the soil is limited by underlying rock or is very rocky, it is still preferable to separate the surficial materials from subsoils as it will contain a bank of native seeds. The rocky substrate and subsoil will not be mixed with the topsoil as the dilution will reduce the effectiveness of the soil in vegetation activities.

Topsoil is not to be used to construct any erosion and sediment control structures as it will inevitably destroy some of its vital characteristics and often makes it very difficult to recover it later. It is extremely important that the soil is stored in an easily identifiable location and its location marked on the Erosion and Sediment Control Check Sheet sketch.

## **7. Control Water Flow.**

This is the most crucial principle of erosion and sediment control. Water is by far the most prevalent medium for erosion and sediment movement and, without control of the flow of water, there will be limited control of erosion and sedimentation processes. It is important during the planning and at subsequent stages to establish where water will flow onto a disturbed site. Where opportunities exist to divert upslope runoff without creating substantially more sediment-laden runoff, diversion banks could be installed. However, given the comparatively small area of disturbance for each drill pad and the slopes on the site, upslope diversions at most sites is assessed as impractical.

For the purposes of the current exploration program, it is proposed that sediment-laden runoff from disturbed areas is controlled through the use of sediment fences, straw bale filter, rock check barriers and rock facing steep slopes. Use of small sediment basins is not required given each area of disturbance is substantially less than the 2 500m<sup>2</sup> threshold nominated in Section 6.3.2(d) of Landcom (2004).

Water flow paths will be identified on the sketch on each Check Sheet sketch.

## **8. Manage Wind Erosion and Dust.**

Wind is the other medium through which erosion can occur on site. While it will not be as effective as water in moving materials, it is still a factor, particularly in these areas where vegetation is limited and the ground is exposed to winds. Measures to control dust include limiting disturbance and the use of a water truck in exposed areas where there is considerable traffic. Dust from the rig is controlled by dust suppression equipment on the rig itself, i.e. when drilling above the water table.

## **9. Rehabilitate Disturbance.**

Any disturbed areas not required for further exploration activities are rehabilitated progressively. A record of the disturbed areas is maintained on each drill hole check sheet until rehabilitation is considered satisfactory.

## **10. Maintain Control Measures.**

The Company has a program to inspect all erosion and sediment control measures on a weekly or monthly basis and following substantial rainfall events (i.e. when >25mm of rain falls within 24 hours).

Following completion of drilling, all erosion and sediment controls would continue to be inspected on monthly or quarterly basis and following substantial rainfall. These inspections would continue until successful rehabilitation is achieved.

## **3.3 TRACKS**

**Figure 4** displays a typical layout of tracks and drill pads within the 40m setback from the bank of a defined channel or flow line in either Watercourse A or the Watercourse B.



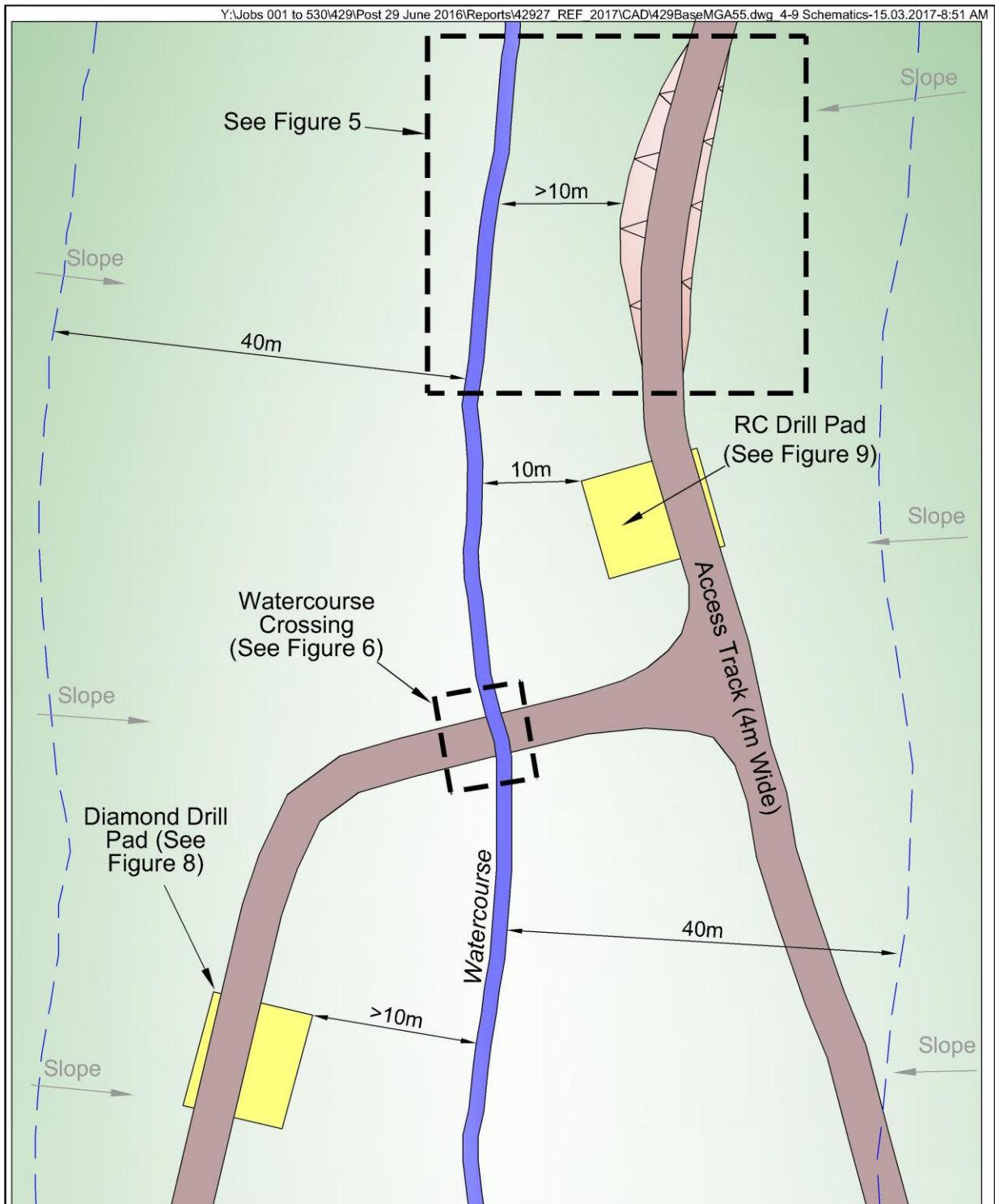


Figure 4  
TYPICAL SITE LAYOUT NEAR  
SECOND ORDER WATERCOURSES

**Figures 5, 6 and 7** display a range of approaches to track construction within the Exploration Area. As discussed in Section 2.1.1, little or no construction work is required in some areas as the tracks are located on comparatively flat ground and vehicles will travel on the existing surface although access may be restricted during/following periods of wet weather. Track construction within 10m of either Watercourse A or Watercourse B would only occur in the event a constructed watercourse crossing is proposed (see **Figure 6**).

### **Track Construction near Watercourses Not Requiring Excavation**

A number of the watercourses displayed on **Figure 3**, particularly the first order “watercourses” comprise gently sloping topography centred on a depression in the landscape. The existing and previous landholders have typically gained access in these areas by travelling in off-road vehicles on the natural surface without constructing any tracks. The Company intends to adopt a similar approach to gain access to drill sites via these tracks on the natural ground surface, however, avoiding such areas following substantial rain events that would result in damage to the soils in those areas.

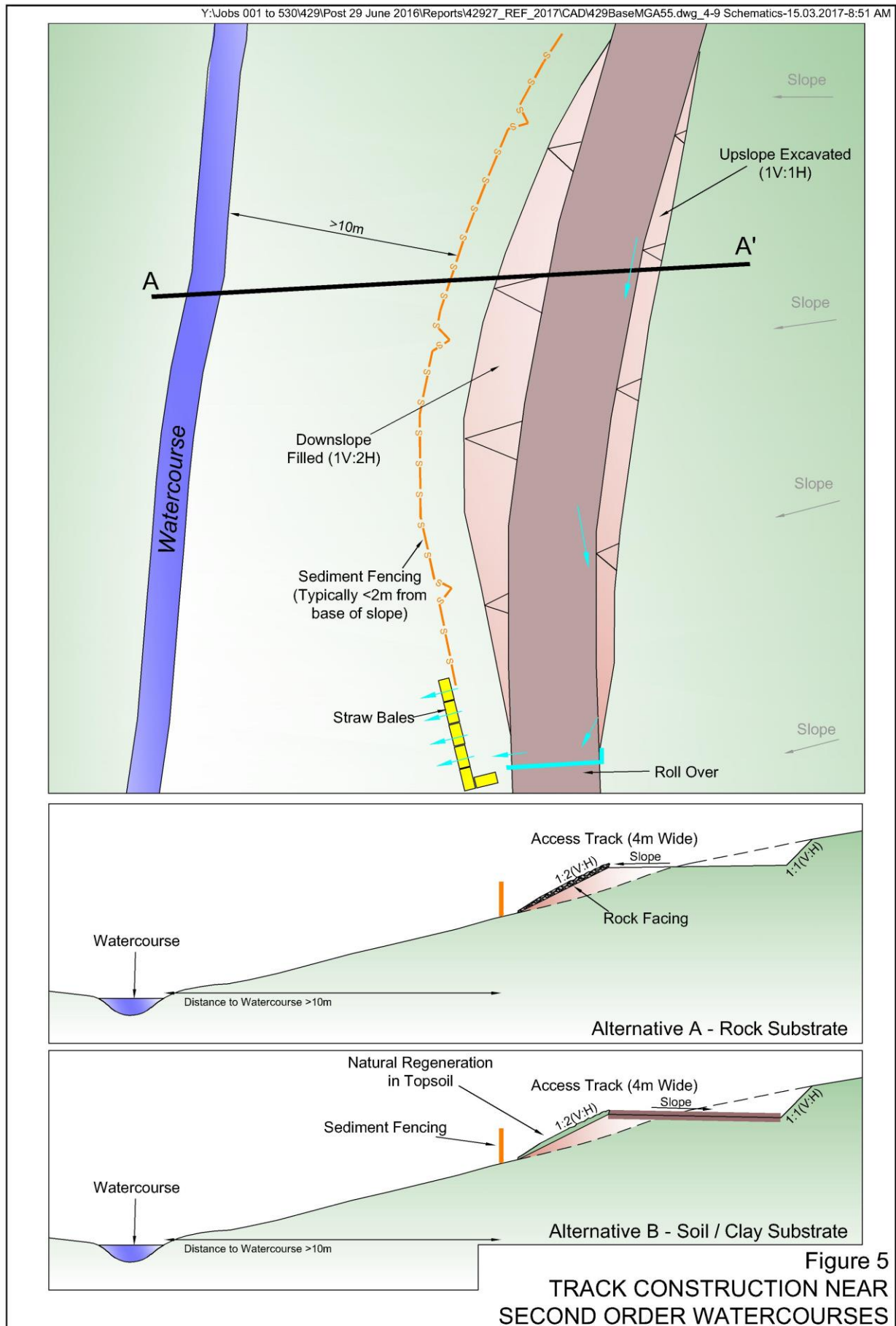
### **Track Construction near Watercourse A and Watercourse B Requiring Excavation**

**Figure 5** displays a typical method for track construction near second order watercourses and the proposed erosion and sediment controls required. It is recognised that within 40m of the prescribed watercourses, the substrate for a track may either be rocky or comprise clay with a soil cover. Consequently, two alternatives are proposed for track construction with differing erosion controls.

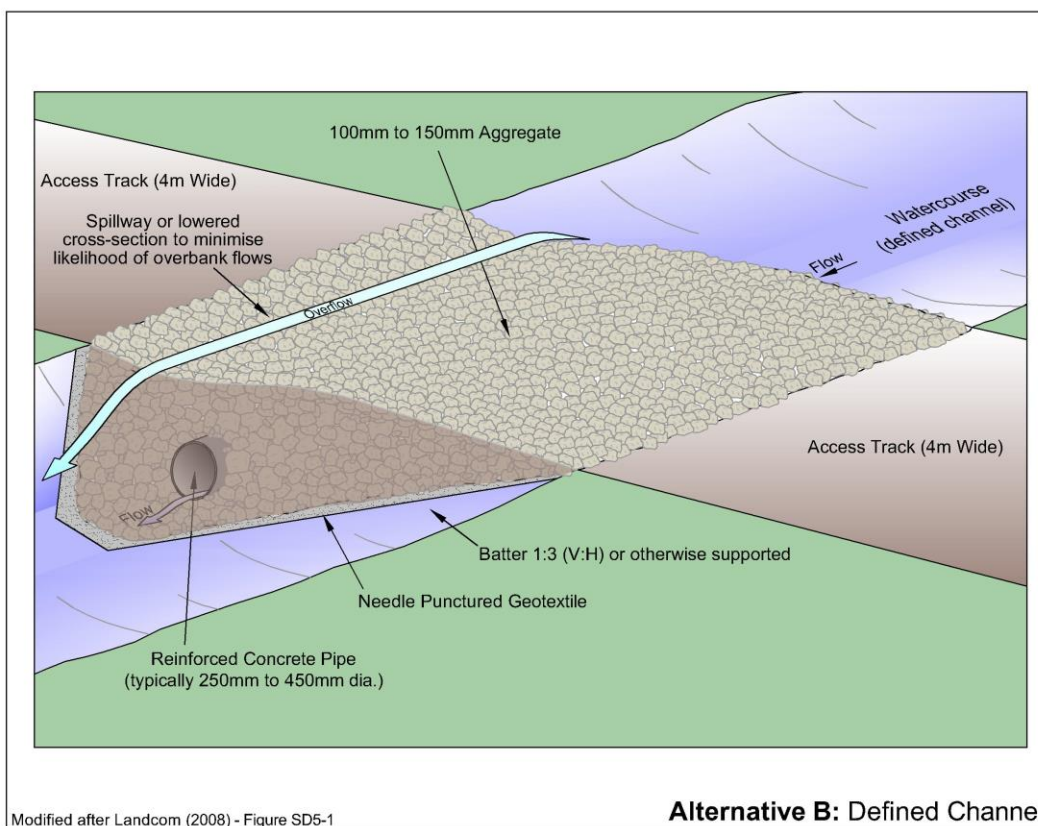
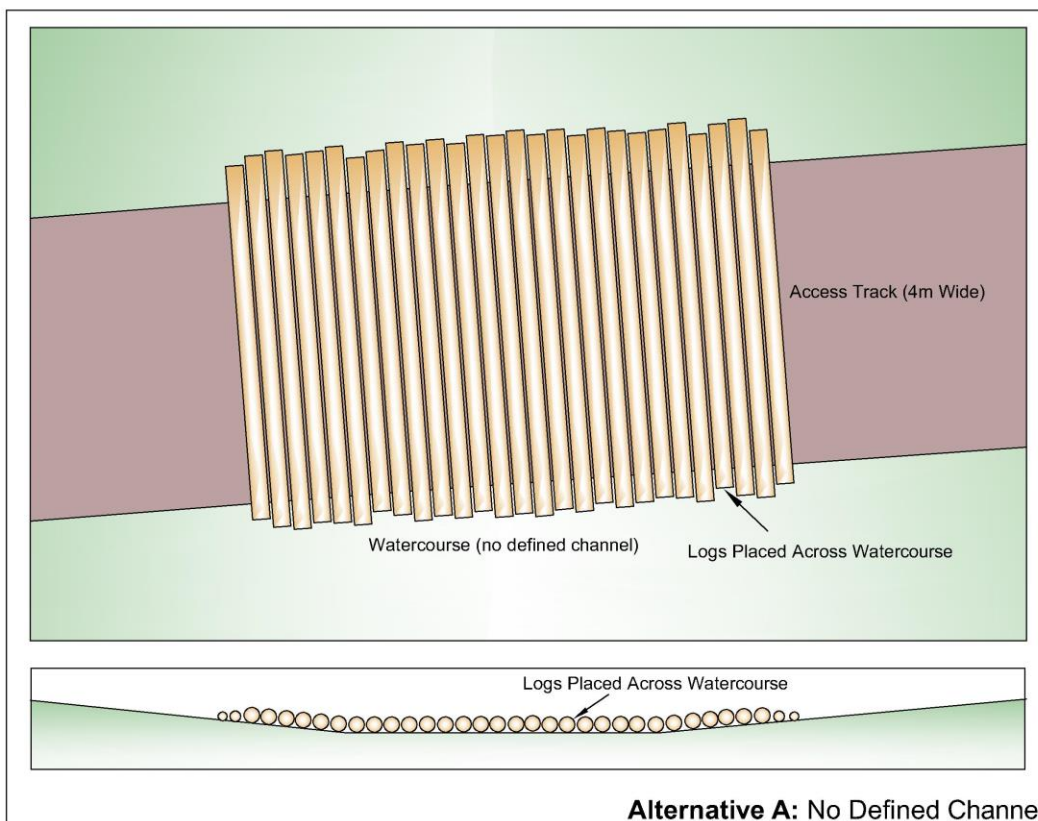
**Figure 5A** displays the proposed use of rock facing on the downslope batter of the access track constructed from rock recovered from the upslope side of the track. This material will be carefully placed on the downslope face, typically at a slope of 1:2 (V:H) covering the finer fraction beneath. It is recognised that some areas within the Gumarooka Exploration Area have slopes in excess of 2:1 (V:H) and therefore the slope of the rock batter and contained finer material will need to be increased to reduce the area of disturbance, while maintaining adequate sediment and erosion control. Therefore in certain areas, the slope will be steepened from 1:2 (V:H) to minimise the area of disturbance while maintaining effective sediment control and safe operational conditions within and downslope of the working area.

The slope of the track would be maintained slightly towards the downslope batter and rock check barriers (preferred for long term maintenance), sediment fencing or straw bale filter placed downslope of the roll overs and/or turnouts.

**Figure 5B** displays the section through a typical track whereby the material excavated is predominantly clay and soil with limited rock. The topsoil from the footprint of the track would be separated and stockpiled in a predetermined area whilst the underlying clayey subsoil is excavated and placed on the downslope side at a slope of 1:2 (V:H). Once shaped, the downslope batter would be seeded with a sterile pasture mix. The use of topsoil is not favoured for temporary revegetation activities as it is considered more appropriate for long term rehabilitation activities.



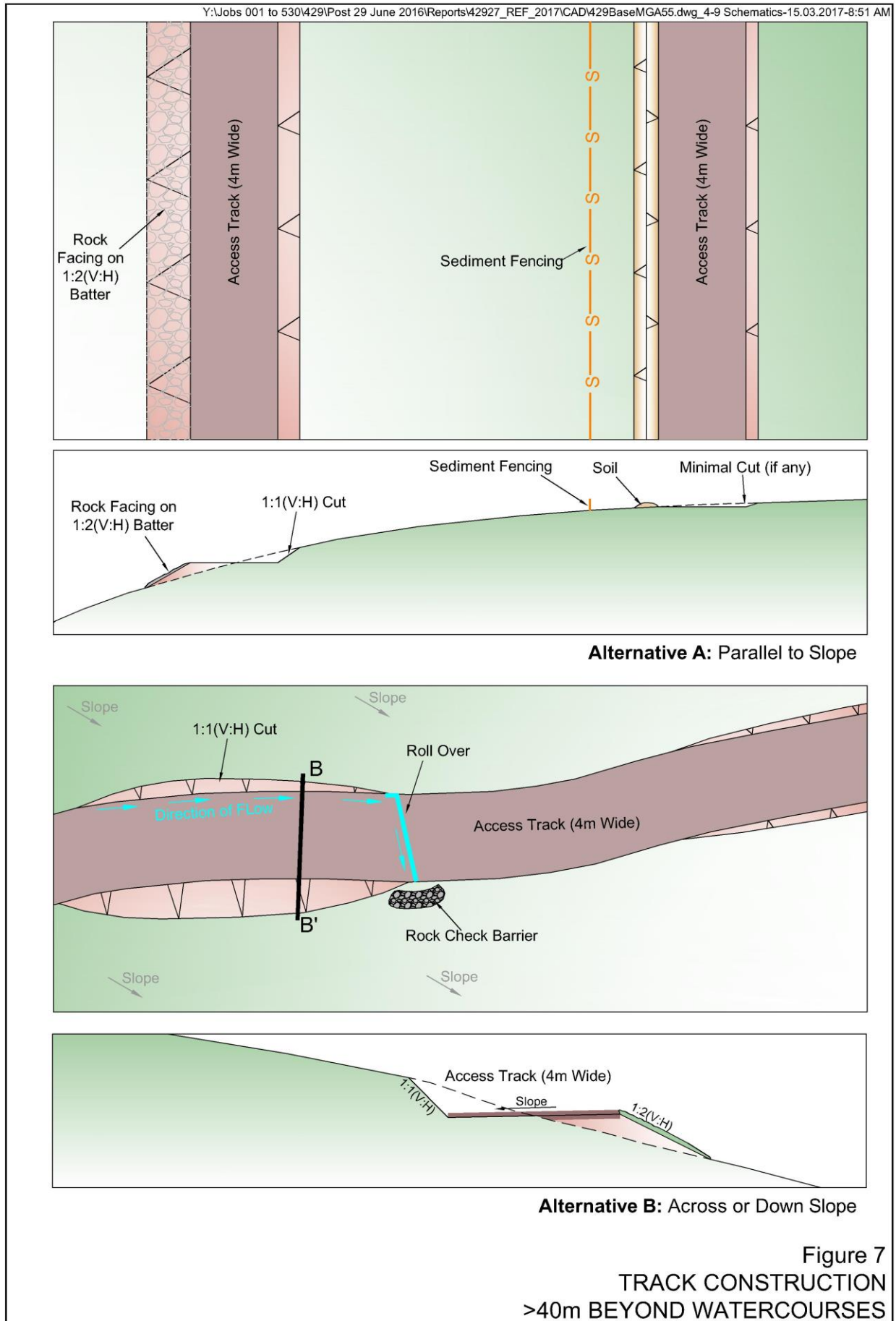
Y:\Jobs 001 to 530\429\Post 29 June 2016\Reports\42927\_REF\_2017\CAD\429BaseMGA55.dwg\_4-9 Schematics-15.03.2017-8:51 AM



Modified after Landcom (2008) - Figure SD5-1

**Figure 6**  
**TRACK CONSTRUCTION ACROSS**  
**SECOND ORDER WATERCOURSES**







The slope of the track constructed with a soil/clay substrate will be gentle and towards the toe of the upslope batter to avoid any runoff across the downslope batter. The runoff from the track would be directed towards a series of rollovers positioned at intervals of between 20m and 40m to direct the runoff across the road to the downslope side (spacing reduced with increased incline of track) and towards either a rock check barrier (preferred for long term maintenance) to a straw bale filter, placed downslope of the roll overs and/or turnouts, which will filter the sediment-laden runoff from the track.

### **Track Construction across Watercourses**

The watercourses within the Exploration Area occur either as gentle depressions without a defined channel or defined channels without significant bank development and typically less than 1m to 2m in depth.

At the outset, track crossings will be limited and located in areas that are best located to avoid/minimise impacts arising from the crossings. It is recognised that the watercourses within the Gumarooka Exploration Area are all non-perennial and that water is rarely present for long periods following rainfall.

**Figure 6A** displays the Company's approach to crossing a watercourse without a defined channel, i.e. a 6m wide section of the track would be covered with either logs typically 100mm to 200mm in diameter recovered from the pre-clearing activities, or alternatively using rock ballast of diameter between 100mm to 250mm above a layer of bidim cloth laid across the watercourse.

**Figure 6B** displays a similar approach to crossing a watercourse with a defined channel. Essentially either logs are placed longitudinally in the channel which in turn allows low flows to continue through the channel, or alternatively bidim cloth is laid out across the watercourse and finer ballast <100mm is placed around a culvert pipe within the defined channel and rock ballast of diameter between 100mm to 250mm is placed above this to allow the flow of water both within the channel and above the channel during high flow periods.

### **Track Construction >40m beyond Watercourses**

**Figure 7** displays the typical layout of tracks constructed either parallel to slope or across/downslope away from the prescribed watercourses within the Gumarooka Exploration Area.

For tracks constructed generally parallel to slope, they will be constructed in a manner similar to those within 40m of watercourses although sediment fencing will only be required downslope of those tracks where substantial soil thicknesses are present. Tracks excavated within rocky slopes will not require the installation of sediment fencing downslope of the track batters as they would be adequately protected by the rock facing.

For tracks traversing slopes, the track will be constructed such that all runoff will be directed towards the upslope batter and flow along the upslope side of the track until it reaches one of the roll overs constructed across the track. Roll overs will be typically constructed at distances of 20m to 40m along the various tracks with a rock check barrier positioned at the downslope side of each rollover.

### **3.4 DRILL PADS**

The key erosion sediment controls for either diamond or RC drill pads involve the following.

1. The installation of sediment fencing on the downslope side within:
  - i) all drill sites within 40m of watercourses; and
  - ii) all other drill sites where the batter slope is not rock armoured.
2. A straw bale barrier or other sediment control structure will be positioned at the drill pad runoff point to allow sediment in runoff from the pad to be filtered prior to flowing downslope. A coarse rock barrier will be used in conjunction with the straw bales where longer term protection is required. When the surface is sufficiently stable, the straw bales may be removed, but rock barriers should remain.
3. RC drill sumps will be provided with a splashboard on the downslope side of the sump to provide protection for water (under pressure) entering the sump. Further discussion on the management of sump water is included in Section 4.

**Figures 8 and 9** display the typical layout of the drill pads and the various erosion and control measures to be adopted.

### **3.5 MAINTENANCE**

All disturbed areas and their erosion controls require regular inspection and, where necessary, maintenance of the structures to prevent any sediment-laden runoff entering the surrounding watercourses.

#### **Tracks**

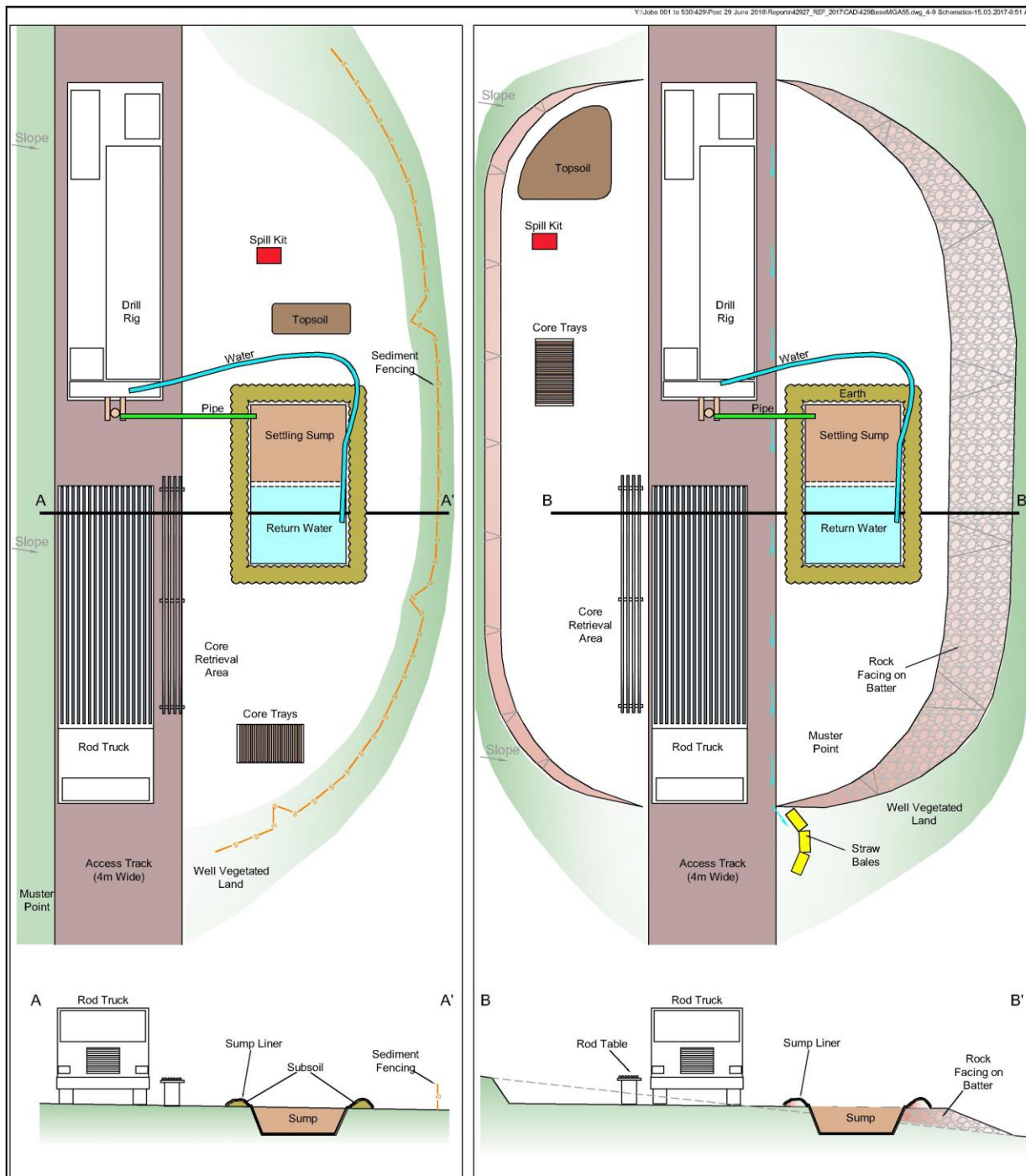
All actively used tracks will be inspected on a weekly basis to ensure that all sediment fences or straw bale filter and rock check barriers do not have excessive sediment retained. In the event that excessive sediment has accumulated behind/within any of these structures, the sediment will be removed either manually or with a small excavator and the materials placed in a predefined area within the Exploration Area.

All roll overs on tracks will be inspected to ensure they remain effective in directing runoff from the tracks to the designated trackside barriers.

Inspections of all tracks will be undertaken following any rainfall event during which >25mm of rainfall occurs within a 24 hour period. Reliance is placed upon the rainfall records collected at the on-site meteorological station.

#### **Drill Pads**

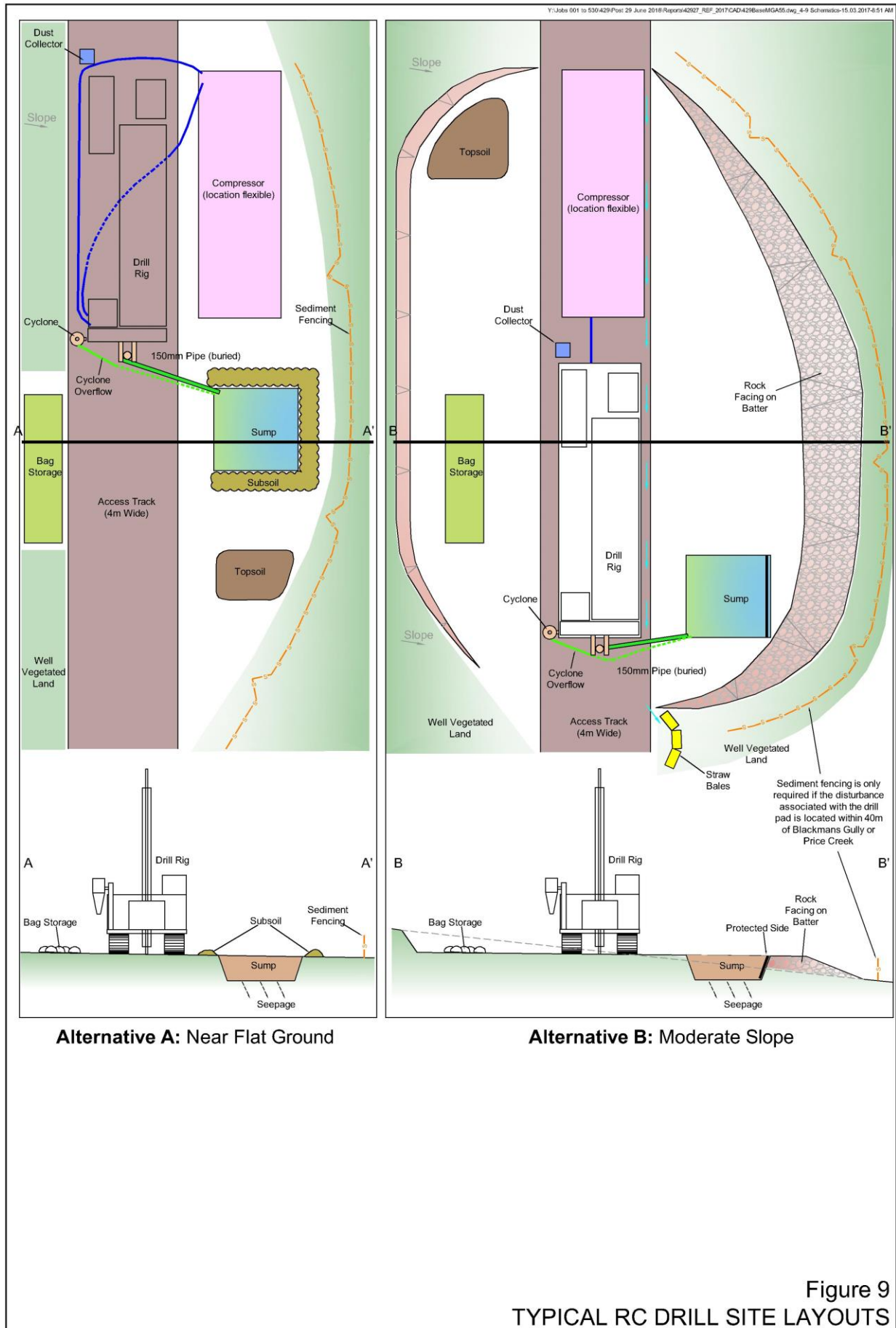
Drill pads will be inspected following construction and prior to use, during use and following the completion of drilling activities. The frequency of inspection will be similar to tracks inspections; weekly when in use and monthly to quarterly when inactive.



**Alternative A: Near Flat Ground**

**Alternative B: Moderate Slope**

**Figure 8**  
**TYPICAL DIAMOND DRILL SITE LAYOUTS**



The principal areas inspected will include the:

1. side walls of the sump to confirm its integrity;
2. integrity of the downslope batter from the drill pad;
3. sediment fence, where present; and
4. straw bale and rock barriers at the runoff point.

### **Excavations**

Where retained for longer term use, excavations should be inspected quarterly.

## **4. WATER MANAGEMENT**

### **4.1 SURFACE WATER**

Surface water will be encountered throughout the Exploration Program both in terms of overland flow towards and across the access tracks and drill pads and within the watercourses that traverse the Gumarooka Exploration Area.

Given the comparatively short period of time that the drill pads are in use, it is not considered appropriate to create upslope diversions above the drill pads. Rather, runoff water would be minor and best managed through collection and disposal from the drill pad itself. As discussed in Section 2.2.1, each drill pad will be sloped in a defined direction to direct runoff that flows onto the pad and is generated on the pad itself toward an outlet point protected by a straw bale filter (see **Figure 8**).

Construction of an upslope diversion embankment is considered unnecessary given the small quantity of runoff likely to be diverted and the fact that the construction of the diversion embankment itself would be the source of sediment-laden runoff which also requires management.

Runoff collecting in the non-perennial watercourses that traverse the Gumarooka Exploration Area will not be impacted through the adoption of various erosion sediment controls nominated in Section 3.

The Company also ensures that each drill site is provided with a fully equipped spill kit to ensure neither the surface water nor groundwater are compromised by any hydrocarbon spills.

### **4.2 GROUNDWATER**

Groundwater will be encountered during the drilling program when the diamond core and RC drilling intersects the regional groundwater table.

All groundwater recovered during the diamond drilling operations (in addition to the water added for lubrication purposes) will be directed from the collar of the drill hole to the nearby sump. Each sump for the diamond drilling operations may comprise two sections, one being a sediment sump and the other a water return sump. Groundwater and added drilling water would



collect in the sumps and be recirculated through the drilling process. In the event that excess water is generated throughout the drilling of a diamond drill hole, excess water from the sump will be pumped to a mobile water truck for disposal.

Groundwater encountered during RC drilling will be returned to the surface principally via the drill collar or sample cyclone. Water from both sources will be directed to the sump adjacent to the drill rig. The sump will be constructed with a top water level marker positioned approximately 250mm below the lowest point of the bund surrounding the sump / top lip of the sump. Where an in-ground sump is used, the sump will also incorporate a splash board positioned on the downslope side of the sump to prevent scouring of the unconsolidated material on the downslope side of the sump.

Drilling personnel will monitor the water level in the sump and cease drilling when the level of water in the sump rises to the marked top water level. Drilling will resume following the pumping of the water from the sump to the mobile water tank on site.

Water collected in the mobile water tank will be irrigated to access roads to aid dust suppression. However, to ensure irrigated water does not result in surface water pollution, water would not be irrigated within 40m of a watercourse or during wet conditions.

## **5. REFERENCES**

**Department of Environment and Climate Change (DECC) 2008.** *Managing Urban Stormwater: Soils and Construction – Volume 2E Mines and Quarries.*

**Landcom 2004.** *Managing Urban Stormwater: Soils and Construction – Volume 1 (4<sup>th</sup> Edition).*

**Strahler, A.N. 1957.** *Quantitative Analysis of Watershed Geomorphology – Transactions of American Geophysical Union.*

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# Attachments

**Attachment 1: Standard Drawings**

1. Sediment Fence
2. Straw Bale Filter

**Attachment 2: Erosion and Sediment Control  
Check Sheets**

1. Gate 1: Prepare Drill Pad
2. Gate 2: Ecology
3. Gate 3: Post Construction Pad/Track

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# **Attachment 1**

## **Standard Drawings**

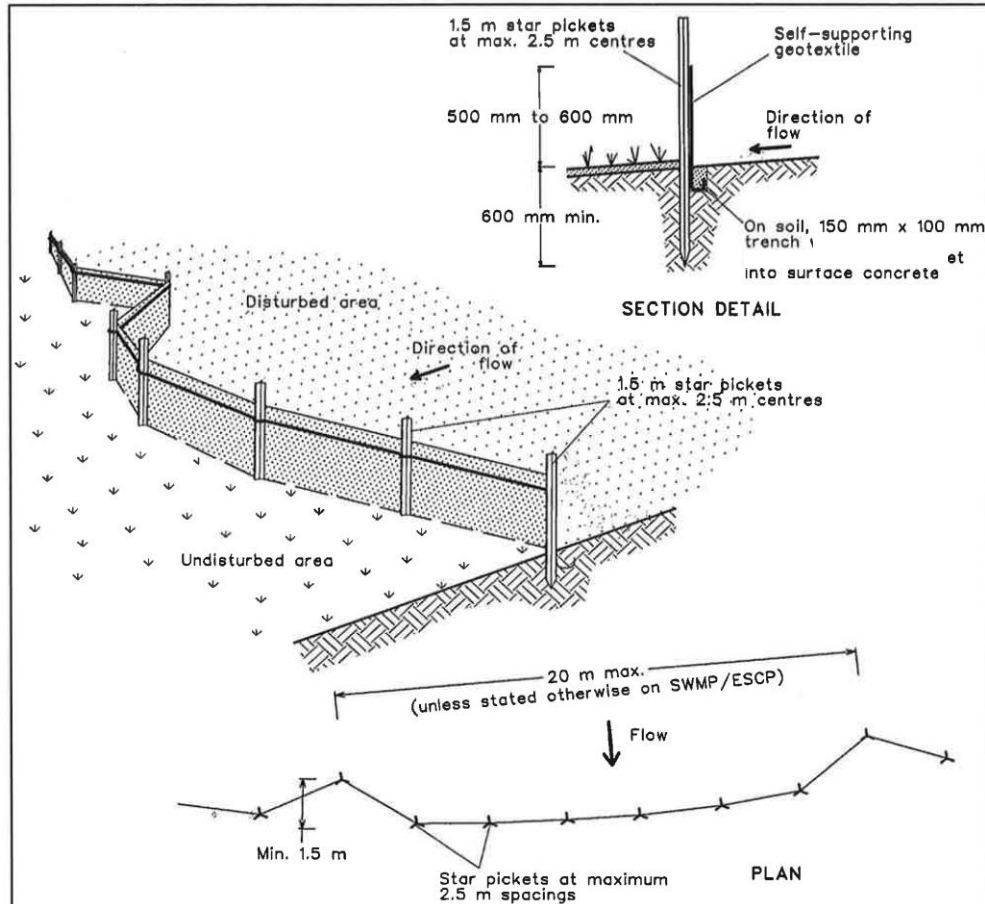
1. Sediment Fence\*
2. Straw Bale Filter\*

\*Modified after Landcom (2004)

Total number of pages including blank pages = 4



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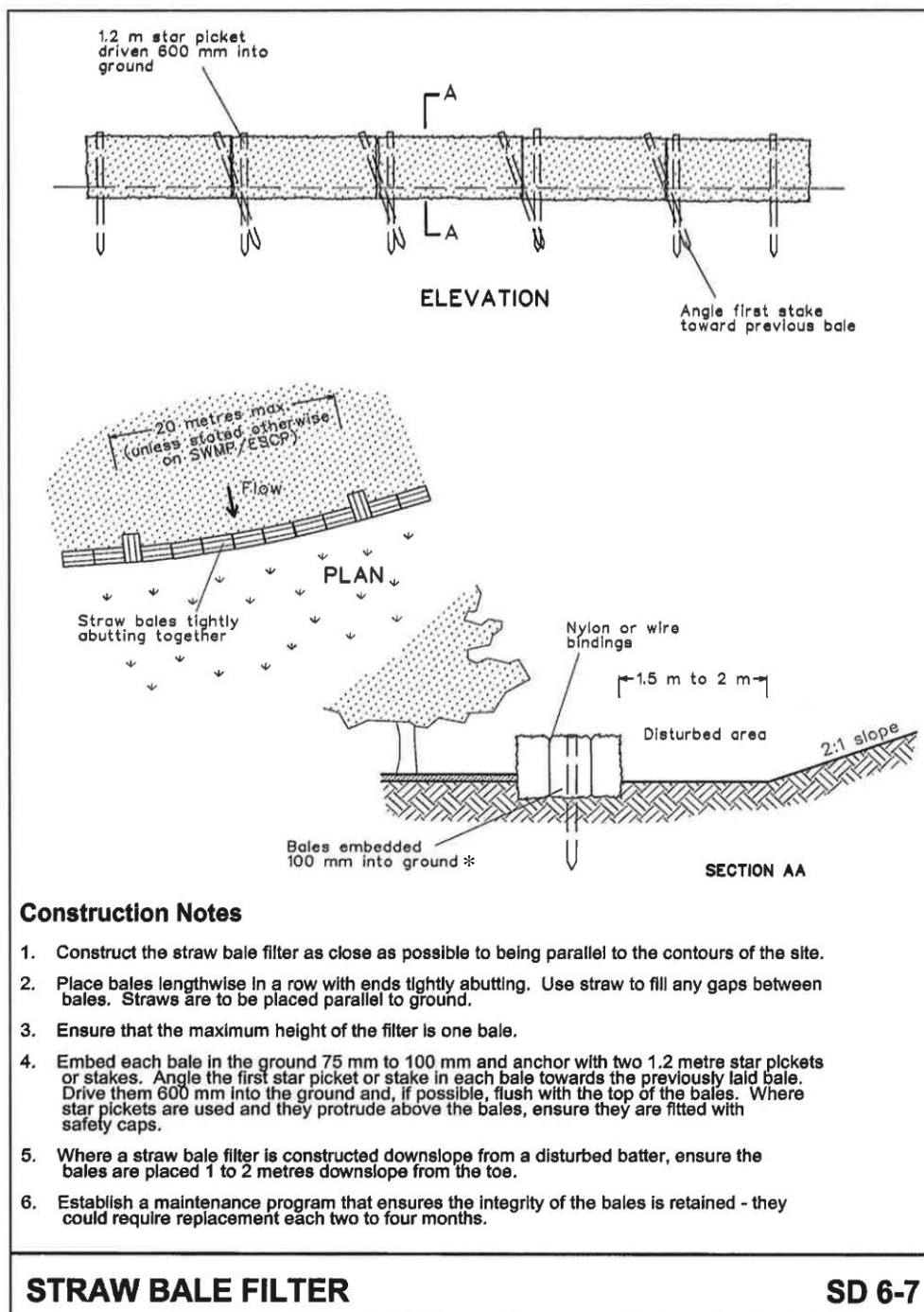


### Construction Notes

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

**SEDIMENT FENCE**

**SD 6-8**



**\*Burying straw bales into the ground is not required if good contact is attained with the ground level.**

# **Attachment 2**

## **Erosion and Sediment Control Check Sheets**

1. Gate 1: Prepare Drill Pad
2. Gate 2: Ecology
3. Gate 3: Post Construction Pad/Track

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**Environmental Exploration Compliance Checklist**

**Gate 1: Prepare Drill Pad**

**EL #5920**

Proposed Hole ID		Conducted on	
Diamond / RC Hole		Access Agreement	Yes / No

Procedure	Yes	No	n/a
GPS location checked and correct?			
Is the site located in EEC?			
AHIMS/Cultural Heritage check completed? Site clear to proceed?			
Drill pad disturbance area (~15x20m) identified and clearly demarcated			
Comment (any adjustment of pad location, track length, bearing. Pad size etc.			
If the site is near residences, can the site be reoriented to minimise noise impact			
Have appropriate erosion and sediment controls been installed? or have arrangements been made for installation?			
Site photo taken and uploaded to BS_ENV_MonitorMeasure_Checklists server			
Sketch site layout with proposed tree placement, soil stockpiles, runoff outlets etc.			

N

NOT TO SCALE

Completed by - name/signature:

ENVIRONMENTAL EXPLORATION: GATE1 PREPARE DRILL  
PAD

SALLY MAYBERRY 04/10/2016



Environmental Exploration Compliance Checklist

**Gate 2: Ecology**

EL #5920

Hole/Track ID		Date	
Checklist completed by:		Located in EEC	Yes / No

Tree Information	Yes	No
Are there live mature trees (>20cm DBH) 1 2 3 4 5 6 7 8		
Are there dead mature trees (>20cm DBH) 1 2 3 4 5 6 7 8		
Does the tree have a small (<10cm) hollow		
Does the tree have a medium (10-20m) hollow		
Does the tree have a large (20-30cm) hollow		
Does the tree have an extra-large (>30cm) hollow		
General comments:		

General site ecology check	Yes	No
If 'yes', reconsider construction options		
Are there nests in trees (birds/mammals)		
Are there scratches on trees		
Are there wear marks around hollows		
Were birds been seen leaving hollows at the time of inspection		
Is there whitewash on tree trunks		
Are there owl pellets visible on ground		
Is there an accumulation of bat scats under trees		
Are there any known threatened flora species on the site <i>Ausfeld's Wattle, Acacia austweldii</i> <i>Capertee Stringybark, Eucalyptus cannonii</i> <i>Small Purple-pea, Swainsona recta</i> <i>Eyebrights - Euphrasia arguta</i>		

Bowdens Representative name/signature:

ENVIRONMENTAL EXPLORATION: GATE2 ECOLOGY

SALLY MAYBERRY 19/10/2016



Environmental Exploration Compliance Checklist

**Gate 3: Post Construction  
Pad/Track**

Hole/Track ID	Date	Completed by
---------------	------	--------------

Procedure	Yes	No
GPS Coordinates checked and correct for hole/track location		
Pre clearance ecological inspection conducted <5 days prior to construction		
Sediment fence installed in predefined area		
Sediment fence integrity checked post construction		
Tree clearing and placement in predefined areas		
Separate subsoil and topsoil stockpiles in predefined areas		
Excavated sump (no sumps to be constructed in EEC)		
Pad/track construction as per predefined sketch. Cleanwater diversion if practicable		
Site photo taken and uploaded to BS_ENV_MonitorMeasure_Checklists server		
Sketch site layout with actual tree placement, soil stockpiles, runoff outlets, identified watercourses (sediment fence needed <40m from watercourse) and other ESC measures		

N

NOT TO SCALE

Bowdens Representative name/signature:

ENVIRONMENTAL CONSTRUCTION EXPLORATION: GATE 3 POST

SALLY MAYBERRY 04/10/2016

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Peter Smith  
BOWDENS SILVER PTY LIMITED  
PO Box 1115  
MUDGEE NSW 2850

Dear Peter,

**EXPLORATION LICENCE 5920 (Act 1992) - BOWDENS SILVER PTY LIMITED -  
GUMAROOKA EXPLORATION PROGRAM - NOTIFICATION OF GRANT OF ACTIVITY  
APPROVAL**

**NOTICE OF GRANT OF ACTIVITY APPROVAL AND VARIATION OF INSTRUMENT**

Your application has been assessed and I advise that pursuant to section 23A(4) of the *Mining Act 1992*, a delegate of the Secretary has decided to grant the activity approval with terms. The activity approval is attached at Annexure A to this letter.

This activity approval is effective from the date of this letter.

**OTHER**

If you have any questions about this letter, please contact Stephen Clipperton directly on 02 6360 5346.

Yours sincerely,

Stephen Clipperton  
**A/Manager and Principal Inspector Environment**  
Division of Resources and Energy  
Department of Industry, Skills and Regional Development

Signed under delegation from the Secretary of the Department of Industry, Skills and Regional Development





## ANNEXURE A

### ACTIVITY APPROVAL OF ASSESSABLE PROSPECTING OPERATIONS AND AMENDMENT OF LICENCE CONDITIONS

#### EXPLORATION LICENCE 5920 (Act 1992) GUMAROOKA EXPLORATION PROGRAM

#### ACTIVITY APPROVAL

Pursuant to section 23A of the *Mining Act 1992*, activity approval is granted to carry out the assessable prospecting operations, which form part of Activity **GUMAROOKA EXPLORATION PROGRAM** (Application Reference **INW17/14695**, Date **17/03/2017**) on EL 5920, from the date specified in the 'Notice of grant of activity approval' in connection with this approval, subject to the following terms and all relevant definitions:

#### General

- (a) The licence holder must carry out Activity **GUMAROOKA EXPLORATION PROGRAM** in accordance with the *42927\_Appendix 1\_ESF4-Exploration-activities-application* submitted on 17/03/2017 and *Review of Environmental Factors – Bowdens Gumarooka Exploration Activities EL5920(1)* submitted on 17/03/2017.

#### DEFINITION

Words in this instrument have the meaning given to those terms in EL 5920, unless otherwise specified below.

**EL 5920** means Exploration Licence No. 5920.

**Activity GUMAROOKA EXPLORATION PROGRAM** means the activities described in Application Form ESF4 and *Review of Environmental Factors (INW17/14695)* prepared by **R.W. CORKERY & CO. PTY. LIMITED** and dated **March 2017**

Signed:

Stephen Clipperton

**A/Manager & Principal Inspector - Central**

Signed under delegation from the Secretary of the Department of Industry, Skills and Regional Development

Dated:

23/03/2017