APPENDIX 15

Soil and Water Management Plan

Austar Coal Mine Pty Ltd

Surface Infrastructure Site
Soil and Water Management Plan

September 2008

Umwelt
Environmental Consultants

Surface Infrastructure Site
Soil and Water Management Plan

Prepared by

Umwelt (Australia) Pty Limited

on behalf of

Austar Coal Mine Pty Ltd

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Report No.	2274/R20/FINAL	Date:	September 2008

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1.0 Introduction

Austar Coal Mine is an underground mine formed from the former Ellalong, Pelton, Cessnock No.1 (Kalingo) and Bellbird South Collieries near Cessnock, NSW (refer to **Figure 1.1**). Austar Coal Mine is to be developed in three stages. A modification to consent (DA 29/56) was granted for Stage 1 of the mine in September 2006 and for the commencement of Stage 2 of the mine in June 2008. The modifications allowed the use of the technology known as Longwall Top Coal Caving (LTCC) to extract coal.

As part of Stage 3 of the development of the mine a new Surface Infrastructure Site is to be constructed to support the ongoing operation of the mine including a mine ventilation system, mine access for workers and surface facilities such as administration buildings, a bathhouse and workshop (refer to **Figure 1.2**).

This Soil and Water Management Plan for the Surface Infrastructure Site has been prepared by Umwelt (Australia) Pty Limited (Umwelt) on behalf of Austar Coal Mine Pty Ltd to describe the soil and water management controls to be adopted for the construction and operation of the Surface Infrastructure Site. This Soil and Water Management Plan has been undertaken as part of the overall Environmental Assessment (EA) for the project.

2.0 Existing Environment

The proposed facilities lie in the upper reaches of the catchment area of Black Creek. Black Creek flows generally in a northerly direction through Cessnock to Branxton before flowing into the Hunter River (refer to **Figure 1.1**) and has a catchment area of approximately 380 km^2.

The catchment is dominated by Permian sedimentary rocks comprising sandstone, mudstone, shale, siltstone, conglomerate, tuffs, limestone and coal. Reference to the 1:250,000 Singleton Soil Landscape Sheet indicates the majority of the Surface Infrastructure Site is located on the upper slopes of the Branxton soil landscape with a small area in the south located on the lower slopes of the Aberdare soil landscape. The areas proposed to be disturbed within the boundary of the Surface Infrastructure Site all lie within the Branxton soil landscape (refer to **Figure 2.1**).

The Branxton soil landscape comprises undulating low hills and rises with many small creek flats and extends over a large area between Singleton and Cessnock. Elevations range from 50 metres to 80 metres, local relief is typically 10 metres to 40 metres with slopes ranging between 3% to 5% and typical slope lengths of 600 metres. Tunnel and gully erosion occurs in the dominant soils due to their high dispersibility. The parent material is formed by alluvial and colluvial deposits of in-situ weathered parent rock. The soils comprise yellow podzolic soils on midslopes with red podzolic soils on crests while yellow soloths occur on lower slopes and in drainage lines. Alluvial sands occur in some creeks with siliceous sands on flats within the larger valleys. The soils on the mid slopes are typically brown sandy loams overlying bright brown mottled yellow grey medium clays, with depths to bedrock typically greater than 0.1 metres. Mid slope soils within this landscape have a moderate topsoil erodability, low salinity and a high erosion hazard.

The proposed site for the surface infrastructure has grades of typically 5% to 7% and is intersected by two drainage lines. These drainage lines are ephemeral and consist of one second order and one third order steam (refer to **Figure 2.1**).

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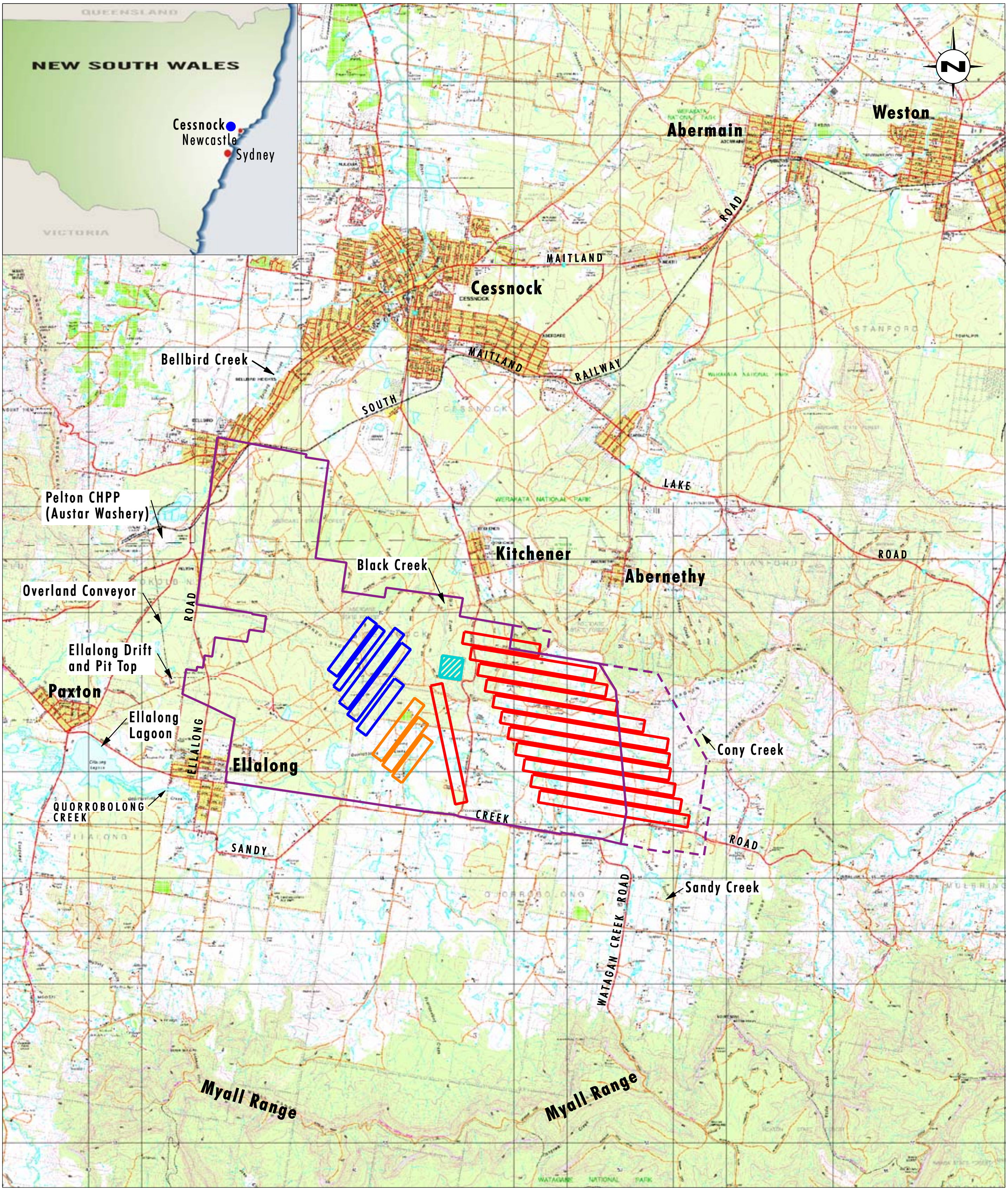


Source: Topo Maps: LPI NSW, Longwall Layout: Austar Coal Mine

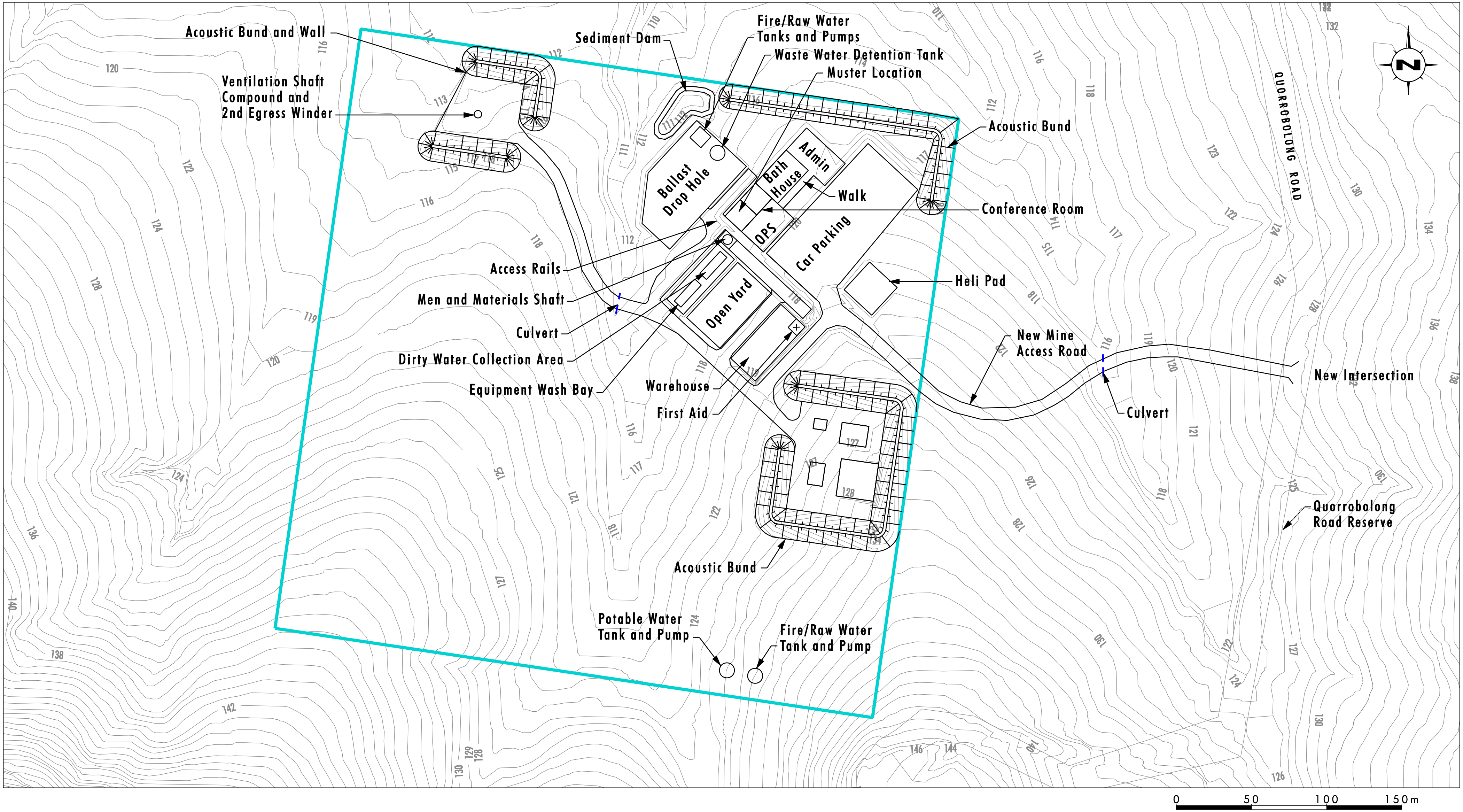
0 1.0 2.0 4km
1:100 000

Legend
- Layout for Stage 1 Longwall Panels
- Layout for Stage 2 Longwall Panels
- Conceptual Layout for Stage 3 Longwall Panels
- Surface Infrastructure Site
- Consolidated Mining Lease (CML) 2
- Proposed Stage 3 Extension Boundary

FIGURE 1.1

Locality Plan

File Name (A4): R20_V1/2274_578.dgn



Legend

Surface Infrastructure Site

FIGURE 1.2

Conceptual Layout for Proposed Surface Infrastructure Site

Note: Contour Interval 1m

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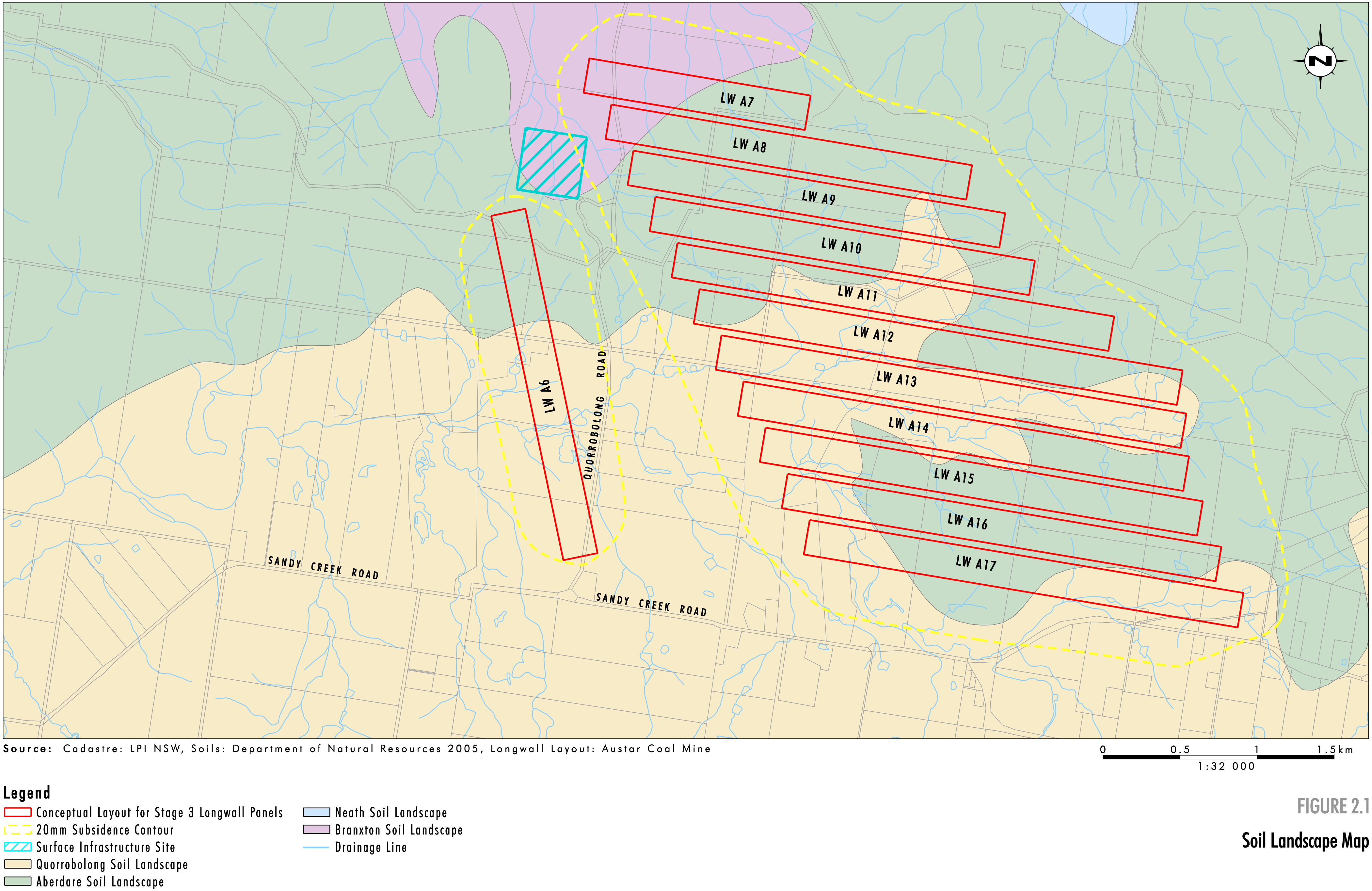


Source: Cadastre: LPI NSW, Soils: Department of Natural Resources 2005, Longwall Layout: Austar Coal Mine

FIGURE 2.1

Soil Landscape Map

File Name (A4): R20_V1/2274_580.dgn

3.0 Management Strategy

The soil and water management strategy for the Surface Infrastructure Site has been designed to minimise the potential impacts on the surrounding environment and downstream catchment areas, including:

- minimise erosion potential of the site and sediment transport off site;
- maintain water quality in downstream watercourses; and
- protect the existing streamlines and riparian habitat.

The key elements of the soil and water management strategy are shown on **Figure 3.1**.

The natural topography of the site includes three natural catchment areas upstream of the proposed infrastructure locations. As such four diversion drains are required to convey natural catchment runoff away from the Surface Infrastructure Site. The first diversion drain will be located on the southern side of the ventilation shaft compound, the second and third upstream of the access road to the ventilation shaft compound and the fourth upslope of the southern acoustic bund (refer to **Figure 3.1**).

It is proposed to capture and treat the majority of surface water runoff from the disturbed areas of the site prior to discharge to downstream drainage systems. The site runoff to the east of the central drainage line will be collected in two catch drains prior to flowing through a series of bio-retention areas to be located at the northern (downslope) boundary of the site (refer to **Figure 3.1**) and into a proposed sediment dam for treatment.

On the western side of the drainage line a small sump will be located in the north-western corner of the ventilation shaft compound. This sump will collect surface water runoff from within the ventilation shaft compound. The collected runoff will be discharged through the acoustic bund wall via a pipe to the downstream drainage system.

A vehicle access road will be constructed from Quorrobolong Road to the ventilation shaft on the western side of the Surface Infrastructure Site. The access road will be sealed with formalised road batters/retaining systems and drainage infrastructure, including culverts and scour protection.

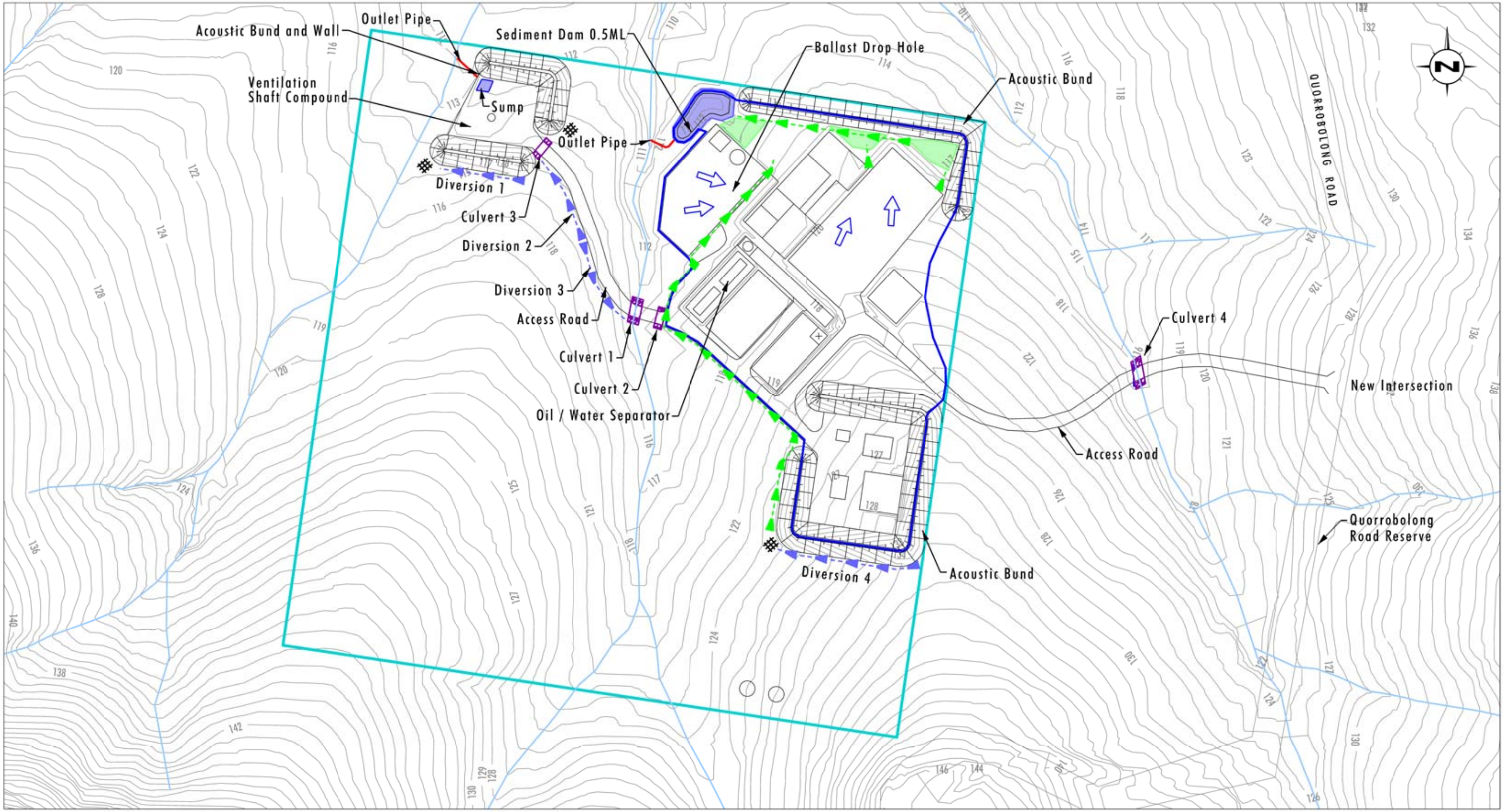
Four culverts will need to be constructed along the access road. The first culvert (Culvert 1) will be required on the access road between the major compound area and the ventilation shaft compound. A second culvert (Culvert 2) will be required to convey site water runoff from the catch drain running along the south-eastern edge of the main compound under this road. The third culvert (Culvert 3) will be also be required to convey runoff from upstream of the access road east of the ventilation shaft compound.

The fourth culvert (Culvert 4) will also be required on the access road to the Site Infrastructure Site from Quorrobolong Road.

Stable vegetative cover will be established on all disturbed areas which are to remain unsealed.

Sediment and erosion controls required during the construction phase are outlined in **Section 4**.

The design components of the management controls outlined above are discussed in further detail in **Section 5**.



Note: Contour Interval 1m

Legend

- Surface Infrastructure Site
- Catchment Boundary
- Bio-Retention Area (Grassed Surface)
- Diversion Drain
- Catch Drain
- Drainage Line
- Culvert
- Flow Direction
- Level Spreader

FIGURE 3.1

Soil and Water Management Controls

4.0 Erosion and Sediment Control during Construction

The erosion and sediment controls for the site have been developed in accordance with the practices detailed in *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004) (the Blue Book). The intent of the erosion and sediment controls is to minimise the generation of sediment on site and its transport around and off the site during the construction phase.

The proposed erosion and sediment controls for the construction phase of the Surface Infrastructure Site are shown on **Figure 4.1**. Specific erosion and sediment controls will be contained in the construction plans for works on the site. These plans will include measures to be adopted to control the quality of runoff, including the following:

- construction of an on-site sediment dam (refer to **Section 5.2.1**) prior to the commencement of any substantial construction works within the catchment area;

- construction and regular maintenance of silt fences downslope of disturbed areas, including the construction sites for the sedimentation dam and catch/diversion drains;

- applying gypsum, where required, to reduce the dispersibility of the subsoils that will be disturbed and to minimise the potential for tunnel erosion and surface rilling of disturbed or reshaped areas. The application rate to be determined by site specific soil testing as required;

- seeding and controlled fertilising of disturbed areas to provide for rapid grass cover. Areas will be seeded with a grass mix specific to the needs of the area to be grassed;

- inspection of all works daily and immediately after storm events to ensure sediment and erosion controls are performing adequately;

- provision for the immediate repair or redesign of sediment and erosion controls that are not performing adequately; and

- placement of floatation curtains (or other devices performing the same function) at the outlet of the sediment dam to trap possible oil and grease spills.

In addition, the construction plans will detail the specific inspection, maintenance and revegetation requirements for each works area based on the construction program schedule. These control measures will be set out in a detailed Sediment and Erosion Control Plan that will be prepared and submitted for approval prior to commencement of construction.

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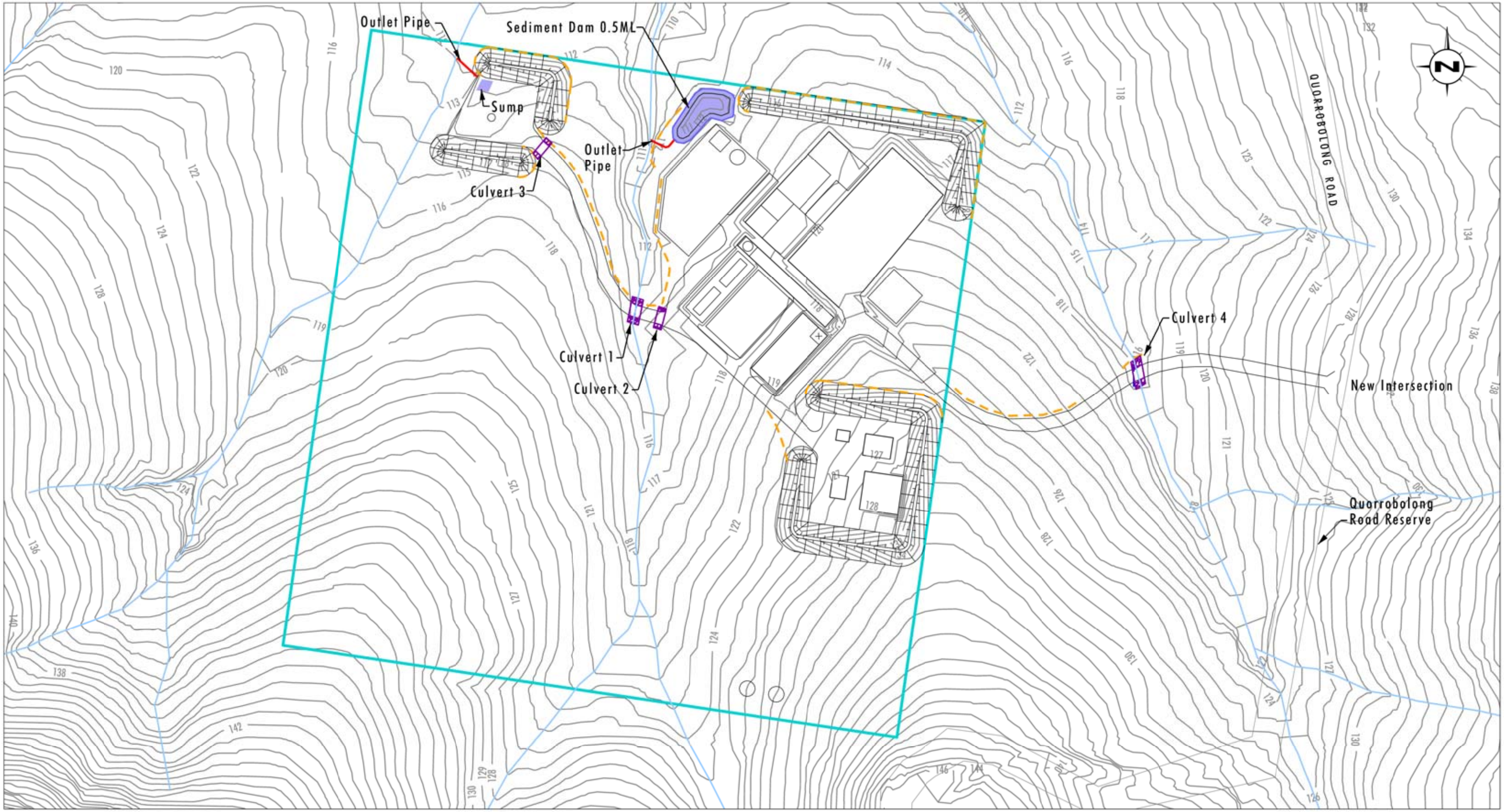

Note: Contour Interval 1m

0 50 100 150m
1:3000

Legend

- Surface Infrastructure Site
- Sediment Fence
- Drainage Line
- Culvert

FIGURE 4.1

Construction Sediment and Erosion Controls

File Name (A4): R20_V1/2274_503.dgn

5.0 Management Controls

5.1 Drainage Systems

5.1.1 Diversion Drains

As part of the soil and water management system four diversion drains are required to divert clean water from the upstream catchment areas around the ventilation shaft compound and associated access road and the southern acoustic bund (refer to **Figure 3.1**).

Peak flows in the diversion drains have been estimated using the Probabilistic Rational Method outlined in *Australian Rainfall and Runoff* (*AR&R*) (IEAust, 1987) for the catchments' critical storm durations.

The critical storm duration for the 3 hectare catchment area upstream of the ventilation shaft compound is approximately 10 minutes. The 20 year Average Recurrence Interval (ARI) storm event peak flows are estimated to be in the order of 0.3 m^3/s.

The critical storm duration for the two 0.5 hectare catchment areas upstream of the ventilation shaft access road is approximately 6 minutes. The 20 year Average Recurrence Interval (ARI) storm event peak flows are estimated to be in the order of 0.1 m^3/s.

The critical storm duration for the 1 hectare catchment area upstream of the southern acoustic bund is approximately 10 minutes. The 20 year Average Recurrence Interval (ARI) storm event peak flows are estimated to be in the order of 0.1 m^3/s.

All diversion drains will be trapezoidal in shape with side batters of 1V:3H (vertical:horizontal), 1.0 metre base width and 0.9 metres deep (including 0.5 metres freeboard).

Calculated peak design flows from the upstream catchment areas range between 0.1 m^3/s and 0.3 m^3/s. These peak flows correspond to peak velocities ranging between 0.8 m/s to 1.2 m/s indicating that scour protection can be achieved by tilling gypsum into the drains and establishing a stable vegetative cover.

5.1.2 Catch Drains

Two catch drains are required to capture and direct runoff from the Surface Infrastructure Site to the proposed sediment dam located to the north-east of the Ballast Drop Hole (refer to **Figure 3.1**). These catch drains will capture runoff from a number of areas including, roads, car parking areas, rooftop areas, the Heli Pad and landscaped areas.

Peak flows in the catch drains have been estimated to be in the order of 0.3 m^3/s. Preliminary sizing indicates that grass lined trapezoidal swales with side slopes of 1V:3H, 0.5 metre base widths, and 0.7 metres deep (including 0.5 metres freeboard) will be sufficient to convey flows from the critical duration 20 year ARI storm event.

Calculations indicate that peak design flows are approximately 0.3 m^3/s with velocities in the order of 1.4 m/s indicating that scour protection can be achieved by tilling gypsum into the drains and establishing a stable vegetative cover.

5.1.3 Culverts

Four culverts are required to direct water from the upstream catchments under the proposed access roads to and around the site (refer to **Figure 3.1**). One culvert is required along the site access road linking the facility to Quorrobolong Road and three culverts are required under the access road to the ventilation shaft compound. Peak flows were estimated using the Probabilistic Rational Method based on the sizes of the upstream catchment areas.

The culverts were sized to convey the critical duration 100 year ARI storm event flows. The design criteria for each culvert are detailed in **Table 5.1**.

Table 5.1 – Culvert Design Criteria

Culvert	Length (m)	Design Flow (m^3/s)	Diameter (mm)	Number of Barrels
1 Ventilation Shaft Compound Access Road (drainage line)	15	5.2	1050	2
2 Ventilation Shaft Compound Access Road (catch drain)	20	0.3	600	1
3 Ventilation Shaft Compound Access Road (diversion drain)	15	0.1	600	1
4 Main Access Road (drainage line)	15	12.7	1250	3

Well graded rip rap for a length of 5 metres with D_{50} equal to 100 mm will be placed at all culvert entry and exits to minimise scour potential during storm events.

5.2 Water Quality Controls

5.2.1 Sediment Dam

To minimise the amount of runoff and the potential increase in sediment generation a two cell sediment dam will be constructed adjacent to the natural drainage depression running through the centre of the site (refer to **Figure 3.1**). A perforated riser and outlet pipe will be constructed to permit discharge of clean water into the natural drainage depression. The discharge point will grade into the natural drainage depression with well graded rip rap (D_{50} = 100 m) to minimise scour potential.

The catchment area of the proposed sediment dam is shown on **Figure 3.1**.

The sediment dam has been sized based on methods consistent with *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004). The design is based on a catchment area of 3.77 hectares and type D soils for an 80th percentile five day rainfall depth of 16.5 mm. The sediment dam will have a volume of approximately 0.5 ML.

5.2.2 Bio-retention Areas

To enhance the quality of water discharging from site three bio-retention areas have been proposed (refer to **Figure 3.1**). These bio-retention areas will be grassed and constructed in relatively flat areas. Excess runoff from the bio-retention areas will be directed to the downstream sediment dam via a catch drain (refer to **Section 5.2.1**).

5.2.3 Oil Water Separator

All runoff from potential dirty water areas (i.e. the warehouse, open yard areas and equipment wash bay) will be directed through a dirty water collection pit and oil/water hydrocarbon separation unit (refer to **Figure 3.1**) prior to this water being discharged into the proposed sediment dam. This will enable the dirty water to be collected and treated on-site prior to discharge.

6.0 Monitoring and Maintenance

6.1 Construction Phase Works

During the construction phase of the project all works and their erosion and sediment controls will be inspected on a daily basis to ensure that all required controls are in place and effective. Following the completion of construction works, the work area will be inspected weekly and after any runoff events until revegetation and stabilisation of drainage structures are complete.

All erosion and sediment controls and their monitoring and maintenance requirements for the construction phase will be detailed in the construction plan.

6.2 Operational Phase Works

During the operational phase of the project, monitoring of the water management control will be undertaken on a monthly basis and after major storm events, for all works that may be affected by such an event.

The walls of the sediment dam will be inspected biennially (every two years) for their structural integrity and any maintenance required. The walls of the dam will grassed and kept free of any trees and shrubs.

6.3 Decommissioning

Assuming that the mine is decommissioned at the end of the current approved development period (21 years), the sediment dam will either remain in use as a farm dam after decommissioning or will be removed. If maintained, the capacity of the dam may be reduced. The proposed diversion drains, catch drains and site bunding will remain as part of the final landform. All buildings/workshops and associated hardstand and sealed areas will be removed and revegetated. In addition, upon decommissioning all access and ventilation shafts to the underground workings will be sealed.

Any future development application for continued operations beyond 21 years will include a revision of the existing soil and water management system.

7.0 Responsibilities

The Austar Coal Mine Environmental Officer and Mine Manager will be responsible for the implementation of the requirements of this plan and ongoing maintenance and review of this plan.

8.0 Reporting and Review

A detailed Soil and Water Management Plan including a construction phase Sediment and Erosion Control Plan will be prepared prior to commencement of construction and will be reviewed every two years and updated where necessary. The Austar Mine Environmental Officer will report any significant findings regarding the implementation of this plan in the Annual Environmental Management Report (AEMR), including:

- the results of monitoring; and
- details of measure undertaken/proposed to address any identified deficiencies in the system.

9.0 References

Institution of Engineers Australia, 1987. *Australia Rainfall and Runoff*.

Kovac, M and Lowrie, J W, 1991. *Soil Landscapes of the Singleton 1: 250 000 Sheet.*

Landcom 2004. *Urban Stormwater: Soils and Construction*.