

4B.7.4.3.3 Capture of Dirty Water

Figure 4B.20 also presents the proposed dirty water management controls. Catchment banks/drains would be constructed to divert potentially sediment-laden waters into sediment basins constructed downstream of these areas of disturbance. The size and storage capacity of the sediment basins have been determined based on the settlement time requirements of the most common soil type (Soil Type D – Landcom, 2004) present on the Project Site (based on GCNRC, 2007b). In addition, unless the water captured in the sediment basins is to be used for dust suppression, and therefore not discharged, flocculants would be used to expedite the settlement process. Water would only be discharged during dry weather if it satisfies discharge criteria.

The catchment banks and sediment basins would be constructed prior to activities in the relevant Project Site sub-catchments. In addition, a third waterway would be constructed to capture and segregate dirty water flowing from the western emplacement to the west, from the clean water flowing from Vickery State Forest to the east and into WW1.

The specifications for each of these structures are included within Soil Conservation Service (2007) and summarised in **Tables 4B.33** and **4B.34**.

Table 4B.33
Catch Bank/Drain Specifications

Structure ID	Catchment Area (ha)	Channel Bottom Width (m)	Channel Grade (%)	Bank Height (m)	Sill Width (m)	Slope Below Sill (%)
Northern Emplacement						
CB1	4	3	0.3	0.7	6	2
CB2	4	3	0.3	0.7	6	2
Western Emplacement						
CB3a & 3	25	3	0.2	0.7	6	2
CB4a & 4	30	4	0.2	0.7	8	2
CB 5,6,7 & 8	4	3	0.3	0.7	6	2
CB9	35	4	0.2	0.7	8	2
	Waterway Width (m)			Bank Height (m)		
WW3	12			0.7		
Source: Modified after Soil Conservation Service (2007) – Table 8						

All sediment basins would be regularly inspected and cleaned of accumulated sediment material once their capacity is reduced by 20%. A marker post indicating this 20% capacity reduction level would be installed within each sediment basin to assist in monitoring. All other water management and storage structures and controls would be inspected monthly and following a rainfall event yielding >25mm, with maintenance work undertaken immediately in the event any of these are not functioning adequately.



Table 4B.34
Sediment Basin Specifications

Structure ID	Catchment Area (ha)	Volume (m ³)	Depth (m)	Dimensions length x width (mxm)	Outlet Width (m)	Sill Width (m)
Northern Emplacement						
SB1	9	2000	3	35x35	3	6
Western Emplacement						
SB2	10	2000	3	35x35	3	6
SB3	25	2000	3	35x35	3	6
SB4	4	1000	3	27x27	3	6
SB5	25	2000	3	35x35	3	6
SB6	30	2000	3	35x35	4	8
SB7	35	3000	3	40x40	4	8
SB8 ¹	4	1000	3	27x27	3	6
Northern Soil Stockpile						
SB9	25	2000	3	35x35	3	6
Open Cut Void Storage						
Open Cut Void Storages must be 11,000m ³ in capacity there can be any number of storages or one large one provided the total capacity is reached. These storages will migrate south as the void moves south.						
Note 1: To be constructed downslope from Site Facilities Area						
Source: Modified after Soil Conservation Service (2007) – Table 9						

4B.7.4.3.4 Discharge of Water

While the size and placement of sediment basins and water storages has been designed to operate a nil discharge site, it is possible that during very heavy or prolonged rainfall, the capacity of the structures of the dirty water catchments may be exceeded, necessitating a discharge of water. In order to ensure the quality of the water discharged meets the nominated criteria (see Section 4B.7.6.3), Soil Conservation Service (2007) has designed each structure to allow sufficient settling time (for Type D or F soil / sediment types), and conduct the flows at non-erosive velocities, such that the criteria for suspended solids would be achieved. To further safeguard against the discharge of sediment laden or otherwise contaminated water, the majority of the sediment basins and storage dams on the Project Site have been designed in-line such that water overflowing from one would be directed to an additional storage downstream. Water flowing between the water storages would be via grassed diversion or catchment banks which would reduce the total concentration of suspended sediment in water.

By constructing each structure in line, there would be only two designated wet weather discharge points (SD1 and SD3) with a water sample to be collected should a discharge occur. Discharged water would be sampled within 24 hours of a discharge event and assessed against DECC water quality criteria. Contingency measures in the event of exceedance of water quality criteria have been prepared and are discussed in Section 4B.1.6.



4B.7.4.3.5 Road Design

The transport route from the Project Site to Hoad Lane would be crowned to allow for the discharge of runoff from the road surface. In order to allow localised floodwater to flow uninterrupted, the proposed roads of the northern section of the transport route would be constructed at ground level. Concrete causeways, or possibly culverts, would be constructed / installed at selected depressions along the length of the transport route to ensure natural drainage is not impeded.

The site access road within the Project Site would be similarly crowned such that any water that falls on the road would be directed into roadside drains on either side. This would limit roadside erosion. Roadside batters would be topsoiled and seeded so that vegetation can limit their erosion. Concrete or pipe causeways would also be used to traverse the central drainage depression of the Project Site. The road would be sealed between the Site Entrance and Site Facilities Area thereby reducing the potential for the generation of sediment-laden water in that area.

4B.7.4.3.6 Hydrocarbon Products

The following management practices would be adopted to ensure water flowing from areas on the Project Site with the potential to generate hydrocarbon-contaminated water, eg. washdown areas, workshops, hydrocarbon storage and refuelling areas, is not contaminated by hydrocarbons.

- All water from wash-down areas and workshops would be directed to oil separators and containment systems.
- All storage tanks would either be self bunded tanks or bunded with an impermeable surface and a capacity to contain a minimum 110% of the largest storage tank capacity.
- All hydrocarbon products would be securely stored.
- With the exception of less mobile mining equipment, eg. excavators which would be refuelled within the open cut area, designated areas would be allocated for refuelling and minor maintenance work. The use of these areas would be enforced by mine management.

4B.7.4.3.7 In-pit Management of Water

RCA (2007) predict (through modelling) that groundwater would seep into the void created by the open cut mining activities. The water quality, while variable, is described as generally brackish (average EC of approximately 2560µS/cm – see Section 4B.1.2.3). The water quality was found to generally meet NHRMC health guidelines, although was not considered of ANZECC drinking water guideline standard.



Any groundwater seeping into the open cut, along with rainfall and runoff would be collected within an in-pit sump and used preferentially for dust suppression activities within the open cut, eg. haul roads, stockpiles and other trafficked areas. The inflow of groundwater would be monitored and compared to the predictions of RCA (2007). The management of water collected within the open cut would ultimately depend on the volume of groundwater inflows.

- If as anticipated, the inflow rate is below that predicted, it is unlikely that significant groundwater would collect within the open cut void, with the majority of water captured coming from rainfall and runoff. In this circumstance, and should heavy rainfall result in a requirement to dewater the in-pit sump and open cut void, a sample of the water quality would be obtained and dewatering only undertaken if the electrical conductivity (EC) of the water is $<350\mu\text{S/cm}$. Pumping of water that satisfies the EC target would be to surface storage structures (see **Figure 4B.20**) with any further discharge to meet discharge limits as nominated in Section 4B.7.6.2.
- Should the inflow rate approximate the predictions of RCA (2007), with the EC of the groundwater $>350\mu\text{S/cm}$, the collected water additional to in-pit dust suppression requirements would be pumped to surface and stored within a specifically designed and located "pit water dam". The dam would be lined with material of hydraulic conductivity $< 1 \times 10^{-9}$ and would be located within a backfilled section of the open cut such that should the dam overflow, the water would drain back into the open cut void, ie. it would not enter either the clean or dirty water management system. **Figure 4B.20** presents the possible locations of a pit water dam, based on the stage of mining when required. The Proponent would notify the DECC should the construction of a pit water dam be required and submit design specifications, construction QA/QC program and an "as constructed" report by a qualified engineer to the DECC.

4B.7.4.3.8 Maintenance of Vegetation

The maintenance of vegetation, particularly ground cover, would be an important factor in reducing the velocity of surface water flows and maintaining surface water quality. By reducing flow velocity, the potential for soil erosion is reduced as would be the potential for further sediment to be entrained by the runoff. The vegetation itself would also act to filter any suspended solids contained within the water. As a general rule, a ground cover would be maintained on the Project Site beyond the planned areas of disturbance. Importantly, the Proponent would undertake progressive revegetation of all completed landforms as discussed in Section 2.14. The Proponent proposes to maintain this ground cover at 70% or better in the areas to be returned to grazing, although this value may fluctuate with seasonal conditions.

The areas where the retention and management of vegetation is of highest priority would be those subjected to large quantities of diverted water. Priority would be given to establishing a grass cover within the three waterways and within a 50m buffer beyond the toe of the overburden emplacements.



Vegetation, particularly trees, also reduces the risk of dryland salinity by reducing the depth of the water table relative to the root zone of plants. By maintaining and/or enhancing as much vegetation on the Project Site as possible, particularly trees on the upper slopes, the potential for dryland salinity would be reduced.

4B.7.4.4 Flooding Controls

As noted in Section 4B.7.2.6, there is limited potential for flooding on the Project Site. WW-2 would divert any minor flood flows from the east away from the open cut area, however, following extreme rainfall, the volume of water flowing from Catchment 4 may be too significant for this structure and flood the Project Site. In this event, personnel and equipment would be evacuated awaiting the dissipation of the flood waters which are likely to recede within 24 hours of the cessation of rainfall (Soil Conservation Service, 2007). Controls which would assist in minimising the potential for flooding related impacts such as erosion and sedimentation include:

- establishing and maintaining a cover of vegetation (particularly grass) over disturbed areas;
- construction of catchment banks/drains directing dirty water to sediment basins;
- constructing the proposed road at ground level, thereby allowing water to flow over the road in an unimpeded manner; and
- construction of concrete causeways.

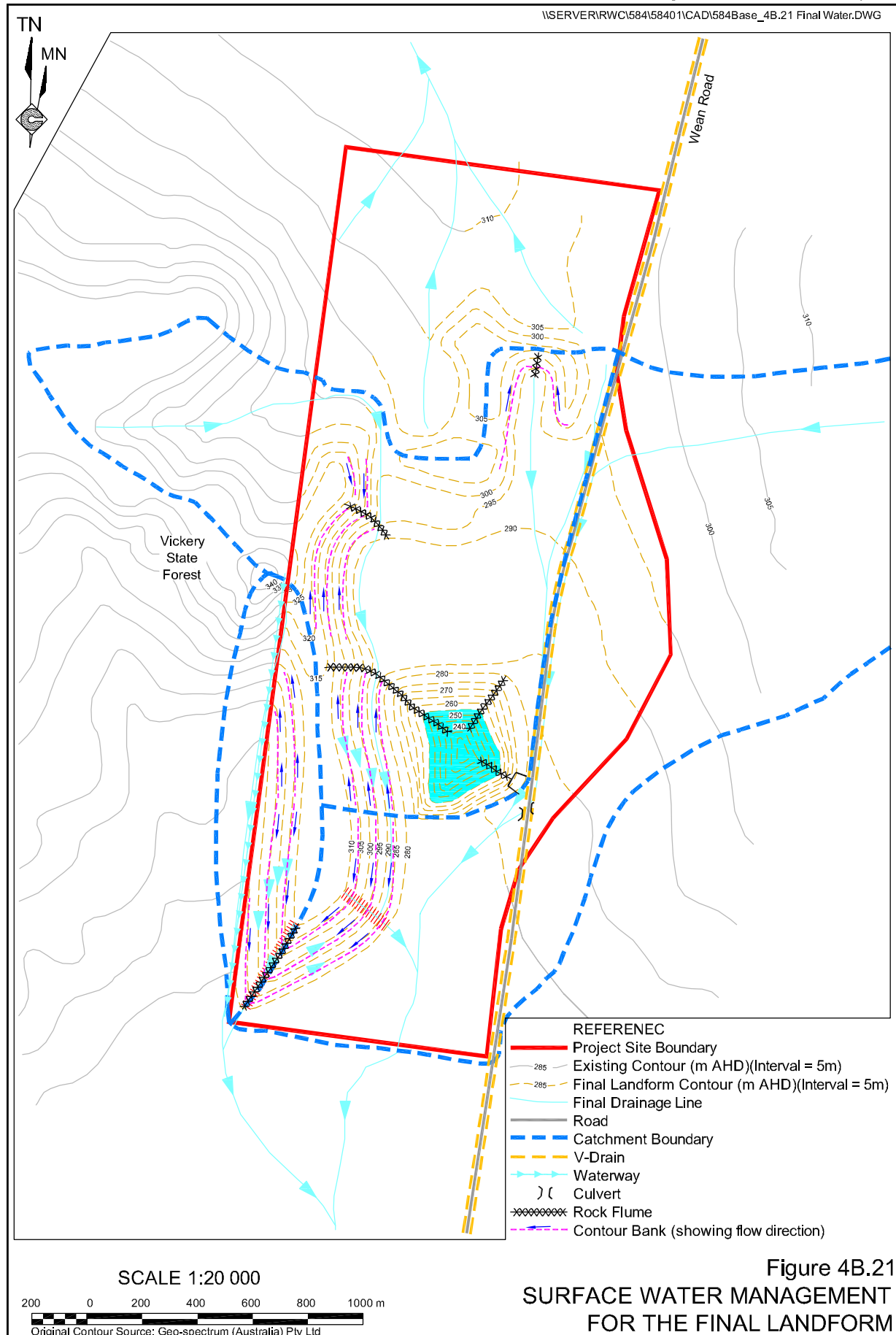
Access to areas of the Project Site affected by localised flooding would also be restricted until such time as the ground is no longer waterlogged. This would reduce the potential for vehicular traffic to further disturb the soil surface which in turn may result in greater erosion potential over these areas.

4B.7.4.5 Post-Mining Management

The final landform would be constructed as presented in **Figure 4B.21** with only water falling on the upper surface of the rehabilitated overburden emplacements directed to the final void. Contour banks on the sloped surfaces of the final landform would direct surface water flows to a number of rock or grassed flumes. The flumes would control the flow of water off the constructed final landform and therefore assist in reducing erosion and maintaining the long term stability of the landform. The flumes may be grass lined or constructed of rock material. If constructed of rock, the flumes would be constructed with >80% of rock with a diameter of at least 200mm and to the following design.

- Channel width >10m.
- Bank height >500mm.
- Channel to be parabolic in shape.
- Excavated batters of 1:4 (V:H) or shallower.





4B.7.5 Management Measures and Contingency Planning

During the construction period for the Project, areas of the Project Site would be cleared with only limited opportunity for the establishment of grass cover. During this period, should high rainfall occur, it is possible elevated levels of sediment could be entrained in surface water flows and ultimately discharged from the designed water storages. In the event that monitoring confirms elevated sediment levels in water discharged, one or more of the following measures would be adopted.

- The DECC would be advised. Salient preceding weather information would also be provided.
- Additional flocculants would be used to expedite settlement of sediments.
- The sediment basins would be enlarged or additional sediment basins constructed.
- An additional storage dam would be constructed downstream which would become the new site discharge point and monitoring location. DECC would be advised to enable amendment to any environment protection licence.

In the event of a major hydrocarbon spill, a 3-phase remedial action plan would be adopted.

- **Phase 1** – Recover as much as possible at the source by pumping free hydrocarbon from the surface and excavating hydrocarbon-contaminated materials. Contaminated materials would be stockpiled on site under cover and on an impermeable surface (eg a high-density polyethylene sheet). This material would later be bio-remediated on site and/or transported to an approved waste depot.
- **Phase 2 – Source Control:** Begin hydraulic control of the source to prevent spreading of contamination. Subject to the relative position of the open cut excavation and the source of contamination, this could involve digging one or more holes close to the centre of the spill area, and pumping from those holes to create a cone of depression with a hydraulic gradient towards the holes. Such actions would prevent movement of contamination away from the area of the spill.
- **Phase 3 – Recovery:** If necessary, install boreholes to remove and treat contaminated groundwater.

4B.7.6 Impact Assessment Criteria

4B.7.6.1 Introduction

As noted in Section 4B.7.3, the Project has the potential to impact on both the surface water quantity and quality in the absence of appropriate management or controls. The following assessment criteria would provide an indication of the impact of the Project on surface water discharged from the Project Site.



4B.7.6.2 Surface Water Quantity

The acceptability of any decrease in the quantity of clean water available downstream of the Project Site would be assessed against the maximum dam capacity for the Project Site of 25.6ML and additional Proponent-owned land of 210ML.

4B.7.6.3 Surface Water Quality

The quality of surface water discharged from the Project Site would be assessed against NSW DECC guidelines for pH, suspended solids and grease and oil as identified in **Table 4B.35**.

Table 4B.35
Discharge Limits – Surface Water

Parameter	50 th Percentile Limit	70 th Percentile Limit	100 th Percentile Limit
pH	-	-	6.5 to 8.5
Total Suspended Solids (mg/L)	20	35	50
Turbidity (NTU)	-	-	50
Grease and Oil (mg/L)	-	-	10
Electrical conductivity (µS/cm)	-	-	350
Source: Modified after Soil Conservation Service (2007) – Table 3			

4B.7.7 Assessment of Impacts

4B.7.7.1 Introduction

Following the adoption of the water management controls identified in Section 4B.7.4 and mitigation measures identified in Section 4B.7.5, the impacts on surface water within and beyond the Project Site and transport route have been assessed as follows.

4B.7.7.2 Surface Water Catchments

During the operation of the Project, the local watershed between the Driggle Draggie Creek and Southern Catchments would be altered with DB1, DB3 and GBD-1 diverting water from Catchment 2 (North), which naturally would flow to the Southern Catchment, to the Driggle Draggie Creek catchment (Catchment 1). Based on the total catchment area to the central drainage line of the Project Site, this diversion would represent a 7% decrease (67ha of 955ha – see **Figure 4B.18**).

On completion of the final landform, the pre-mining catchments would be largely re-instated, with water within Catchment 2 (North) and small areas of (2) East and 2 (West) reporting to the final open cut void. This would reduce the area of the Southern Catchment available to downstream water users by less than 10%, once again a very minor change to local drainage.



4B.7.7.3 Surface Water Quantity

By maximising the use of dirty water, maintaining storage dams with a combined capacity sufficient only to capture the maximum dam capacity of the Project Site and drawing supplementary water from the open cut area and groundwater bores, the Project would be unlikely to significantly impact on surface water available to landholders downstream of the Project Site or environmental flows within local watercourses and the Namoi River. As noted in Section 4B.7.7.2, a small percentage of the southern catchment would be lost as a result of flows into the final void. This would be unlikely to significantly affect the volume of water flowing in the central drainage depression given this represents less than 10% of the total catchment.

4B.7.7.4 Surface Water Quality

The water management controls recommended by Soil Conservation Service (2007) and identified on **Figure 4B.20** have been designed to capture all dirty water generated by Project-related activities and direct it to sediment basins via catchment banks/drains. The design of the catchment banks/drains and sediment basins would ensure that sufficient time is provided for any suspended sediment to settle out prior to discharge from the Project Site. In the event water quality criteria are exceeded, the adoption of the mitigation measures presented in Section 4B.7.4.3 would ensure any exceedance would be limited to isolated occurrences. As a result, the likely impact of the Project on surface water quality external to the Project Site would be negligible.

The Namoi Catchment Management Authority has established targets to be achieved within the Namoi River Catchment with reference to river salinity (NCMB, 2003). The Project has therefore been assessed against the four following targets.

- Target RS.1 - Water quality

By 2010 to have all land managers (including urban) using better management practices throughout the catchment to minimise the mobilisation of salt to rivers.

The salinity of any water discharge from the Project Site would be comparable with existing water quality provided all potentially saline subsoils are appropriately incorporated in the overburden emplacements. The overburden itself has been characterised to have a low potential for salinity generation.

- Target RS.2 - Gully control

By 2010, halt existing gully erosion and bed lowering within priority salinity sub catchments by constructing 1000 gully control and bed lowering structures to reduce the mobilisation of salt to the river.



The comprehensive erosion and sediment controls presented within Section 4B.6.4 would ensure gully erosion is minimised on the Project Site and therefore provide a positive contribution towards the achievement of this target.

- Target RS.3 - New development

From 2001, new investment requiring a Development Application or requiring approval under Part 5 of EP&A Act, to result in no net increase in the salt load to the river.

Project Site water discharge should contribute to no net increase in the salt load within the Namoi River as a result of the Project, ie. based upon the observations relating to Target RS.1 above.

- Target RS.4 - Point sources

By 2010 existing point sources of river salinity to have a reduction of 10% on current (2001) salt loads.

There are no point sources of river salinity associated with the Project.

4B.7.7.5 Final Void Water Quality

RCA (2007) predicts a 75% recovery in groundwater table within 7 years of the cessation of mining (approximately 253m AHD) with complete recovery within 100 years (approximately 260m AHD). This would suggest that a significant proportion of the final void water storage (approximately 235m AHD at its deepest point) would be provided by groundwater and the final water quality would, initially, be similar to that of the local groundwater, ie. brackish but generally within NHRMC health and agricultural suitability guidelines (see Section 4B.1.2.3).

The catchment to the final void would be approximately 66.4ML, and based on regional rainfall records, and a likely run-off coefficient similar to that of the pre-mining landform, ie. grassed valley, the catchment yield flowing to the void is predicted to be as follows.

- Low rainfall year (373.6mm) ~ 40ML.
- Average rainfall year (616.4mm) ~ 62ML.
- High rainfall year (843.4mm) ~ 85ML.

Based on the regional evaporative rate of 1900mm/year, and a surface area of the water in the void at 260mAHD of approximately 7.1ha, annual evaporation would approximate 135ML.

While the evaporative rate would exceed the inflow rate, the water level would be maintained within the void as a consequence of the continued seepage of groundwater. However, as a consequence of the evaporation exceeding inflow, the salinity of the water within the void would gradually increase, due to the crystallisation process of evaporation and the leaching of salts from the backfilled overburden.



The exact final salinity level of water within the retained void has not been calculated, however, existing research for other open cut mines, eg. Mackie Environmental Research (2003), would suggest a salinity concentration of in excess of 15 000mg/L could be expected before an equilibrium in the system is reached (over several hundred years).

While an elevated salinity level is expected within the final void, this would be effectively isolated from the surface water drainage system of the final landform as the likely final water level of between 253m AHD and 260m AHD would be between 20m and 30m below the lowest point of the surrounding final landform (see **Figure 2.14**). The potential for impact on downstream waters would therefore be minimal.

The risk of advective dispersion of salinity back to the coal measures would also be minimal due to the ongoing seepage into the void resultant from the evaporative process.

4B.7.7.6 Erosion and Sedimentation

The construction of the water quality management controls identified in Section 4B.7.4 and implementation of mitigation measures identified in Section 4B.7.5, in conjunction with the commitment of the Proponent to enhance the vegetation (particularly grass) cover (see Section 4B.7.4.3.8), would reduce the potential for erosion and sedimentation on the Project Site.

4B.7.7.7 Flooding

Flooding is not anticipated to have a major impact on the operation of the Project. Given there would be minimal alteration to local catchments as a consequence of the Project, it is unlikely to alter local flooding patterns.

4B.7.7.8 Dryland Salinity

Native deep-rooted vegetation on the Project Site would be retained beyond the proposed areas of disturbance. This, together with the rehabilitation of the final landform with native woodland vegetation, would contribute to the reduction in the potential for short and long term for dryland salinity issues.

The Namoi Catchment Management Authority has also established targets to be achieved within the Namoi River Catchment with reference to dryland salinity (NCMB, 2003). The Project has therefore been assessed against the three following targets.

- *Target DS.1 - Use of best management practices*
By 2010, to have 60% of land managers and an area of 18 600km² across the whole of the Namoi catchment managed to minimise the mobilisation of salt to a set of agreed best management practices and in identified hazard areas to increase the adoption rate to 80%.



Consideration has been given to maximising the retention of deep-rooted vegetation on the Project Site to reduce the potential for dryland salinity. As such, the Project would provide a positive impact in achieving this target.

- *Target DS.2 - Cap and pipe the bores*
By 2010 Cap and Pipe all (25) high flow bores (>5L/s) in the Namoi portion of the Great Australian Basin.

This target is not applicable to the Project.

- *Target DS.3 - Discharge areas*
From 2001 retain all vegetation on saline discharging areas and establish an additional 1 000ha of ground cover to be managed at greater than 70% cover.

Not applicable as the proposed areas of disturbance are not saline discharging areas.

4B.7.8 Monitoring Program

Table 4B.36 presents a conceptual water quality monitoring program to be implemented for the proposed East Boggabri Coal Mine. The program would be revised / modified in consultation with the NSW DECC and DWE on the basis of monitoring results.

Table 4B.36
Surface Water Monitoring Program

Location	Parameter	Frequency
Selected Storage Dams, Sediment Basins	EC, pH, suspended solids, hydrocarbons	Quarterly or in the event of a significant rain event
	EC, pH, suspended solids, hydrocarbons, heavy metals, nutrients.	Annually
Wet Weather Discharge Points (SD1 and SD3)	EC, pH, suspended solids, hydrocarbons.	Within 24 hours of commencement of discharge.
Void water, groundwater	EC, pH, suspended solids, hydrocarbons	Quarterly
	EC, pH, suspended solids, hydrocarbons, heavy metals, nutrients.	Annually
Confluence points of Driggle Draggie Creek Catchment and Southern Catchment	EC, pH, suspended solids, hydrocarbons, heavy metals, nutrients.	Annually or in the event of a significant rain event
Source: Modified after Soil Conservation Service (2007) - Table 10		



4B.8 VISIBILITY

4B.8.1 Introduction

Based on the environmental risk analysis undertaken for the Project (see Section 3.3 and **Table 3.6**), the potential environmental impacts on visual amenity requiring assessment and there unmitigated risk rating are as follows.

- Reduced amenity of the altered Project Site landform as a result of:
 - temporary disturbance to the landform (high risk);
 - marginally identifiable changes to landscape (high risk); and
 - highly identifiable changes to the landscape (high risk).
- Reduced effectiveness of the Siding Springs Observatory as a result of night-time lighting (low risk).

The following sub-sections assess the existing visual amenity of the local setting, identify operational safeguards and mitigation measures and provide an assessment of the residual impacts following the implementation of these safeguards and mitigation measures.

4B.8.2 Existing Visual Amenity

4B.8.2.1 Introduction

Existing visual amenity is considered in relation to views of the Project Site and the transport route. The existing visual amenity is described with respect to those non-project related residences that may have some view of the proposed activities and public vantage points offered from local roads.

Views of the Project Site and transport route are described as either local (within 1km) or distant (>1km), direct (without significant obstruction from topography or vegetation) or obscured (with significant obstruction from topography or vegetation). **Figure 4B.22** presents the affected non-project related residences with an assessment of the view afforded to each of the Project Site and transport route. Local views of the Project Site are also possible from sections of Wean Road (SR 6), Jaeger Lane and several other currently closed roads.

4B.8.2.2 Views of the Project Site and Transport route

The existing topography of the local area, specifically the elevated and vegetated slopes of Vickery State Forest, offer natural screening to the west of the Project Site. No other natural screening, other than stands of mature trees, is provided to the Project Site.



From those non-project related residences surrounding the Project Site, the following views would be afforded of the Project Site.

- The “Costa Vale” residence is located approximately 2.5km north of the Project Site at approximately the same elevation (290m AHD) as the majority of Project Site activities. This residence would have distant views of the soil stockpiles and northern emplacement. Natural screening provided by existing vegetation on the “Glenroc” property would obscure the visibility of the western face of the open cut and the western emplacement (see **Figure 4B.22**). Occupants of this residence would not have any views of the transport route.
- The “Surrey” residence is located approximately 2.5km southeast of the Project Site at an elevation (280m AHD) marginally lower than the majority of Project Site activities. Occupants of this residence would have distant views of soil stockpiles, the western face of the open cut and western emplacement, obscured by the vegetation within the Wean Road easement (see **Figure 4B.22**). It is possible there may be some obscured views of the transport route from this residence.
- The “Carlton” residence is located approximately 3.2km southeast of the Project Site at approximately the same elevation (290m AHD) as the majority of Project Site activities. Occupants of this residence would have distant views of soil stockpiles, the western face of the open cut and western emplacement, obscured by the vegetation within the Wean Road easement (see **Figure 4B.22**). It is possible there may be some obscured views of the transport route from this residence.

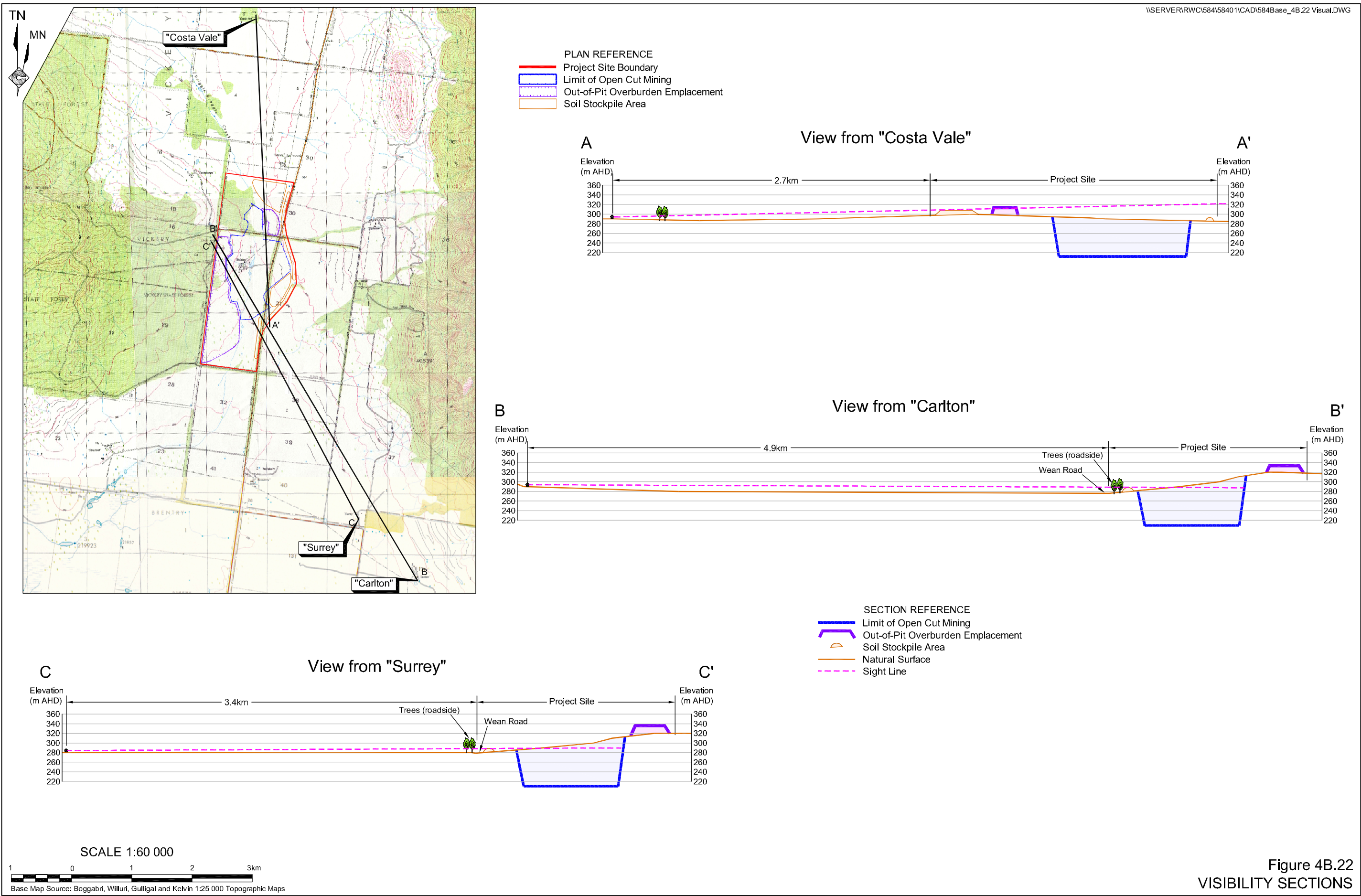
Although obscured for much of their lengths, the open cut mining, overburden emplacement and general site activities would be visible from vehicles travelling on Wean Road (SR 6) and Jaeger Lane.

4B.8.3 Visual Controls

The roadside vegetation of the Wean Road (SR 6), Jaeger Lane, Riordan Road (SR 192) and Shannon Harbour Road (SR 93) easements would offer natural screening of the proposed activities on the Project Site and along the transport route, the following additional controls would be implemented.

- The Project Site would be progressively rehabilitated such that cleared or non-vegetated areas would be minimised. In particular, non-persistent cover crops would be sown immediately over areas of re-contoured final landforms prior to the establishment of the designated vegetation type.
- The overburden emplacements themselves have been designed to, as much as possible, replicate existing topographic features. The Northern Emplacement has been designed to create a knoll type extension of the elevated ground of the Vickery State Forest. The Western Emplacement has been designed to create a gentle to moderate slope from Vickery State Forest. **Figure 4B.22** illustrates these design features as observed from the nearest residences.





Other more general safeguards and controls to be implemented would include:

- minimising the extent of land disturbance / clearing in advance of mining;
- progressive rehabilitation of all disturbed areas within the Project Site. Significant rehabilitation of the post-mining landform would commence in Year 2;
- implementation of air quality controls as identified in Section 4B.10.5; and
- maintaining the mine and associated areas of disturbance in a clean and tidy condition at all times.

Consideration has been given by the Proponent to night-time light emissions which may affect surrounding residents and/or the Siding Spring Observatory near Coonabarabran. A maximum of six lighting plants would be used for night-time activities and would have a combined illumination of 3 480 000 lumens. This level of illumination would be unlikely to have any impact on the observatory viewing conditions.

Floodlights would be positioned and directed to minimise emissions, with lighting not required at any given time not used. Where the use of floodlights is required in the open cut, on the overburden emplacements or within the coal handling and processing area, they would be directed downwards and towards the west and northwest, ie. away from all non-project related (and project related) residences and public roads.

4B.8.4 Assessment of Impacts

It is acknowledged that occupants of several residences would have variously obstructed views of activities or disturbance on the Project Site and transport route. It is also noted, however, that the Project Site lies within a rural landscape where areas of land are disturbed seasonally for agriculture-related purposes. Given the Proponent's commitment to minimise the extent of surface disturbance in advance of mining and to implement progressive rehabilitation, together with the design features of the overburden emplacements to blend with the existing landform, the likely visual impact of the Project is assessed to be acceptable.

Notwithstanding the likely extent of visual impact, the Proponent would maintain regular communications with those residents whose visual amenity is affected by the Project and implement any reasonable additional controls to further reduce the impact on their visual amenity.

As the Project Site is located approximately 130km from the Siding Spring Observatory, and night-time lighting would be limited to no more than six lighting plants, vehicle lights and building lighting, the impact on the viewing conditions of the observatory would be negligible and almost certainly immeasurable.



The constructed and upgraded section of the transport route between the Project Site and Hoad Lane (SR 95) would not be visible from any non-project related residences and as such, this aspect of the Project would have no impact on visual amenity. The remainder of the transport route is already an established route for coal carrying trucks and while the increase in truck movements along this section of road may be noticeable from adjoining residences, it is concluded that the impact would be acceptable.

4B.9 SOILS, LAND CAPABILITY AND AGRICULTURAL SUITABILITY

The soils and land capability assessment was undertaken by Geoff Cunningham Natural Resource Consultants (GCNRC, 2007b). The full assessment is presented in Part 5 of the Specialist Consultant Studies Compendium, with the relevant information from the assessment summarised in the following subsections.

4B.9.1 Introduction

Based on the environmental risk analysis undertaken for the Project (see Section 3.3 and **Table 3.6**), the potential soil impacts and changes to land capability and agricultural land suitability requiring assessment and their unmitigated risk ratings are as follows.

- Insufficient soil quantities for rehabilitation (high risk).
- Temporary disturbance to soil quality (moderate risk).
- Degradation of soil quality (moderate risk).
- Elevated erosion or erosion potential (moderate risk).
- Decreased land and agricultural capability of the final landform (high risk).

The Director-General's requirements issued by the Department of Planning require that the assessment of soils and land capability / agricultural land capability would refer to *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004).

The following sub-sections describe the soils within the areas proposed to be disturbed, identify the soil and land management issues and the proposed soil-related controls, safeguards and mitigation measures. Additionally, an assessment of the residual impacts upon the soil resources following the implementation of these safeguards and mitigation measures is also described.



4B.9.2 Soil Occurrences

4B.9.2.1 Regional Setting

The Project Site and constructed section of the transport route are described within the Soil Conservation Service Technical Manuals as occurring where the Gunnedah and Narrabri Districts adjoin. Duplex and Gravelly soils are described by the Gunnedah District Soil Conservation Service Technical Manual and are associated with the ridges on Pilliga and Narrabeen Sandstones and the slopes of Middle Carboniferous sedimentary formations in the Wean / Kelvin area within the Gunnedah region.

- Duplex Soils: exhibit a strong texture differentiation with an abrupt boundary between the A and B horizons. Normally a well developed bleached A₂ horizon is present in the profile. The B horizon is usually blocky but may be columnar in structure. The A horizon is usually neutral to slightly acid in reaction while the B horizon is alkaline to strongly alkaline.
- Gravelly Soils: are characterised by the presence of small rounded pebbles and gravelly material throughout the profile. The surface soil is usually moderately thick and mildly acid to neutral in pH while the B horizons are alkaline with occasional carbonate nodules present.

Soils within the Narrabri District Soil Conservation Service Technical Manual are described as Solodic Soils and Brown Clays and Shallow Solodic Soils and Lithosols.

- Solodic Soils and Brown Clays: are formed on alluvial and colluvial material and are often hardsetting, dull brown to grey brown coloured soils. In some situations these soils may be duplex in texture with a well developed A₂ horizon, while in others the soils are hardsetting brown - grey clays.
- Shallow Solodic Soils and Lithosols: are associated with the areas adjoining Vickery State Forest. The soils of the ridges are usually shallow and sandy and consist basically of an A horizon containing conglomerate material throughout the horizon. Further down the slope, the soils contain much conglomerated derived gravel material.

4B.9.2.2 Project Site Soils

4B.9.2.2.1 Soil Mapping Units

Following the sampling of selected test pits over the Project Site, four Soil Mapping Units (SMUs) were identified as described as follows.

- SMU 1 – identified on the upper slopes and crests of the Project Site. These soils are about up to 110cm deep with a hard setting surface and medium levels of large surface stone.



- SMU 2 – identified on the lower slopes and drainage flats of the Project Site and transport route. These soils are from 170cm to >290cm deep with the soil surface varying from hard setting to almost self mulching. Surface stone is usually absent, although sometimes some to much surface stone of between 5cm and 12cm is present.
- SMU 3 – found in the gilgai depressions and mounds of the Project Site. The soil is up to 270cm in depth with a soft to self mulching surface with surface stone uncommon.
- SMU 4 – generally found mid-slope on the western side of the Project Site. The soil is generally between 50cm and >250cm deep. The soil surface varies from occasionally hard setting to self mulching with stone usually absent.

Figure 4B.23 illustrates the distribution of the four SMUs on the Project Site and transport route and **Table 4B.37** presents a summary of the soil profiles and characteristics of the identified SMUs.

4B.9.2.3 Soil Physical Attributes

Particle Size Analysis

The Particle Size Analysis (PSA) test shows the amounts of gravel, clay, silt, fine sand and coarse sand contained within each sample. The results shown in **Table 4B.37** indicate that the proportion of gravel in the soils is variable. Even when this proportion is relatively high, it is not sufficient to cause the material to be unsuitable for use in rehabilitation works.

Dispersion Percentage

The Dispersion Percentage (D%) test indicates the proportion of the soil material less than 0.005 mm in size that would disperse on wetting.

The percentage values presented in **Table 4B.38** indicates that the topsoils on the Project Site have dispersion percentages that are generally from 'negligible' to 'slight'. Those of the subsoils vary from 'slight' to 'high'. Given these results, the erosion potential for exposed subsoil (including stockpiled subsoil) would be high and such materials would require immediate erosion protection following stripping, stockpiling or respreading.

Emerson Aggregate Test (EAT)

This test provides a measure of the coherence of soil aggregates when they are immersed in water. The degree of soil aggregate stability increases from Class 1 through to Class 8, with aggregates in Emerson Classes 1 and 2 being generally regarded as being unstable while those in Classes 4 to 8 are considered to be stable. Classes 2 and 3 have a number of subclasses based on the degree of dispersion.



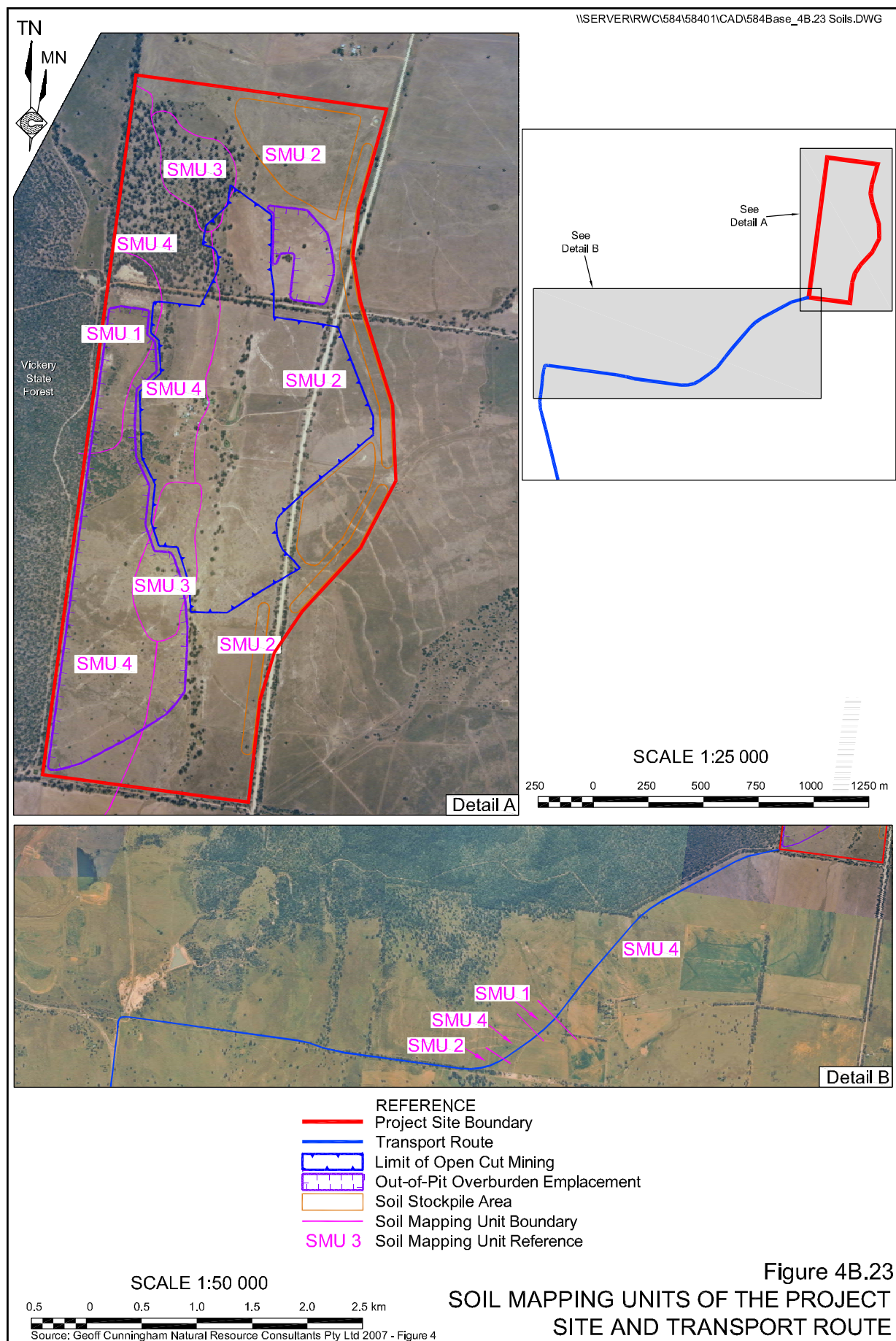


Table 4B.37
Summary of Soil Mapping Units within the Project Site and Transport Route

Soil Mapping Unit (SMU)*	General	Topsoil	Subsoil
1 - Upper Slopes and Crests	<i>Soil depth:</i> 110cm deep <i>Surface:</i> hardsetting <i>Stones:</i> medium levels of large surface stone <i>Overlies:</i> weathered conglomerate	<i>Texture:</i> Light to medium clay <i>pH:</i> 6.5 <i>Colour:</i> dark greyish brown, very dark greyish brown	<i>Texture:</i> Heavy clay <i>pH:</i> 9.0 – 9.5 <i>Colour:</i> light grey, greyish brown, dark greyish brown, very pale brown, light brownish grey
2 - Lower slopes and drainage flats	<i>Soil depth:</i> 173cm to >290cm <i>Surface:</i> soft, loose, firm, hardsetting to almost self mulching <i>Stones:</i> usually absent <i>Overlies:</i>	<i>Texture:</i> sandy clay loam, silty clay loam, clay loam, fine sandy loam, light clay, light to medium clay, loam fine sandy, medium clay, medium to heavy clay <i>pH:</i> 5.0 to 6.5, sometimes 7.0 to 8.5 <i>Colour:</i> various grey to brown	<i>Texture:</i> medium to heavy clay <i>pH:</i> 9.0 to 9.5 <i>Colour:</i> shades of brown (pale brown, brown, light brown) or grey (light brownish grey, dark grey, light grey, pinkish grey)
3a - Gilgai depressions	<i>Soil depth:</i> to 270cm <i>Surface:</i> soft to self mulching <i>Stones:</i> uncommon or absent <i>Overlies:</i> soil material	<i>Texture:</i> sandy clay loam to heavy clay <i>pH:</i> 5.0-6.0 <i>Colour:</i> grey	<i>Texture:</i> medium to heavy (sometimes gritty or sandy) <i>pH:</i> 5.5 to 6.0 <i>Colour:</i> light grey, grey, dark grey or greyish brown
3b- Gilgai mounds	<i>Soil depth:</i> to 252cm <i>Surface:</i> soft to self mulching <i>Stones:</i> sometimes present <i>Overlies:</i> soil material	<i>Texture:</i> clay loam to sandy light clay <i>pH:</i> 5.0 to 8.0 <i>Colour:</i> brown to greyish brown	<i>Texture:</i> medium to heavy clay <i>pH:</i> 8.5 to 10.0 <i>Colour:</i> brown or brownish grey
4 - Midslopes	<i>Soil depth:</i> 50cm to 250cm <i>Surface:</i> soft, loose, firm or almost self mulching <i>Stones:</i> generally absent <i>Overlies:</i>	<i>Texture:</i> sandy loam; loam fine sandy, silty clay loam, fine sandy clay, loam sandy clay loam, light clay, light to medium clay <i>pH:</i> 5.5 to 7.0 <i>Colour:</i> generally brown or greyish brown	<i>Texture:</i> clay <i>pH:</i> 9.5-10 <i>Colour:</i> various shades of brown
Source: Modified after GCNRC (2007b) – Section 5.			*See Figure 4.23

The results of the EAT presented in **Table 4B.38** indicate that the surface (topsoil) layers display negligible to slight dispersibility. However, dispersibility increases to the moderate to high range in the lower (subsoil) layers. These results reinforce the previously noted requirement for immediate erosion protection for exposed subsoils.

4B.9.2.4 Soil Chemical Attributes

The representative samples used for physical characterisation were also subject to laboratory chemical analyses to evaluate the likely salinity hazard. **Table 4B.39** presents the results of the chemical analyses of the Project Site.

Soil pH

The results for soil pH indicate that while all the topsoil is within the acceptable range for agronomic purposes (pH 4.0 to pH 8.5), the alkalinity of the soil tends to increase with depth with several layer exhibiting levels greater than the acceptable range.



Table 4B.38
Physical Laboratory Analyses Data for Selected Soil Profiles

Pit	Layer	Texture [fine earth] #	Depth [cm]	Particle Size Analysis						D %	Dispersion	Soil Coherence - EAT	EAT Dispersibility
				Clay (%)	Silt (%)	Fine Sand(%)	Coarse Sand (%)	Total Sand (%)	Gravel (%)				
SMU 1													
Pit 30	1	clay loam	0 – 20	34	21	33	11	44	1	23	slight	3[1]	slight
	2	clay	20 – 95	54	15	21	8	29	2	41	moderate	4	negligible
	3	clay loam	95 – 110	30	14	42	12	54	2	47	moderate	3[1]	slight
SMU 2													
Pit 3	1	clay	0 – 20	42	19	28	8	36	3	19	slight	3[1]	slight
	2	clay	20 – 90	61	14	16	6	22	3	64	high	3[1]	slight
	3	clay	90 – 110	38	19	26	15	41	2	36	moderate	2[1]	high to moderate
	4	sand	110 - 180	2	1	7	23	30	67	14	slight	3[1]	slight
	5	loamy sand	180 - 210	8	15	37	40	77	0	27	slight	8 / 3[1]	negligible to slight
Pit 20	1	loam/loamy sand	0 – 18	13	24	36	20	56	7	17	slight	8 / 3[2]	negligible to slight
	2	loam/silty loam	18 – 38	15	25	39	20	59	1	56	high	3[2]	slight
	3	clay loam	38 – 80	34	21	32	13	45	<1	40	moderate	3[3]	moderate
	4	sandy loam	80 – 111	4	3	8	14	22	71	40	moderate	3[3]	moderate
	5	silt loam	111 - 141	16	29	37	17	54	1	33	moderate	2[1]	moderate
	6	clay loam	141 - 257	27	13	36	22	58	2	86	very high	2[2]	high
Pit 24	1	loam	0 – 17	15	18	39	23	62	5	8	slight	3[2]	slight
	2	clay	17 – 40	41	17	23	12	35	7	33	moderate	3[2]	slight
	3	clay	40 – 126	37	10	23	12	35	18	52	high	2[1]	high to moderate
	4	clay	126 - 240	36	15	27	12	37	10	40	moderate	2[2]	high
SMU 3a													
Pit 18	1	silty clay loam	0 – 20	32	32	27	7	34	2	22	slight	3[2]	slight
	2	silty clay loam	20 - 63	30	28	29	9	38	4	36	moderate	2[1]	high to moderate
	3	silt loam	63 – 120	25	33	28	10	38	4	49	moderate	2[2]	high
	4	clay loam	120 - 160	20	11	15	23	38	31	55	high	2[3]	very high
	5	clay loam	160 - 210	33	21	26	20	46	<1	81	very high	2[3]	very high
	6	loam	210 - 270	16	11	24	47	71	2	53	high	2[3]	very high
SMU 3b													
Pit 19	1	sandy loam	0 – 18	9	5	28	15	43	43	0	negligible	3[1]	slight
	2	clay	18 – 80	31	10	23	19	42	17	51	high	2[3]	very high
	3	loam/clay loam	80 – 162	11	8	15	15	30	51	69	very high	2[3]	very high
	4	clay	162 - 252	43	20	23	12	35	2	9	very high	1	very high
SMU 4													
Pit 29	1	clay/clay loam	0 – 12	26	9	24	18	42	23	18	slight	8 / 3[2]	negligible to slight
	2	clay loam	12 – 23	17	11	22	14	36	36	29	slight	2[1]	high to moderate
	3	clay	23 – 52	42	13	20	15	35	10	64	high	3[1]	slight
	4	clay	52 – 150	54	12	22	11	33	1	62	high	2[1]	high to moderate
	5	clay	150 - 250	50	14	30	6	36	<1	56	high	2[1]	high to moderate
Note: # texture based on laboratory measurements													
Source: Modified after GCNRC (2007b) - Table 1a and 1b													



Table 4B.39
Chemical Analyses of Soils

Pit	Layer	Texture [fine earth]#	Depth [cm]	pH*	Calculated EC _e	Soil Salinity Status
SMU 1						
Pit 30	1	clay loam	0 – 20		0.14	non-saline
	2	clay	20 – 95		0.36	moderately saline
	3	clay loam	95 – 110		0.33	moderately saline
SMU 2						
Pit 3	1	clay	0 – 20		0.16	non-saline
	2	clay	20 – 90		0.46	slight salinity
	3	clay	90 – 110		0.93	moderate salinity
	4	sand	110 – 180		0.38	high salinity
	5	loamy sand	180 – 210		0.33	moderate salinity
Pit 20	1	loam/loamy sand	0 – 18		0.06	non-saline
	2	loam/silty loam	18 – 38		0.05	non-saline
	3	clay loam	38 – 80		0.06	non-saline
	4	sandy loam	80 – 111		0.07	non-saline
	5	silt loam	111 – 141		0.07	non-saline
	6	clay loam	141 – 257		0.27	slightly saline
Pit 24	1	loam	0 – 17		0.10	non-saline
	2	clay	17 – 40		0.07	non-saline
	3	clay	40 – 126		1.00	moderately saline
	4	clay	126 – 240		1.28	moderately saline
SMU 3a						
Pit 18	1	silty clay loam	0 – 20		0.08	non-saline
	2	silty clay loam	20 – 63		0.06	non-saline
	3	silt loam	63 – 120		0.06	non-saline
	4	clay loam	120 – 160		0.21	slight salinity
	5	clay loam	160 – 210		0.35	moderate salinity
	6	loam	210 – 270		0.08	non-saline
SMU 3b						
Pit 19	1	sandy loam	0 – 18		0.24	slight salinity
	2	clay	18 – 80		0.10	non-saline
	3	loam/clay loam	80 – 162		0.29	slight salinity
	4	clay	162 – 252		0.81	moderately saline
SMU 4						
Pit 29	1	clay/clay loam	0 – 12		0.10	non-saline
	2	clay loam	12 – 23		0.11	non-saline
	3	clay	23 – 52		0.84	moderately saline
	4	clay	52 – 150		1.23	moderately saline
	5	clay	150 – 250		0.92	moderately saline
Note: * = field measurement # laboratory analysis						
Source: Modified after GCNRC (2007b) - Tables 4, 6 and 7						

Electrical Conductivity

Soil salinity is a measure of the presence of water-soluble salts, mainly of sodium, calcium and magnesium in the soil solution. These salts may be chlorides, sulphates or carbonates and can have a major impact on plant growth if they occur in sufficiently large quantities. The level of salinity in a soil sample is determined by measuring the electrical conductivity [EC] of a 1:5 soil / water suspension. The results printed in **Table 4B.39** indicate that the topsoil of each SMU is generally non-saline. However, some subsoil samples display salinity levels of moderate to high.



4B.9.2.4.1 Soil Erodibility and Erosion Potential

Visual observations of the soils within the Project Site indicate that, in their current state, they are generally stable except for some minor areas of sheet erosion on the slopes and some gully erosion in the main drainage lines. It is notable, however, that the land within the Project Site study area that has been cleared for agricultural activities is susceptible to, and has been subject to, previous soil erosion. As a consequence of this erosion, a large number of diversion bank and waterway systems have subsequently been constructed on these lands to mitigate this. Much of the area protected by these bank and waterway systems is included within the area that would be disturbed by the proposed mine.

Data from the representative soil samples for each SMU were analysed using the Soilloss computer program to determine erosion hazard. The program indicated that the majority of soils have a moderate erodibility, with SMU 3a displaying a high erodibility. The soils would require careful management during the stripping and rehabilitation stages to ensure that soil structure damage is minimal, and that they are suitably protected by vegetation or some other medium at all times.

Care is also required to ensure that the rehabilitated post-mining landform is protected by appropriate soil conservation measures and that these properly interface with any parts of existing systems that are not disturbed during development. The assistance of Soil Conservation Service has been obtained in the design of surface water control and storage structures and procedures (see Soil Conservation Service, 2005) to ensure this occurs.

4B.9.2.5 Soil Management

Management procedures for both topsoil and subsoil are described in Section 2.4.3 and are summarised as follows.

- Topsoil from each SMU would be stripped to a depth of 15cm. There would be no requirement to stockpile the different soil types separately. During the first 18 to 24 months of mine operations, topsoil would be stockpiled for later retrieval and spreading over specific areas. Beyond this initial period, it is proposed that the Project Site topsoil would typically be directly transferred onto sections of the final landform.
- Subsoil from each SMU would be stripped to a depth of 50cm below the topsoil. There would be no requirement to stockpile the different soil types separately which would be available for respreading as areas become available for rehabilitation.
- Further subsoil to bedrock would be stripped and generally each SMU would be segregated. The higher alkalinity soils would be placed over the surface of the overburden emplacement to provide neutralising capacity in the event pockets of acid forming rock are encountered. Installing erosion protection around stockpiles of this material would be a priority given the higher erosion potential with direct transfer from source to sink commenced as soon as practicable.



- Topsoil stockpiles would not exceed 2m in height and, where practical, be maintained as windrows in preference to larger structures. The placement of these stockpiles would reflect the likely destination of the soil on the final landform. Any stockpiles retained for over three months would be seeded with a non-persistent cover crop to reduce erosion potential and assist in the maintenance of the biological viability of the soil.
- Subsoil stockpiles would generally not exceed 3m in height and would typically be placed in larger stockpiles than the topsoil.
- An inventory of soil resources present on the Project Site, ie. both in stockpiles and awaiting stripping, would be maintained and regularly reconciled with rehabilitation requirements.
- Water management structures would be utilised to divert surface water flow away from soil stockpile areas, thereby reducing the potential for erosion. Additionally, silt-stop fencing or similar would be placed immediately downslope of stockpiles where required, until stable vegetation cover is established.

4B.9.2.6 Assessment of Impacts

Analyses of the physical and chemical attributes of the soil to be stripped, stockpiled and respread indicate that the soils have a texture and pH levels generally suitable for plant growth, but display moderate to high erosion potential. By adopting the soil management controls presented in Section 2.4.3 and Section 4B.9.2.5, there would be minimal impact as a consequence physical or chemical alteration and/or loss of biological activity. Erosion from soil stockpiles or rehabilitated surfaces would be monitored throughout the life of the Project with remedial works undertaken should erosion be observed.

4B.9.3 Land Capability and Agricultural Land Suitability

4B.9.3.1 Existing Land Capability

“Land capability” was defined by Houghton and Charman (1986) as *“the ability of land to accept a type and intensity of use permanently, or for specified periods under specific management, without permanent damage”*. Land that is used beyond its capability ultimately loses its production value through exhaustion of soil nutrient levels or land degradation of some description.

After a stereoscopic interpretation of airphotos of the site and field assessments during the vegetation and soil survey GCNRC (2007a) identified the land capability of the Project Site a constructed section of the transport route varied between Classes III and VI.



Figure 4B.24 displays the land capability within the Project Site and along the alignment of the constructed section of the transport route whilst **Table 4B.40** presents relevant land capability class descriptions drawn from Houghton and Charman (1986).

Based upon the proposed extent of surface disturbance shown on **Figure 2.1**, it is envisaged that 121ha of Class III land, 81ha of Class V and 35ha of Class VI land would be disturbed within the Project Site.

Table 4B.40
Land Capability Class Descriptions

Land Capability Class	Description
Class III	<i>"Land suitable for regular cultivation provided structural soil conservation works such as diversion banks together with soil conservation as in Class II are used".</i>
Class IV	<i>"Land suitable for grazing with occasional cultivation and requiring soil conservation practices such as stock control, application of fertiliser and minimal cultivation for the establishment or re-establishment of permanent pasture".</i>
Class V	<i>"Land suitable for grazing with occasional cultivation. Structural soil conservation works such as absorption banks, diversion banks and contour ripping, together with use of suitable soil protection measures such as pasture improvement, stock control and application of fertiliser".</i>
Class VI	<i>"Land not capable of being cultivated but suitable for grazing; and application of soil conservation practices including limitation of stock, broadcasting of seed and fertiliser, prevention of fire and destruction of vermin".</i>
Source: Modified after GCNRC (2007b) - Section 9	

4B.9.3.2 Existing Agricultural Land Suitability

"Agricultural land suitability" is based on land capability, but with the incorporation of other factors, such as closeness to markets and availability of water or processing facilities, in order to provide an indication of its suitability with respect to agriculture (Cunningham *et al.*, undated).

GCNRC (2007b) has determined that the Project Site and constructed section of the transport route comprise Class 3 and 4 land as shown in **Figure 4B.25**.

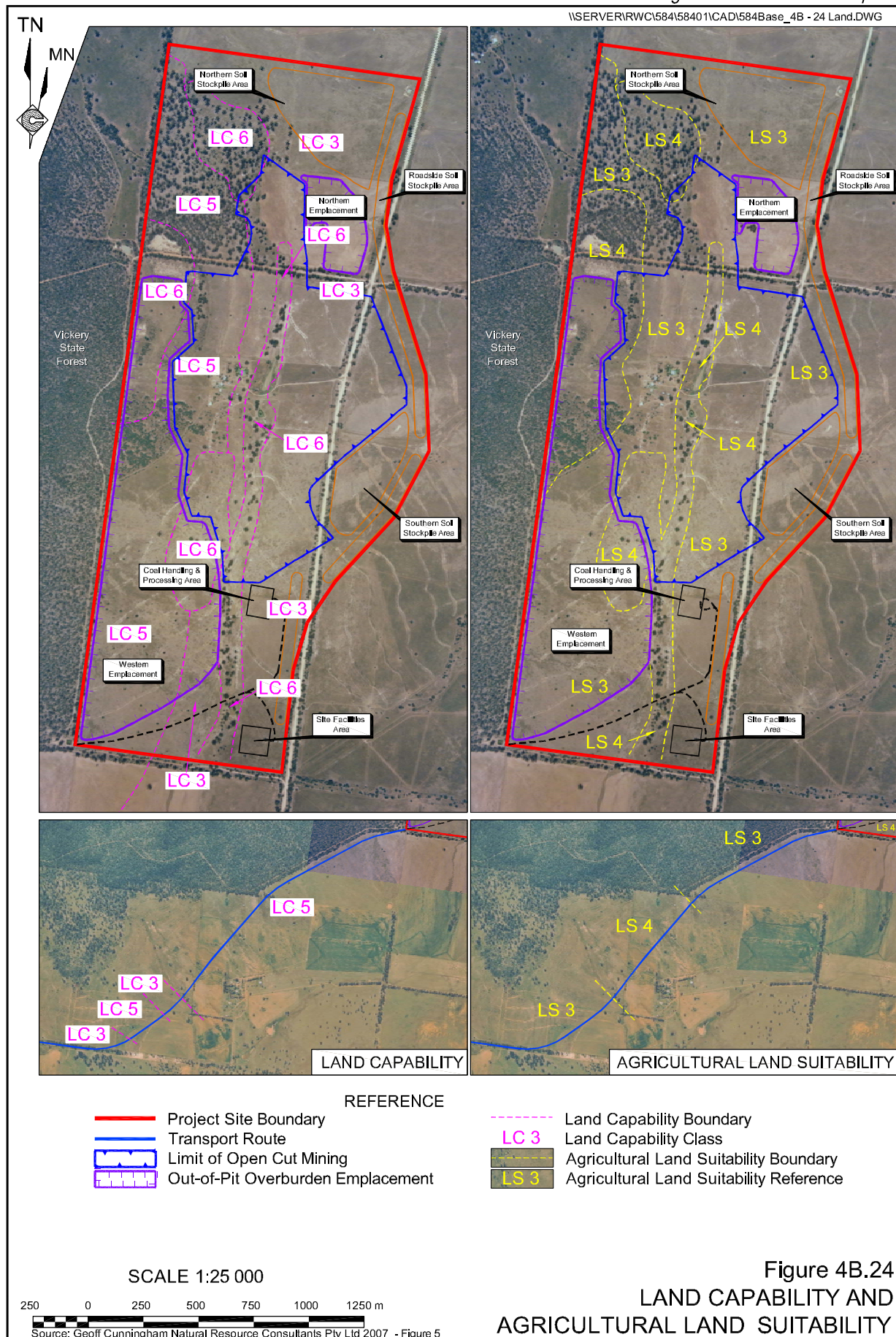
The descriptions of the agricultural land suitability classes are presented in Table 4B.41.

4B.9.3.3 Assessment of Impacts

4B.9.3.3.1 Project Site Impacts

The Project Site does not contain higher land capability and agricultural land suitability class lands and as part of the progressive rehabilitation of the Project Site, the Proponent would re-establish agricultural land for future agricultural purposes. **Figure 4B.25** presents the proposed re-establishment of Class II, III, and V capability land on the Project Site as part of the progressive rehabilitation program.





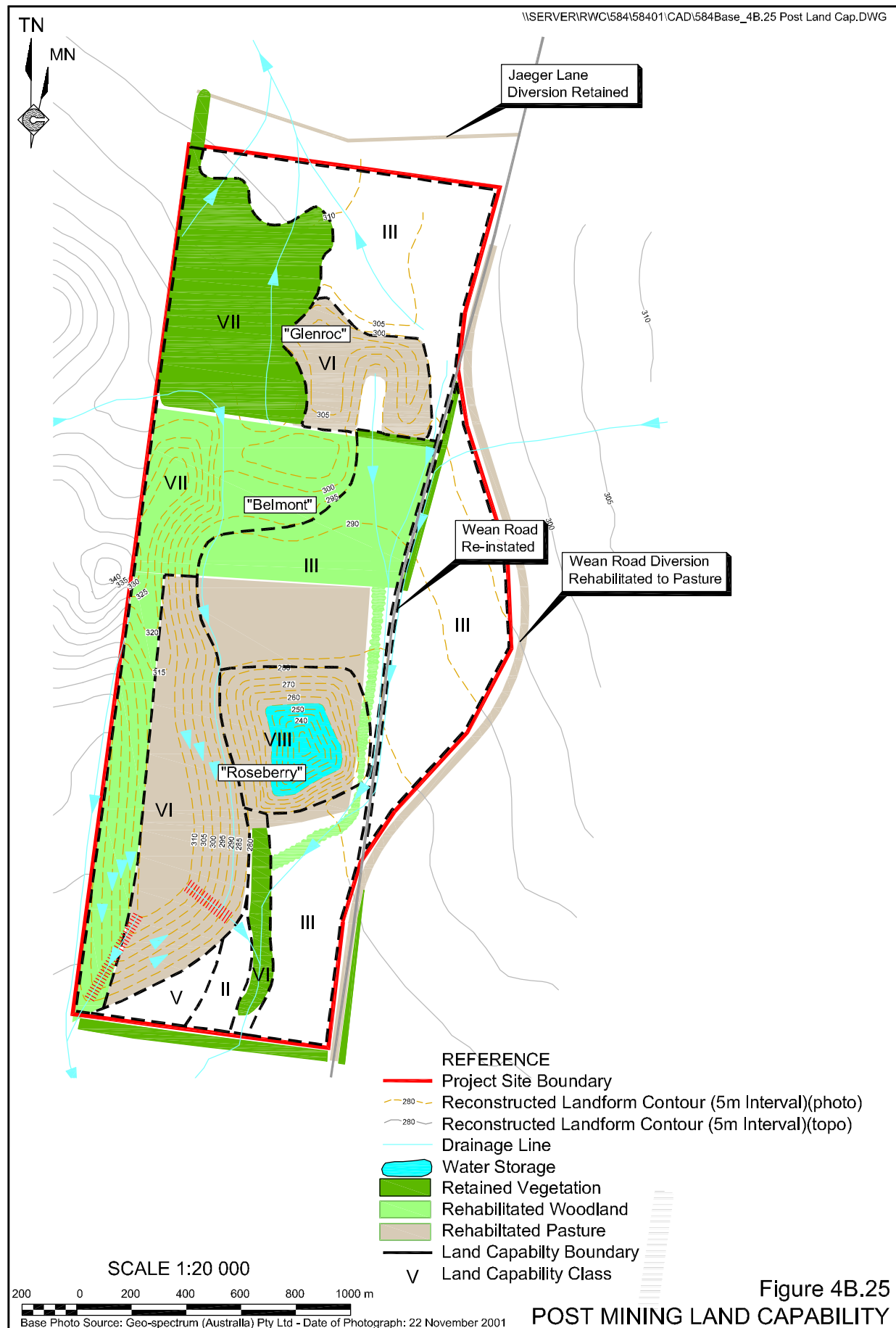


Table 4B.41
Agricultural Land Suitability Class Descriptions

Agricultural land suitability Class	Description
Class 3	<i>“Grazing land or land well suited to pasture improvement that may be cultivated and cropped in rotation with pasture. Erosion hazard or soil structural breakdown limit the frequency of ground disturbance, and conservation works may be required”.</i>
Class 4	<i>“Land suitable for grazing but not for cultivation. Agriculture is based on native pastures on improved pastures established using minimal tillage techniques”.</i>
Source: Modified after GCNRC (2007b) - Section 9	

While subject to minor variation arising from available soil resources and proposed final land use, the proposed final landform would provide 5.2ha of Class II, 157.2ha of Class III and 200.4ha of Class V to VIII capable land. The areas of these higher class lands would be slightly reduced from that in the pre-mining environment and reflects the proposed revegetation of native woodland communities as part of the Proponent’s biodiversity offset strategy.

The proposed re-establishment of native vegetation on areas of Class III capability land is assumed to be acceptable given the importance of re-establishing native vegetation on the final landform.

4B.9.3.3.2 Regional Impacts

The Namoi Catchment Management Authority has established targets to be achieved within the Namoi River Catchment with reference to soils (NCMB, 2003). The Project has therefore been assessed against the following three targets.

- *Target S.1 - Land capability*
By 2010 increase the percentage of resource managers using land within its capability throughout the catchment to 60% and an area of 18 600km² and in identified hazard areas to increase the adoption rate to 80%.

Throughout the life of the Project, all land which is not to be disturbed would be fenced off to encourage natural regeneration which is well within the land’s capability.

- *Target S.2 - Property plans*
Increase the percentage of resource managers implementing integrated property management plans on their property from 5% to at least 20% by 2010.

This has not been considered as part of the Project. The Proponent’s emphasis on rehabilitating the areas of disturbance on the Project Site to accommodate both agriculture and nature conservation illustrates a commitment to integrated property management particularly where the emphasis is placed upon tree growth to limit dryland salinity production.



- *Target S.3 - Conservation farming*
Increase the percentage of landholders using conservation farming practices (minimum/no till cropping, crop and pasture rotation, sustainable stock management, stubble retention and soil/water conservation works) from 25% to at least 75% by 2010.

The Proponent's intention to return 107ha of the disturbed area back to agricultural uses would be undertaken with recognition of conservation farming practices.

4B.10 AIR QUALITY

The air quality assessment was undertaken by Heggies Pty Ltd (Heggies, 2007). The full assessment is presented in Part 6 of the Specialist Consultant Studies Compendium, with the relevant information from the assessment summarised in the following subsections.

4B.10.1 Introduction

Based on the environmental risk analysis undertaken for the Project (see Section 3.3 and **Table 3.5**), the potential air quality impacts requiring assessment and their unmitigated risk rating are as follows.

- Deposited dust levels attributable to the Project occasionally (for one or two months every year) above DECC guideline, affects only adjacent landholders (moderate risk).
- Deposited dust levels attributable to the Project regularly (>5 months per year) above approved limit, affects landholders some distance from the Project Site (high risk).
- PM₁₀ levels attributable to the Project occasionally (once every 1 to 2 years) above the project goal, affects only adjacent landholders (moderate risk).
- PM₁₀ levels attributable to the Project occasionally (>5 times per year) above the project goal affects landholders some distance from Project Site (high risk).
- Impacts extend beyond the Project Site or impact on extensive areas of native vegetation (high risk).
- Greenhouse gas emissions (moderate risk).

The Director-General's requirements issued by the Department of Planning require that the assessment of air quality refer to *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (DEC, 2005).

