5.6 SURFACE WATER

5.6.1 Background

A surface water impact assessment for the PPR was undertaken by WRM Water and Environment (WRM) as an addendum to Appendix M of the EA and is provided in full in **Appendix E**. The purpose of the assessment was to revise the final landform water balance model in order to simulate and report the potential impacts to the local surface water regime resulting from the revised conceptual final landform design.

5.6.2 Method

The Drayton South final void OPSIM simulation has been reconfigured incorporating the latest changes to the revised final landform and the revised groundwater inflows (see **Section 5.7**) in order to replicate the final void behaviour and assess the long term build-up of salts in the Drayton South final void.

The configuration of the Drayton South OPSIM model is described in the EA. The changes made to the OPSIM model as part of the PPR are as follows:

- The adopted final void catchment area was reduced to 688 ha (previously 1,140 ha);
- The adopted stage-storage curve was updated based on the revised final landform contours;
- The final void spill height is approximately 174 mRL;
- The time series of long term gross groundwater inflows and outflows to the revised final landform, adopted for the OPSIM modelling were updated; and
- Revised estimates of TDS concentration for water stored in the backfilled overburden was applied to the gross inflow of groundwater. The TDS concentration leaving the void was calculated by OPSIM assuming full mixing of groundwater and surface water flows.

Further details of the reconfigured OPSIM model are provided in **Appendix E**.

5.6.3 Impact Assessment

OPSIM Model Results

The results of the revised OPSIM simulation are summarised as follows:

- The final void will reach an equilibrium water level of approximately 153 mRL after about 700 years;
- The freeboard between the final water level surface and the void spill height is approximately 20m. Hence, the final void is never likely to fill (nor spill);
- The salinity in the final void will not begin to increase until seepage out of the void ceases and net groundwater inflow begins at about 160 years post-mining; and

- The final void will reach an equilibrium salinity level of between 750 and 1,300 mg/L (depending on the climatic conditions) after about 700 years. Equilibrium is reached due to the final void acting as a "flow through system", (as described in the PPR groundwater assessment (see **Section 5.7**)) which provides a pathway for removal of salts from the void.

Catchment Losses

The revised final landform design has improved the post-mining catchment by reducing the area draining internally to the final void and returning more areas of the rehabilitated landscape to natural catchment. A comparison against the findings of the EA for the final void and existing natural catchments is provided in the sections below.

Final Void

The catchment draining to the final void decreases from 1,140 ha as reported in the EA to 688 ha which represents a decrease of 40%. Accordingly the volume of surface water take that will require licensing post closure under the Hunter River Unregulated Water Sharing Plan (HRUWSP) will decrease from 730 ML (as estimated in the RTS) to 318 ML.

Saddlers Creek

Up to 490 ha of the revised final landform has been redesigned to drain to Saddlers Creek and hence the loss of catchment to Saddlers Creek will decrease from 989 ha (as presented in the EA) to 499 ha post-mining.

Saltwater Creek

The loss of catchment to Saltwater Creek will not change from that reported in the EA.

Hunter River

The revised final landform catchment draining directly to the Hunter River will increase by 14 ha.

5.6.4 Mitigation and Management

As a result of large areas of the revised final landform being diverted back into Saddlers Creek a series of channel modification works will be required in downstream sections of the existing natural catchment. This is because the revised final landform results in a significant increase in catchment area being diverted to the natural channels in areas to the north-east, north and west. Where deemed appropriate it is proposed to reconstruct parts of the natural catchments in these areas to cater for the additional flows using natural channel design principles generally in accordance with the guideline *Management of Stream/Aquifer Systems in Coal Mining Developments Hunter Region* (DIPNR, 2005). The channels will be designed by a suitably qualified person in consultation with the Catchment Management Authority and relevant regulators. The modified channels will be designed using nearby gullies with similar catchment areas as a template.

All other mitigation and management measures proposed in regard to surface water impacts as presented in the EA (see Section 8.11.4 of the EA) are still considered to be appropriate.

5.7 GROUNDWATER

5.7.1 Background

A groundwater impact assessment for the PPR was undertaken by AGE Groundwater and Environmental Consultants Pty Ltd (AGE) as an addendum to Appendix N of the EA and is provided in full in **Appendix F**. The purpose of the assessment was to revise the groundwater model that was prepared for the EA in order to simulate and report the potential impacts to the local groundwater regime resulting from the revised conceptual final landform.

5.7.2 Method

The groundwater impact assessment undertaken for the EA (see Appendix N), characterised the existing groundwater regime (pre-mining environment) and then comprehensively assessed the groundwater impacts associated with the mining and post-mining phases of the Project. Given that no substantial changes are proposed to the overall mine plan (ie. the same extent is still proposed to be mined) the addendum for the PPR only considers and assesses impacts relevant to the post-mining phase with regard to the revised conceptual final landform design.

The post-mining groundwater model was reconfigured for the revised conceptual final landform in order to enable predictive simulations to be undertaken to evaluate the groundwater recovery and potential long-term impacts arising after mining. These simulations were specifically undertaken to assess the:

- Final void water balance;
- Groundwater heads and hydraulic gradients; and
- Elevation of water level within the final void.

Modelling of the final void water balance required collaboration between AGE and surface water consultants, WRM. WRM initially updated their two dimensional OPSIM hydrology model prior to AGE commencing the groundwater model simulations (see **Section 5.6**). The OPSIM results were used by AGE to help guide the input/output of the groundwater model.

5.7.3 Impact Assessment

Conceptual Groundwater Model of the Revised Final Landform

The revised final landform will consist of overburden emplacement areas that have been backfilled within the final void and reshaped across the entire mining area. The overburden will be shaped in a manner that promotes free drainage away from the northern and western mining areas. Drainage of the majority of the eastern and central areas will be directed towards a central void area. The final void will have a catchment area of about 688 ha and have a depth up to about 75 m below the pre-mining surface topography. The lowest elevation of the final void is about 125 mRL. The deepest elevation of the mined area prior to backfilling of the void and reshaping the overburden areas will be about 50 mRL.

The water balance of the mining area will consist of two connected components, these being associated with the backfilled overburden and the final void area. The backfilled overburden will collect and accumulate water sourced from deep percolation of rainfall recharge and it will also receive groundwater inflow from surrounding geological units.

The void will collect and accumulate water sourced from the surrounding backfilled overburden material (in the longer term), direct rainfall into the void, and from the slopes of the overburden draining into the void. All undisturbed catchment flows will be diverted around the void, to limit the impact on overland flow.

Estimate of Final Void Water Level

For the revised final landform design, saturation of the backfilled overburden is predicted to take about 160 years (after mining), before seepage from the overburden would begin to enter the final void. The void water level is predicted to reach 85% of the post-mining equilibrium level within 450 years after mining. This water level is equivalent to about 147 mRL. Water levels within the final void attain their post-mining equilibrium level of about 153 mRL after 850 years. Effectively, at this elevation, the amount of water entering the void via runoff, direct rainfall, and seepage from the overburden is equivalent to the amount of water lost to evaporation from the void water surface. These revised results differ to those predicted for the final landform within the EA where the void water level reached an equilibrium elevation of about 117 mRL after about 1000 years.

The surface water spill height of the revised final landform is located at an elevation of approximately 174 mRL. The freeboard between the spill point of the revised final landform design and the surface water elevation is therefore predicted to be about 20 m. The higher predicted surface water level for the revised final landform design is a result of increased backfilling in order to reduce the size (and hence storage capacity) of the final void.

Final Void Water Balance

For the revised final landform design, the net groundwater contribution from the surrounding geology (i.e. Permian coal measures) into the backfilled overburden is predicted to decrease from 1.24 ML/day down to 0 ML/day, over a period of about 143 years following mining. Therefore, no outflow of water into the surrounding aquifers is predicted to occur whilst a hydraulic gradient exists towards the overburden area (i.e. a “groundwater sink”). The hydraulic gradient is predicted to be reversed away from the overburden area after 143 years, when heads within the overburden reach an elevation greater than 120 mRL. The loss of water from the backfilled overburden into the coal measures is predicted to rise from 0 ML/day up to 0.54 ML/day during the period between 143 and 450 years after mining (i.e. a groundwater “source”).

The effect of evaporation on recovering water levels is absent for about the first 160 years after mining. This is due to the head within the overburden being lower than the base of the void area. The absence of evaporation during this period enhances the rate at which the water level recovers within the overburden.

Evaporation from the final void water surface, after 160 years, increases from 0 ML/day to a maximum of 3.18 ML/day, as the area of the void water surface increases. Water movement from the overburden into the void increases from 0 ML/day to a maximum of 1.33 ML/day to replace void water that is lost to evaporation.

These revised results differ to those predicted in the EA, where the void water balance indicated that the void would remain a sink for a period of about 700 years after mining. Also, the loss of water from the EA final void into the coal measures was predicted to be less than that predicted for the revised final landform design. The loss of water from the EA void design was predicted to rise from 0 ML/day up to 0.02 ML/day, which is less than the rate of 0.54 ML/day predicted for the revised final landform design.

Groundwater Heads and Hydraulic Gradient

The hydraulic gradients predicted for the revised landform design suggest the overburden profile and the final void will act as a "flow through system", which is recharged from the north-east and discharged towards the north, north-west, west, south-west, and south. The predicted head gradients suggest that seepage from the overburden area is likely to migrate beyond the mining area and into the surface drainage of Saddlers Creek and the Hunter River, via migration through the Permian coal measures and alluvial aquifers. These revised predictions are broadly similar to those predicted within the EA, where similar hydraulic gradient patterns were established.

The existing (i.e. pre-mining) hydraulic gradient already promotes upward leakage of Permian coal measure (basement) water into the Hunter River alluvium and Saddlers Creek alluvium. Evidence of this process has been confirmed by groundwater head measurements and the occurrence of moderate salinity within some sections of the alluvial aquifers.

For the revised final landform design the net movement of water from the Permian coal measures into the alluvium is increased for both the Hunter River alluvium and Saddlers Creek alluvium as a result of the increased head gradients. The increased flow to the Hunter River alluvium from the Permian coal measures steadily increases over time to a rate that is about 0.05 ML/day higher than natural conditions. The rate of increased seepage into the Hunter River alluvium is predicted to account for about 0.1% of the total water budget for the alluvium, and therefore the increase will not be measureable.

As reported in the EA, depressurisation beneath Saddlers Creek during mining is predicted to reduce the natural movement of water from the Permian coal measures into the alluvium. The maximum decrease in net seepage to the alluvium is predicted to be about 0.2 ML/day, occurring about 50 years after mining. These results are in broad agreement with those presented in the EA. However, the more rapid recovery associated with the revised final landform design reduces the duration of the impact to the Saddlers Creek alluvium.

As the head within the overburden continues to recover after 350 years, the head gradient promotes flow to occur from the overburden into Saddlers Creek Alluvium. The total increased rate of seepage into the Saddlers Creek alluvium is predicted at 0.24 ML/day above natural conditions which would account for about 30% of the total water budget for the

alluvium, and therefore it will lead to a significant contribution in baseflow to the creek. The TDS concentration of water stored within the overburden is predicted to range from slightly brackish to brackish, which is a better quality than the natural moderately saline base flow.

Baseflow to Hunter River and Saddlers Creek

Baseflow to the Hunter River is predicted to be impacted by an insignificant increase of 0.05 ML/day. This increase equates to about a 0.02% increase to the river flow during average flow conditions (i.e. ~250 ML/day), and about a 0.05% increase to the river flow during low flow events (i.e. 90 ML/day).

As reported in the EA, with regards to Saddlers Creek, a reduction in baseflow is anticipated to occur initially after mining in response to the hydraulic gradient being towards the recovering head within the overburden. However, for the revised final landform, the baseflow is returned to pre-mining conditions at about 325 years after mining. The baseflow within Saddlers Creek is predicted to continue to increase to a rate that is 0.23 ML/day higher than natural conditions. The increased baseflow is promoted by the equilibrium hydraulic gradient that is established away from the overburden towards Saddlers Creek. The increase in baseflow within Saddlers Creek is predicted to be about 30% higher than it was pre-mining. Increased baseflow within Saddlers Creek is likely to sustain longer periods of flow.

Final Void and Overburden Water Quality

Saturation of the revised final landform overburden profile is predicted to take about 160 years before seepage from the overburden would enter the void. As such, the void is predicted to remain dry during the initial 160 years after recovery. As a result, evaporation will not be able to concentrate the salinity of water stored within the overburden profile. Therefore, the salinity of the water stored within the overburden could only be affected by the generation of overburden leachate.

The salinity of water stored within the overburden can be predicted by calculating the TDS concentration of the mixture between groundwater inflow from surrounding Permian coal measures, and deep percolation through the overburden originating from rainfall recharge (ie. overburden leachate water).

RGS Environmental (RGS) characterised the overburden, interburden, and potential coal reject material as part of the EA (see Appendix P of the EA). As part of this assessment RGS found that the leachate from overburden typically has a low TDS concentration. RGS also found that the salinity of the overburden leachate decreased with time during their 12 week kinetic leach column (KLC) test program. The KLC test TDS concentrations ranged between 470 mg/L and 32 mg/L, with an average TDS concentration of 144 mg/L. For the PPR groundwater assessment a conservative TDS concentration of 200 mg/L was adopted for the overburden leachate water, based on the tests undertaken by RGS.

The adopted TDS concentration of the Permian coal measures seepage to the overburden is anticipated to remain at a constant rate of about 3,500 mg/L.

The mixture of the overburden leachate water with seepage from the coal measures is predicted to have a significantly lower TDS concentration compared to the surrounding coal measures. The TDS concentration is predicted to be initially around 1,500 mg/L, which then decreases down to about 486 mg/L over time.

Using the above assumptions for the TDS of the groundwater inflow and deep percolation through the overburden, the long term build-up of salts in the revised final landform design was assessed by WRM using an OPSIM water balance model which was configured to replicate the void behaviour (see **Section 5.6**).

The OPSIM water balance model predicted salt concentrations within the final void water body would gradually increase, with TDS concentrations reaching an equilibrium salinity level of between 750 mg/L and 1,300 mg/L (i.e. slightly brackish to brackish) after about 700 years. The range of TDS concentration is predicted to fluctuate in response to climatic conditions (i.e. during high rainfall and low rainfall periods). The equilibrium salinity level is reached in response to the "flow through system", whereby continual movement of water will occur from the overburden and through the void water body. This process will lead to mixing of water within the void to form a combination of water derived from overburden, direct rainfall and rainfall runoff. In addition, salinity in the final void will not begin to increase until evaporation begins on the water surface about 160 years after mining.

These revised results differ to those predicted within the EA, where TDS concentrations were predicted to gradually increase up to about 5,600 mg/L (i.e. moderately saline) about 120 years after mining and between 8,000 mg/L and 13,000 mg/L after about 1000 years. The primary factor leading to the higher TDS values for the EA void design was due to the effects of evaporation off the water body surface within the final void. For the original design within the EA evaporation was predicted to occur immediately after mining, leading to a higher TDS concentration compared to the modified void design.

A hypothetical mixture between Hunter River water (i.e. 250 ML/day average flow at 507 mg/L TDS) and overburden water (i.e. 0.54 ML/day loss from the void at 1,300 mg/L TDS) equates to a TDS increase within the Hunter River by about 0.24%. This hypothetical mixture represents a worst case scenario as it does not account for the significant dilution that would occur as the void water migrates through the alluvial aquifers. As such, the worst case scenario impact on the Hunter River salinity would remain less than the NSW Aquifer Interference Policy trigger level of 1% change for the revised final landform design.

The TDS concentration of current natural base flow within Saddlers Creek ranges between 3,000 mg/L and 5,000 mg/L. As such, the predicted TDS concentration of water sourced from the overburden and/or the void will be lower than the present baseflow concentration. An increase of 0.23 ML/day to the baseflow of Saddlers Creek, with a TDS concentration of about 1,300 mg/L is therefore predicted to not degrade the water quality within Saddlers Creek. In fact, the higher baseflow at a TDS lower than natural conditions would more than likely improve the quality of the creek system.

5.7.4 Mitigation and Management

Given that the nature of the predicted impacts on groundwater associated with the revised final landform design are consistent with or improved (particularly with regard to Saddlers Creek) from what was presented in the EA the suite of mitigation and management measures presented in the EA (see Section 8.12.4 of the EA) are considered appropriate.

6 STATEMENT OF COMMITMENTS

This section provides the revised statement of commitments for the Preferred Project.

The Revised Statement of Commitments in **Table 7** summarises the major aspects of the Project and the key management and mitigation measures proposed in the EA with those additional measures being proposed from this PPR presented in **bold font**.

Table 7
Revised Statement of Commitments

Ref.	Commitment	Section
	Mining Operations	
1	Anglo American will extract coal at a rate of up to 7 Mtpa ROM for 27 years, in accordance with the EA	EA Section 4.1
2	Anglo American will design and undertake highwall mining operations in accordance with the EA, ensuring that there is no noticeable subsidence (< 20 mm at the surface)	EA Section 4.2.2
3	Following the grant of a new project approval, Anglo American will surrender the existing project approval for Drayton Mine (PA 06_0202) and the DC for the Antiene Rail Spur (DC 106-04-00)	EA Section 4.1
4	Anglo American will obtain the relevant licences and approvals (see Table 16 of the EA) for the Project	EA Section 5.10
5	**Anglo American will ensure that the northern most edge of the main haul road is set back from Saddlers Creek in all areas by at least 40m**	**PPR Section 2.4**
	Environmental Management	
6	Anglo American will revise the existing Drayton SHECMS in consultation with the relevant regulators (and the Aboriginal community where relevant) and to the satisfaction of DP&I. This will include the following: • Air quality management plan (including a TARP for dust); • Noise management plan (including a TARP for noise); • Greenhouse and energy efficiency management plan; • Spontaneous combustion management plan; • Blasting management plan; • Fauna and flora management plan (including a biodiversity action plan); • Aboriginal and cultural heritage management plan; • Non-Aboriginal heritage management plan; • Water management plan; • Land management plan; • Rehabilitation and offset management plan; • Final void management plan; • Tailings management plan; • Bushfire management plan; and • Waste management plan	EA Section 8

Ref.	Commitment	Section
	Air Quality and Greenhouse Gases	
7	Anglo American will implement leading practice dust mitigation measures to achieve the air quality outcomes described in the EA	EA Section 8.1.4
8	Permanent haul roads will be treated using a dust suppression agent (e.g. Dust-A-Side or Dust Bloc)	EA Section 8.1.4
9	Anglo American will install an air quality monitoring network comprising real-time PM_{10} and $PM_{2.5}$ monitors, TSP monitors and dust deposition gauges. This monitoring network will be designed in consultation with OEH	EA Section 8.1.4
10	Anglo American will install a real-time meteorological station with predictive software capabilities. The location of this meteorological station will be selected in consultation with OEH	EA Section 8.1.4
11	Anglo American will undertake monitoring of greenhouse gas emissions and review energy efficiency initiatives to ensure that Scope 1 greenhouse gas emissions are kept to the minimum level practicable	EA Section 8.2.4
	Noise and Blasting	
12	Anglo American will implement leading practice noise mitigation measures to ensure that the predicted noise levels at private receivers are not exceeded	EA Section 8.3.4
13	The double benching method will be utilised when constructing the initial box cut for the Houston mining area	EA Section 8.3.4
14	Conveyors at the existing Drayton Mine will be fitted with low noise idlers	EA Section 8.3.4
15	Initial excavation in the Houston mining area will be limited to the day. Night operations will only commence once mining reaches a depth of 12 m and the Houston visual bund reaches a height of 15 m	EA Section 8.3.4
16	Anglo American will install a real-time noise monitoring system, which will be designed in consultation with OEH	EA Section 8.3.4
17	Anglo American will design blasts so that the relevant overpressure and vibration criteria are not exceeded	EA Section 8.4.4
18	Anglo American will undertake monitoring of blasts at representative receivers	EA Section 8.4.4
	Visual and Lighting	
19	**The Houston visual bund will be constructed in accordance with the Coolmore Option 4A design included the PPR**	**PPR Section 2.2**
20	Tree screens will be established on the ridgeline adjoining the Houston visual bund, as well as sections of the Golden Highway and the realigned Edderton Road within the Project Boundary	EA Section 4.7 and 8.6.5
21	If a landholder considers that they are experiencing significant visual impacts, Anglo American will consult with that landholder. Anglo American will implement offsite visual treatments (such as tree screens) if it is determined that additional mitigation is required	EA Section 8.6.5
22	In order to reduce direct lighting impacts, fixed lights will be directed away from sensitive receivers and low lux lamps will be used wherever practicable	EA Section 8.6.5

Ref.	Commitment	Section
	Ecology	
23	Anglo American will progressively rehabilitate mined areas, with an emphasis on re-establishing Woodland communities	EA Section 4.2.1, 8.7.5 and 8.8
24	Anglo American will implement the biodiversity offset strategy described in this EA for the purpose of initially maintaining and ultimately improving the ecological values of the region	EA Section 8.8
25	Anglo American will progressively undertake the Saddlers Creek restoration program in conjunction with the CMA	EA Section 8.8.3 and 8.17.3
	Aboriginal Archaeological and Cultural Heritage	
26	Protection and salvage of Aboriginal objects will be conducted in accordance with the Aboriginal and cultural heritage management plan, which will be revised in consultation with the Aboriginal community and OEH. The revised plan will include a suitable Aboriginal Cultural Heritage Induction Program	EA Section 8.9.4
27	Anglo American will establish, in consultation with the Aboriginal community and OEH, a keeping place for the purpose of housing salvaged Aboriginal artefacts from the local area	EA Section 8.9
	Non-Aboriginal Heritage	
28	Non-aboriginal heritage items will be managed in accordance with a Non-aboriginal Heritage Management Plan, which will be revised in consultation with OEH	EA Section 8.10.4
29	Anglo American will prepare photographic archival recordings and scaled drawings for each of the heritage items to be impacted by the Project	EA Section 8.10.4
	Water Resources	
30	Anglo American will revise the existing Drayton Mine water management system in consultation with the relevant regulators	EA Section 4.8 and 8.11.4
31	Anglo American will conduct ongoing monitoring of surface water quantity and quality. The monitoring data will be used to update and validate the OPSIM water balance model	EA Section 8.11.4
32	In the event that out-of-pit storages reach capacity, one of the four mining areas at Drayton South will be temporarily used for water storage	EA Section 8.11.4
33	In the event that offsite water supplies are required, Anglo American will obtain the necessary WAL prior to sourcing water from the Hunter River	EA Section 8.11.4
34	Anglo American will conduct ongoing monitoring of groundwater quantity and quality. In particular, monitoring bores will be installed near the rejects and tailings emplacements to detect movement of seepage away from these areas	EA Section 8.12.4
	Agriculture	
35	Anglo American will enable or establish sustainable farming practices on available agricultural areas within the Drayton South area	EA Section 8.16.4

Ref.	Commitment	Section
	Geochemical	
36	Anglo American will monitor the quality of seepage and runoff from the OEAs	EA Section 8.14.4
	Traffic and Transport	
37	The realignment of Edderton Road will be designed in consultation with MSC, and the intersection of Edderton Road and the Golden Highway will be designed in consultation with RMS	EA Section 8.18.4
	Rehabilitation, Final Landform and Final Land Use	
38	Anglo American will rehabilitate mined areas in accordance with the commitments made in the EA.	EA Section 8.17
39	Anglo American will implement leading practice soil management measures, as described in Section 8.15.4 of the EA, to minimise degradation of soil reserved for rehabilitation	EA Section 8.15.4
40	**The final landform will be designed in accordance with the PPR**	**PPR Section 2.3**
	Community	
41	Anglo American will offer a VPA to MSC	EA Section 8.22.5
42	Anglo American will sponsor the recruitment and training of at least three apprentices per year for the life of the Project	EA Section 8.22.5
43	Anglo American will support a CCC for the Drayton Complex	EA Section 6.5
44	Anglo American will support the continuation of working groups with Coolmore Australia and Darley Australia with regard to the construction and operation of the Project	EA Section 6.5
	Reporting	
45	Anglo American will prepare an Annual Review (which reports monitoring results and evaluate performance), to be distributed to the relevant regulatory authorities and the Drayton CCC	EA Section 8

7 CONCLUSION

This PPR has been prepared to fulfil the prerequisites for a Preferred Project as requested by the Director-General and allow for amendments to the conceptual Project layout for which approval is being sought (see **Section 2**), including:

- Minor amendments to the required infrastructure (collectively referred to as the amended infrastructure areas) including;
  - A modified alignment for a portion of the haul road and conveyor option within the transport corridor. This includes repositioning the required Macquarie Generation conveyor overpass and associated infrastructure to accommodate the modified alignment for the haul road and conveyor option;
  - An alternative alignment for the required discharge pipeline from the Houston Dam to the Hunter River; and
  - Subsequent revision of the Project Boundary to encompass the infrastructure amendments proposed above.
- Amendments to the Houston Visual Bund in order to align with the option proposed in the public submission received from Coolmore Australia;
- A revised conceptual final landform design to reduce the size of the final void, reduce the slope of the final highwall and provide a more natural landscape incorporating principles of micro-relief; and
- Amendments to the Project layout to ensure the set back from Saddlers Creek for the mine plan is at a minimum 40 metres in all areas from the northern most edge of the main haul road.

Given the minor nature of the amendments sought, many of the environmental and socio-economic aspects are deemed consistent with the impact assessments and associated mitigation and management measures provided in the EA.

This PPR demonstrates that the infrastructure amendments proposed as part of the Preferred Project will improve safety performance, operational efficiency and reduce bulk earthwork requirements without causing significant environmental and socio-economic impacts.

When the changes proposed as part of the Preferred Project are considered together there will be a net decrease in the projected impacts to vegetation from that assessed in the Environmental Assessment. This includes a projected reduction in the area of listed Box-Gum Woodland CEEC (-39 ha) and non-listed derived native grassland (-14 ha) that will be impacted by the Project.

As the Preferred Project will reduce the quantum of predicted impacts on biodiversity, the existing biodiversity offset package is deemed adequate.

The amended discharge pipeline alignment will result in an additional 7 ha of disturbance when compared to the alignment in the EA. However, once the pipeline is installed, the topsoil material collected along this alignment and conserved will be reinstated and rehabilitated. In this regard, impact on SAL, other agricultural resources, enterprises and its associated production will be minimal and short-term in nature.

The Coolmore Option 4A visual bund as included in the Preferred Project presents a significant improvement for the Drayton South Coal Project by further minimising impacts on neighbouring stakeholders. The visual impact assessment undertaken for the PPR has confirmed that the Coolmore Option 4A visual bund is effective at screening all views to the Project once constructed. Further the amended visual bund has been designed to enable its construction to be completed within 8 months which is a significant improvement from the EA design which was estimated to take 16 months to complete.

Finally the revised conceptual final landform proposed in this PPR improves on the design that was initially presented in the EA as it significantly reduces the size of the final void, reduces the slope of the final highwall and provides a more natural landscape incorporating principles of micro-relief.

The water assessments undertaken for the revised final landform have confirmed that no material environmental impacts are predicted on the existing natural water regimes concluding that the quality of water migrating from the final void is not likely to have a measurable impact on the Hunter River. This is generally consistent with the predictions within the EA. With regard to Saddlers Creek water migrating from the final void is likely to contribute to a higher baseflow at a Total Dissolved Solids concentration lower than natural conditions. This is likely to improve the quality of the creek system.

Given the relative consistency of the amendments sought in this PPR with the content presented in the EA and the minimal environmental and socio-economic impacts that will result from its operations when considered in the broader context of the Drayton Complex, it is deemed that the Preferred Project remains in the public interest.

8 ABBREVIATIONS

Abbreviation	Description
AHIMS	Aboriginal Heritage Information Management System
Anglo American	Anglo American Metallurgical Coal Pty Ltd
BSAL	Biophysical Strategic Agricultural Land
CEEC	Critically Endangered Ecological Community
CIC	Critical Industry Cluster
DP&I	NSW Department of Planning and Infrastructure
EA	Environmental Assessment
EARs	Environmental Assessment Requirements
EEC	Endangered Ecological Community
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
ha	Hectare
Hansen Bailey	Hansen Bailey Environmental Consultants
HRSTS	Hunter River Salinity Trading Scheme
KLC	Kinetic Leach Column
km	Kilometre
m	Metre
m^3	Cubic metre
ML	Mega Litre
MNES	Matters of National Environmental Significance
mRL	metres reduced level
NSW	New South Wales
PAC	Planning Assessment Commission
PPR	Preferred Project Report
The Project	Drayton South Coal Project
Project Boundary	Project Application Boundary
RTS	Response to Submissions
SAL	Strategic Agricultural Land
SEWPaC	Department of Sustainability, Environment, Water, Populations and Communities
SEPP Major Development	*State Environmental Planning Policy (Major Development) 2005*
SRLUP	*Strategic Regional Land Use Plan – Upper Hunter*
TDS	*Total Dissolved Solids*

9 REFERENCES

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Management of Stream/Aquifer Systems in Coal Mining Developments Hunter Region (DIPNR, 2005)

NSW Department of Planning and Infrastructure (DP&I) (2012) *Strategic Regional Land Use Plan – Upper Hunter.*

NSW Office of Water (NOW) (2010) *Guidelines for Outlet Structures.*

Revised Schedule of Land to which this PPR Applies

A

Drayton South Coal Project
Appendix A – Revised Schedule of Land to which this PPR applies

Lot	DP	Lot	DP
1	1004725	1	1004725
3	1004725	41	1105798
1	247510	1	1159371
2	616024	2	1159371
5	843635	1	238862
8	843635	22	241179
22	1018587	44	241179
321	625513	45	241179
4	701496	46	241179
6	701496	1	532672
9	701496	1	556370
12	701496	1	752486
13	701496	180	812852
14	701496	31	1156564
21	545087	2	1095515
64	850818	23	225426
65	850818	Edderton Road	
7	29950	Various Crown roads	
9	843635	Various sections of Council roads	
21	1018587	New England Highway (Antiene Rail Spur overpass)	
1	1095515		

Note: The cadastral information for the lands to which the PPR applies was sourced from the NSW LPI records database.

Regulatory Correspondence

B

Major Projects Assessment
Mining & Industry
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Phone 02 9228 2040
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Rick Fairhurst
Project Studies Manager
201 Charlotte Street
BRISBANE QLD 4000

10/04845

Dear Mr Fairhurst,

Drayton South Coal Project – Preferred Project Report

I refer to an email to the Department dated 18 February 2013 in which your project consultant, Hansen Bailey, outlined proposed changes to the Drayton South Coal Project.

The Department has reviewed the proposed changes, and I can advise you that under Section 75H(6) of the *Environmental Planning and Assessment Act 1979* (which still applies to the project because it is a Transitional Part 3A Project) the Director-General requires a Preferred Project Report (PPR) to be prepared for the project.

The PPR must:

- detail the proposed changes to the project and provide revised maps of the project as a whole incorporating the proposed changes; and
- include an assessment of the impacts of the proposed changes. Expert reports should be updated where it is practicable (and preferably not supplemented with an addendum) so the impacts of the proposed changes are considered in the context of the whole project.

The Department anticipates your PPR would be lodged concurrently with your Response to Submissions. Please let me know if this will not be the case.

Yours sincerely

DKitto 18/2/13

David Kitto
Director
Mining & Industry Projects
As the Director-General's nominee

Mining Projects
GPO Box 39
SYDNEY NSW 2001
Phone 02 9228 2091
Fax 02 9228 6466
Email mike.young@planning.nsw.gov.au

Rick Fairhurst
Project Studies Manager
201 Charlotte Street
BRISBANE QLD 4000

10/04845

Dear Mr Fairhurst

Drayton South Coal Project – Preferred Project Report

The Department has now completed its review of the mine plan for the Drayton South Coal Project.

Following the review, the Department understands that Anglo Coal has agreed to make the following changes to the project:

- reduce the size of the visual bund to the south of the Houston Pit to generally comply with "Option 4" proposed in the submission from the Coolmore Horse Stud;
- progressively fill the central haul road to reduce the depth of this void at the cessation of mining;
- increase the setback from Saddlers Creek to at least 40 m in all areas;
- reduce the depth of the final void at the southern edge of the Whynot Pit; and
- reduce the slope of the final highwall on the southern boundary of the open cut.

I wish to advise you that the Preferred Project Report (PPR) requested by the Director-General on 18 February 2013 must also include a detailed description of these (and any other) changes to the project including clear maps showing the changes in comparison to what was originally proposed, and an assessment of the potential impacts of these changes.

The Department anticipates that once the PPR is submitted, the Planning Assessment Commission will hold public hearings and complete its review of the project within 3 months.

If you have any further questions, please contact Mike Young on 9228 2091.

Yours sincerely

DKitto 25/7/13

David Kitto
A/Executive Director
Development Assessment Systems & Approvals
As the Director-General's nominee

Ecology Impact Assessment Addendum

C

DRAYTON SOUTH COAL PREFERRED PROJECT REPORT

Ecology Impact Assessment Addendum

For:

Hansen Bailey Pty Ltd

August 2013

Final

CUMBERLAND ECOLOGY

PO Box 2474
Carlingford Court 2118

Report No. 9080RP8

The preparation of this report has been in accordance with the brief provided by the Client and has relied upon the data and results collected at or under the times and conditions specified in the report. All findings, conclusions or recommendations contained within the report are based only on the aforementioned circumstances. The report has been prepared for use by the Client and no responsibility for its use by other parties is accepted by Cumberland Ecology.

Revision	Date Issued	Revision Type
1	8/4/2013	First Draft to HB for review
2	16/4/2013	Final Draft to HB
3	9/5/2013	Final Report issued to HB
4	13/5/2013	Final Report
5	19/8/2013	Final Report with additional amendments for HB review
6	26/8/2013	Final Report

Approved by: Dr. David Robertson

Position: Director

Signed: David Robertson

Date: *26 August, 2013*

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Glossary of Terms

Amended infrastructure areas	Comprises the minor amendments to the Project layout that are the focus of this Ecology Impact Assessment. This comprises a modified alignment for a portion of the haul road and conveyor option within the transport corridor and an alternative alignment for the required discharge pipeline from the Houston Dam to the Hunter River. The total area is approximately 18 ha in size (**Figure 1.1** to **Figure 1.3**)
Anglo American	Anglo American Metallurgical Coal Pty Ltd, the Proponent
Box-Gum Woodland	EPBC-listed CEEC and TSC-listed EEC *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland.* Note that this refers collectively to both the woodland and grassland forms of the community.
CEEC	Critically Endangered Ecological Community
CMA	Hunter-Central Rivers Catchment Management Authority
Disturbance Footprint	The total area within the Study Area that will require clearing for mining and construction, and all infrastructure associated with the Drayton South Coal Project
DP&I	NSW Department of Planning and Infrastructure
Drayton Mine	Drayton Mine is an operating coal mine in Coal Lease 229 and is managed by Anglo American. The mine commenced production in 1983 and predominately produces steaming coal for the export market at a maximum of 8 Mtpa of ROM coal
Drayton South	Refers generally to the area of the Drayton South Coal Project, located within Exploration Lease (EL) 5460
Drayton South Coal Project	Refers to Project Application 11_0062. This application is for a 27 year open cut coal and high wall mining operation with associated infrastructure and services. Proposed as the continuation of Drayton Mine, it is in the

	process of being assessed under Part 3A of the EP&A Act
EA	Environmental Assessment, submitted under Part 3A of the EP&A Act for the Drayton South Coal Project (Project Application 11_0062)
EEC	Endangered Ecological Community
EIA	Ecology Impact Assessment
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
FM Act	*Fisheries Management Act 1994*
GDEs	Groundwater Dependent Ecosystems
LGA	Local Government Area
Locality	Land within 10 km radius of the Study Area
MAC	Mt Arthur Coal
Macquarie Generation	Owners and operators of the Liddell and Bayswater Power Stations, located adjacent to the Project. A small portion of the amended transport corridor is located on Macquarie Generation land
MNES	Matters of National Environmental Significance that are listed in the EPBC Act
NP&W Act	*National Parks and Wildlife Act 1974*
NSW	New South Wales
OEH	NSW Office of Environment and Heritage, a division of the NSW Department of Premier and Cabinet (formerly the Department of Environment, Climate Change and Water)
PMST	EPBC Act Protected Matters Search Tool
PPR	Preferred Project Report
RTS	Response to Submission report, submitted to the Department of Planning and Infrastructure in response to submissions to the EA

The Project	Refers to Project Application 11_0062, or the Drayton South Coal Project
Project Boundary	The Project Boundary encompasses all land required for the Drayton South Coal Project including the existing Drayton Mine, Drayton South and the transport corridor, as shown in **Figure 1.1**
SEWPaC	Commonwealth Department of Sustainability, Environment, Water, Population and Communities (formerly Department of Environment, Water, Heritage and the Arts)
Study Area	The Study Area comprises an overall area of approximately 4,627 ha and includes the proposed Drayton South Disturbance Footprint, the transport corridor, the Edderton Road realignment and water pipelines to the Hunter River. The Study Area excludes the existing Drayton Mine as this area has been the focus of previous assessments
TEC	Threatened Ecological Community listed under the TSC Act and/or EPBC Act
Threatened species	Flora and fauna listed under the TSC Act, EPBC Act and FM Act
TSC Act	NSW *Threatened Species Conservation Act 1995*

Executive Summary

S1 Introduction

Cumberland Ecology Pty Ltd (Cumberland Ecology) has been engaged by Hansen Bailey Environmental Consultants (Hansen Bailey) on behalf of Anglo American Metallurgical Coal Pty Ltd (Anglo American) to prepare an addendum to the Ecology Impact Assessment (EIA) completed as part of the *Drayton South Coal Project Environmental Assessment* (EA) for the Drayton South Coal Project (the Project). The purpose of this addendum is to form an appendix to a Preferred Project Report (PPR) being prepared by Hansen Bailey to support project application 11_0062 under section 75H, Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

S2 Background

Drayton Mine commenced production in 1983 and is managed by Anglo American, the controlling partner of the Drayton Joint Venture. Drayton Mine currently operates under Project Approval (PA) 06_0202, approved 1 February 2008, to provide predominantly steaming coal to export and domestic markets at a maximum of 8 Million tonnes per annum (Mtpa) of Run of Mine (ROM) coal. The Antiene Rail Spur (approved under Development Consent 106-04-00) is utilised to transport export steaming coal to the Port of Newcastle via the Main Northern Railway. PA 06_0202 expires in 2017 at which time operations will cease.

The Project will allow for the continuation of the existing Drayton Mine by the development of open cut and high wall mining operations within the Drayton South area, which is located within Exploration Licence (EL) 5460. The continued operations will utilise the existing workforce, infrastructure and equipment. A transport corridor will be constructed to link Drayton Mine and the Drayton South area (collectively referred to as the Drayton Complex).

The Drayton Complex is located approximately 10 kilometres (km) north-west of the village of Jerrys Plains and approximately 13 km south of the township of Muswellbrook in the Upper Hunter Valley of New South Wales (NSW). The Drayton Complex is predominately situated within the Muswellbrook Local Government Area (LGA).

S2.1 Project Application under Part 3A of the EP&A Act

Anglo American is seeking approval for the Project under Part 3A of the EP&A Act. A major project application (11_0062) and supporting Preliminary Environmental Assessment was submitted to the NSW Department of Planning and Infrastructure (DP&I) in March 2011.

The EA was prepared by Hansen Bailey on behalf of Anglo American to support the major project application. The EA was placed on public exhibition between 7 November and 21 December 2012.

An EIA was prepared for the Project as a component of the EA (see Appendix J of the EA). The assessment considered an overall area of approximately 4,597 ha, which includes the proposed Drayton South Disturbance Footprint, transport corridor, Edderton Road realignment, water pipelines to the Hunter River (collectively referred to as the Study Area) and additional mining areas proposed at Drayton Mine.

The purpose of the assessment was to characterise the terrestrial and aquatic flora and fauna within the additional mining areas at Drayton Mine and within the Study Area, including threatened species, populations and ecological communities protected under the *Threatened Species Conservation Act 1995* (TSC Act), *Fisheries Management Act 1994* (FM Act) and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), assess the impacts of the Project on biodiversity values and recommend measures to mitigate, manage and offset these impacts.

A summary of the key components provided in the EIA are reiterated in this addendum to provide context with regards to the amendments sought as part of the Preferred Project.

S2.2 Description of the Preferred Project

Following submission and public exhibition of the EA in late 2012, Anglo American has further evaluated and tested the functionality of the conceptual Project layout presented in the EA as part of the detailed engineering design phase. This work has resulted in the development of an optimised design for key infrastructure components required to facilitate the Project and amendments to the conceptual Project layout for which approval is being sought. Further to this following a review of the Project mine plan by DP&I Anglo American has agreed to make additional changes to the Project in order to improve the outcomes for neighbouring stakeholders and the environment.

The amendments sought as part of the Preferred Project are described below:

- Minor amendments to the required infrastructure (collectively referred to as the amended infrastructure areas) including;
  - A modified alignment for a portion of the haul road and conveyor option within the transport corridor. This includes repositioning the required Macquarie Generation conveyor overpass and associated infrastructure to accommodate the modified alignment for the haul road and conveyor option;
  - An alternative alignment for the required discharge pipeline from the Houston Dam to the Hunter River; and
  - Subsequent revision of the Project Boundary to encompass the infrastructure amendments proposed above.
- Amendments to the Houston Visual Bund in order to comply with the option proposed in the public submission received from Coolmore Australia;

- A revised conceptual final landform design to reduce the size of the final void, reduce the slope of the final highwall and provide a more natural landscape incorporating principles of micro-relief; and

- Amendments to the Project to ensure the set back from Saddlers Creek for the mine plan is 40 metres in all areas.

With regard to the above only the amended infrastructure areas require additional assessment for inclusion in this report. The changes to the Houston visual bund, final landform and additional set back from Saddlers Creek are all within the disturbance boundary that has previously been assessed and included in the EIA completed for the EA. As such these components are not discussed any further in this report.

The haul road alignment within the transport corridor has been revised to provide an improved geometric design. The radius (or tightness) of the horizontal curve in the haul road design has been increased to significantly optimise efficiency and safety performance. The revised design also avoids complex terrain, reduces fill requirements and drainage complications.

The discharge pipeline alignment has been revised to allow water to be transferred by means of gravity feed from the Houston Dam, which is situated at a higher elevation, to the Hunter River. The relocation of the pipeline also avoids complex terrain and minimises issues with erosion.

All residual components of the Project remain consistent with the EA.

S3 Methods

The Project was subject to a detailed ecological investigation for the EA to identify the key ecological attributes within the Project Boundary. As part of that assessment, a thorough review of available information was completed that included numerous ecological reports for surrounding coal mine projects; regional vegetation mapping studies; threatened species records from the Office of Environment and Heritage (OEH) Atlas of NSW Wildlife database and the Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) EPBC Protected Matters Search Tool.

The ecological investigation for the EA also included detailed ecological field surveys, comprising flora, fauna and aquatic investigations carried out over a number of different seasons. Terrestrial surveys were conducted, where practicable, in accordance with accepted conventional guidelines and included quadrat sampling, habitat assessments, targeted species searches, trap line surveys, nocturnal surveys and bat surveys. Aquatic assessments included visual assessments of the creek line environments, water quality sampling and analysis.

As a result of the ecological investigation carried out for the EA, the biodiversity values within the Project Boundary, and hence the amended infrastructure areas are well known and understood. This addendum EIA largely draws upon the existing data base of information to assess the potential impacts of the amended infrastructure areas. A site inspection of the amended infrastructure areas was conducted on February 28, 2013 to verify the desktop information, assess the presence of specific habitat features in these areas and to determine the likelihood of threatened flora or fauna occurring in the amended infrastructure areas.

S4 Results

S4.1 Threatened Vegetation Communities and Species in the Study Area

The Study Area supports a number of different remnant vegetation communities; however, the predominant vegetation unit within the Study Area is native grassland that has been derived from the clearing of the original woodland and forest communities. The majority of the remnant vegetation is dominated by *Eucalyptus moluccana* (Grey Box) and comprises Central Hunter Box-Ironbark Woodland, which is listed under the TSC Act. Many of the remaining woodland communities in the Study Area also conform to communities that are listed as Threatened Ecological Communities (TECs) under the TSC Act and/or the EPBC Act. Some of these vegetation communities conform to Box-Gum Woodland, which is listed as an Endangered Ecological Community (EEC) under the TSC Act and as a Critically Endangered Ecological Community (CEEC) under the EPBC Act.

Threatened flora species listed under the TSC Act and EPBC Act that were recorded within the Study Area include:

- A single *Cymbidium canaliculatum* (Tiger Orchid);
- Two small patches of regrowth *Acacia pendula* (Weeping Myall);
- Some *Bothriochloa biloba* (Lobed Blue Grass) individuals; and
- A patch of approximately 30 scattered individuals of *Diuris tricolor* (Pine Donkey Orchid).

Twenty-one threatened fauna species have been recorded from the Study Area since 2000; all are represented by mobile avifauna and microbat species and are generally restricted to areas of remnant vegetation.

S4.2 Vegetation in the Amended Infrastructure Areas

S4.2.1 Transport Corridor

The vegetation in the transport corridor is dominated by open grassland but contains some woodland vegetation. The woodland vegetation has been mapped as Central Hunter Box-Ironbark Woodland and is dominated by a canopy of *Eucalyptus moluccana* (Grey Box). This community is the most abundant and widespread community within the Study Area. It is listed under the TSC Act as an EEC. It is not listed under the EPBC Act.

The open grassland areas in the transport corridor were originally derived from the historic clearing of woodland communities for agriculture. As such, it is commonly referred to generically as "derived native grassland". The derived native grassland areas present in the transport corridor are still dominated by native grasses, including *Aristida* spp. (Three-awn Grass) and *Austrostipa* spp. (Spear Grass), with very minor proportions of *Themeda australis* (Kangaroo Grass) and *Austrodanthonia* spp. (Wallaby Grass) and a lower frequency of native herbs present. They also contain a relatively high percentage cover of exotic species, including broad-leaved plants such as *Plantago lanceolata* (Lamb's Tongue) and *Gnaphalium* spp. (Cudweeds).

The derived native grassland in the transport corridor varies from low to high diversity of native herbaceous species. It has been mapped as a vegetation unit referred to in the EA as 'Other Grassland'. This unit is distinct from other areas of derived grassland in the locality that are listed as a TEC under the EPBC Act and TSC Act. 'Other Grassland' areas within the amended infrastructure areas are largely dominated by a variety of native perennial grass and forb species but contain exotic species as is typical of grazing lands.

S4.2.2 Discharge Pipeline

The original character of the vegetation in the discharge pipeline corridor has been cleared or highly modified by historic clearing for agriculture such that no forest or woodland communities are present. All trees have been removed, leaving only derived grassland. This grassland is similar to that found within the transport corridor and is still dominated by native grasses and a variable diversity of native herbaceous species.

As with the derived grassland in the transport corridor, this unit is distinct from other areas of derived grassland in the locality that are listed as a TEC under the EPBC Act and TSC Act and has been referred to in the EA as 'Other Grassland'.

S4.3 Flora

No threatened flora species have been found within the amended infrastructure areas. Notwithstanding the above, a number of threatened plant species listed under the TSC Act and / or EPBC Act were either recorded outside of the amended infrastructure areas during surveys for the Preferred Project, or are known at other locations in the locality. Species that have some potential to occur in the amended infrastructure areas are listed in **Table S.1**.

Table S.1 Threatened Flora Species with Potential to Occur in the Amended Infrastructure Areas

Family	Scientific Name	Common Name	EPBC Status	TSC Status	Likelihood of Occurrence
Orchidaceae	*Cymbidium canaliculatum*	Tiger Orchid	-	E2	Potential
Orchidaceae	*Diuris tricolor*	*Pine* Donkey Orchid	-	E1, E2	Low potential
Poaceae	*Bothriochloa biloba*	Lobed Blue-grass	V	-	Potential

V = Vulnerable; E1 Endangered (TSC Act); E2 = Endangered population

S4.4 Fauna Habitat and Fauna

S4.4.1 Woodland Habitat

The woodland habitat in the transport corridor comprises a small proportion of the overall amended infrastructure area; however, it is part of a larger patch of woodland located around the upper reaches of Saddlers Creek in the Study Area. The woodland habitat in the transport corridor represents a mixture of moderately valuable to highly valuable foraging and roosting habitat for bats, and woodland and nectar-feeding birds. The woodland habitat is also moderately valuable for arboreal mammals and reptiles but does not provide much habitat for amphibians and terrestrial mammals.

S4.4.2 Grassland Habitats

The grassland habitat within the amended infrastructure areas is generally limited and of low value for most native fauna as it is situated on dry hillsides that lack trees and other important habitat features such as a complex understorey structure, large tree hollows, and ground habitat such as leaf litter and woody debris.

The grasslands provide suitable foraging habitat for large mammals including Eastern Grey Kangaroo (*Macropus giganteus*) and Red-necked Wallaby (*Macropus rufogriseus*). They also afford habitat for birds, bats, reptiles, and to a lesser extent frogs, that can feed within grassland areas. Feral animals such as foxes, cats, rabbits and hares also occur. Tree-dependent species are rare or absent and such species include possums and gliders, Koala, and tree-dependent birds.

S4.4.3 Aquatic Habitat

The amended infrastructure areas do not support aquatic habitats.

S4.4.4 Threatened Species

No threatened fauna species have been recorded in the amended infrastructure areas but the woodland habitat in vicinity of the transport corridor is known to support occurrences of Southern Myotis (*Myotis macropus*), Eastern Cave Bat (*Vespadelus troughtoni*), Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*), Grey-crowned Babbler (*Pomatostomus temporalis temporalis*) and Speckled Warbler (*Pyrrholaemus saggitatus*). The woodland habitat within the transport corridor provides foraging habitat for the above threatened species and provides roosting or nesting habitat for the *Saccolaimus flaviventris*), Grey-crowned Babbler (*Pomatostomus temporalis temporalis*) and Speckled Warbler (*Pyrrholaemus saggitatus*).

Other threatened species considered to have some potential to occur in the amended infrastructure areas are listed in **Table S.2**. Many of the species that have a low potential to occur are unlikely to be dependent on habitat in the amended infrastructure areas or are unlikely to occur frequently. For the threatened fauna that have some potential to occur, these species are likely to be restricted to mobile species such as birds and bats that may forage or overfly the amended infrastructure areas on occasion. These species are unlikely to depend on habitat within the amended infrastructure areas for breeding or roosting.

Table S.2 Threatened Fauna Species with Potential to Occur in the Amended Infrastructure Areas

Family	Scientific Name	Common Name	EPBC Act Status	TSC Act Status	Likelihood of Occurrence
Birds					
Apodidae	*Hirundapus caudacutus*	White-throated Needletail		Mi	Low Potential
Accipitridae	*Circus assimilis*	Spotted Harrier	V		Low Potential
	Hieraaetus morphinoides	Little Eagle	V		Low Potential
Psittacidae	*Lathamus discolour*	Swift Parrot	E	E; Ma	Low Potential
Strigidae	*Ninox connivens*	Barking Owl	V		Low Potential
Meropidae	*Merops ornatus*	Rainbow Bee-eater		Mi	Low Potential
Climacteridae	*Climacteris picumnus*	Brown Treecreeper	V		Potential in the vicinity of transport corridor during ecology surveys for the EA
Acanthizidae	*Pyrrholaemus saggitatus*	Speckled Warbler	V		Recorded in the vicinity of the

Table S.2 Threatened Fauna Species with Potential to Occur in the Amended Infrastructure Areas

Family	Scientific Name	Common Name	EPBC Act Status	TSC Act Status	Likelihood of Occurrence
					transport corridor during ecology surveys for the EA
Meliphagidae	*Melithreptus gularis gularis*	Black-chinned Honeyeater (eastern subspecies)	V		Potential in the transport corridor
Pomatostomidae	*Pomatostomus temporalis temporalis*	Grey-crowned Babbler (eastern subspecies)	V		Recorded in the vicinity of the transport corridor during ecology surveys for the EA
Petroicidae	*Petroica boodang*	Scarlet Robin	V		Potential in the transport corridor
	Melanodryas cucullata	Hooded Robin	V		Potential in the transport corridor
Estrildidae	*Stagonopleura guttata*	Diamond Firetail	V		Potential in the transport corridor
Mammals					
Emballonuridae	*Saccolaimus flaviventris*	Yellow-bellied Sheathtail-bat	V		Recorded in the vicinity of the transport corridor during ecology surveys for the EA
Molossidae	*Mormopterus norfolkensis*	Eastern Freetail-bat	V		Potential in the transport corridor
Petauridae	*Petaurus norfolcensis*	Squirrel Glider	V		Potential in the transport corridor. Recorded in the vicinity of the transport corridor within the adjacent Mt Arthur Mine lease area.
Vespertilionidae	*Chalinolobus dwyeri*	Large-eared Pied Bat	V	V	Potential in the transport corridor

Table S.2 Threatened Fauna Species with Potential to Occur in the Amended Infrastructure Areas

Family	Scientific Name	Common Name	EPBC Act Status	TSC Act Status	Likelihood of Occurrence
	Miniopterus orianae oceanensis	Eastern Bentwing-bat	V		Potential in the transport corridor
	Myotis macropus	Southern Myotis	V		Recorded in the vicinity of the transport corridor during ecology surveys for the EA
	Nyctophilus corbeni	Greater Long-eared Bat	V	V	Potential in the transport corridor
	Scoteanax rueppellii	Greater Broad-nosed Bat	V		Potential in the transport corridor
	Vespadelus troughtoni	Eastern Cave Bat	V		Recorded in the vicinity of the transport corridor during ecology surveys for the EA

E = Endangered; V = Vulnerable; Ma = Marine (EPBC Act); M = Migratory (EPBC Act)

S5 Impacts of the Preferred Project

The Preferred Project includes amendments to the alignment of the haul road/conveyor option and discharge pipeline to the Hunter River. These amendments encompass a total disturbance footprint of 18 ha (**Table S.3**). In reality, the construction of the haul road, conveyor option and the discharge pipeline will not require the disturbance of the entire corridor, and so the actual disturbance will be less than 18 ha.

The Preferred Project amended infrastructure areas will require the direct disturbance of approximately 2 ha of Central Hunter Box – Ironbark Woodland (EEC) in the transport corridor and 16 ha of non-listed derived native grassland, or "Other Grassland". The area of Central Hunter Box – Ironbark Woodland (EEC) to be disturbed in the infrastructure areas will not increase from the disturbance area reported in the EA. No additional areas of TEC will be impacted as a result of the Preferred Project (see **Table S.3**).

The Preferred Project will result in an increased disturbance area of 7 ha and that this additional disturbance will comprise non-listed derived native grassland or "Other Grassland" (**Table S.3**).

The Preferred Project also includes amendments to the Houston visual bund and the mine set back from Saddlers Creek; these amendments will decrease the overall Project disturbance footprint, including a 39 ha decrease in the area of Box-Gum Woodland estimated to be impacted.

Table S.3 Summary of Predicted Impacts Due to the Amended Infrastructure Areas

Vegetation Community	Status	Infrastructure Areas (EA) (ha)	Preferred Project Report (ha)			Change from Impact as Predicted in the EA
			Transport corridor	Discharge pipeline	Total	
Central Hunter Box-Ironbark Woodland	EEC (TSC Act)	2	2	0	2	0
Other Grassland	Not listed	9	9	7	16	+7
TOTAL (ha)		**11**	**11**	**7**	**18**	**+7**

The Preferred Project will not have a direct impact on known occurrences of threatened species. However, the Preferred Project may still have an impact on potential habitat for threatened species. The woodland habitat within the realigned transport corridor provides potential habitat for *Cymbidium canaliculatum* (Tiger Orchid) and *Diuris tricolor* (Pine Donkey Orchid) although none have been recorded in this area to date during surveys completed for the EA. The woodland habitat also provides potential foraging and roosting habitat for a number of threatened fauna species. Many of these species are likely to be mobile species such as birds and bats that may forage or overfly the amended infrastructure areas on occasion and are unlikely to depend on these habitats for their persistence in the locality. The potential impact of the Preferred Project on woodland habitat for threatened species will remain unchanged from the impacts predicted in the EA.

The Preferred Project will directly impact an additional 7 hectares of non-listed derived grassland habitat. Although this grassland habitat represents potential habitat for *Bothriochloa biloba* (Lobed Blue-grass) and potential foraging habitat for a number of threatened fauna species, the value of the habitat afforded by derived grassland environments is low and is unlikely to support important populations of native threatened species. Many of the threatened fauna species that may forage within grassland habitats are likely to be mobile species such as raptors and migratory birds that may forage or overfly the amended infrastructure areas on occasion and are unlikely to depend on these habitats for their persistence in the locality. Comparable or better quality habitat will remain within the vicinity that will not be impacted by the Project. Therefore, the direct disturbance of an

additional 7 hectares of grassland habitat is unlikely to significantly change the threatened species impacts of the Project above the impacts predicted in the EA.

The Preferred Project is considered unlikely to have a significant impact on the health and water quality of aquatic habitats as no aquatic habitats are present in the impacted areas.

The Preferred Project will not result in any further indirect impacts to those already assessed for the equivalent infrastructure components as part of the Project. The Preferred Project will not exacerbate indirect impacts such as competition for resources, noise, light, dust, erosion, vehicle strike and increased weeds and feral animals, which have already been assessed for the Project. Therefore, the potential ecological impacts due to the Preferred Project are unlikely to significantly change the predicted impacts of the Project as described in the EA.

S6 Impact Mitigation and Compensatory Measures

S6.1 Biodiversity Offset Package

In recognition of the unavoidable impacts of the Project, a comprehensive Biodiversity Offsets Package (BOP) was developed to offset the residual ecological impacts that would remain after avoidance and mitigation measures have been implemented. The BOP is designed to ensure that the Project does not result in a net loss of biodiversity values, and that the area and condition of habitat for flora and fauna is maintained or improved over the life of the Project. The BOP includes the following components:

- Onsite Offsets, which is the protection and improvement of conservation areas within the Study Area:
  - Conservation of vegetation along the primary ridgeline in the Study Area;
  - The restoration and enhancement of Saddlers Creek and the wildlife corridor;
  - Rehabilitation of the Project Disturbance Footprint; and
- Offsite Offset, which is the acquisition, long-term protection and improvement of an offset property located outside of the Study Area.

Site-specific Biodiversity Offset Management Plans (BOMPs) will be prepared as part of the BOP to prescribe ongoing management actions for the onsite offsets and offsite offset property. This is a key component of the BOP to ensure that the biodiversity values of the Project's offsets can be maintained and improved.

S6.2 Consistency with the Biodiversity Offset Strategy

The potential impacts of the Project were assessed previously in the EA; these predicted impacts will be mitigated through the implementation of a suite of measures, such as erosion and weed control measures; and offset through the Project's BOP.

The Preferred Project amended infrastructure areas are unlikely to significantly change the predicted impacts of the Project on the local occurrence of TECs, threatened species and populations or their habitats as described in the EA. Furthermore, the amended Houston visual bund and Saddlers Creek set back will reduce the overall impacts of the Preferred Project on Box-Gum Woodland and potential threatened species habitat. As such, the BOP that was presented in the EA will be improved by the Preferred Project and is considered to be appropriate. No further offsets are required to address changes due to the Preferred Project.

Potential indirect impacts on surrounding land and downstream habitats are not likely to be significant but should be managed, particularly during the construction phase.

S7 Conclusion

The Preferred Project as proposed will involve amendments to the haul road and conveyor option alignments within the transport corridor and the discharge pipeline alignment to the Hunter River. The Preferred Project amended infrastructure areas will have a potential direct impact of 18 ha, comprising 2 ha of Central Hunter Box-Ironbark Woodland EEC and 16 ha of non-listed derived grassland varying from low to high diversity of native herbaceous species.

The Preferred Project will not change the quantum of impact to TECs or potential habitat for threatened woodland species that may utilise the woodland habitat along the haul road/conveyor option alignment in the transport corridor. However, the amended infrastructure areas will remove an additional 7 ha of non-listed grassland habitat as a result of the realignment of the discharge pipeline.

The Preferred Project also includes amendments to the Houston visual bund and the mine plan to ensure a 40 m set back from Saddlers Creek in all areas. When the amended infrastructure areas, amended Houston visual bund and amendments to the mine plan are considered together, there will be a net decrease in the projected impacts to woodland from that assessed in the EA. This includes a projected decrease in the area of Box-Gum Woodland that will be impacted by the Project.

Considering the above, the Preferred Project is not likely to increase the impact on TECs, threatened species and populations or their habitats. The predicted ecological impacts of the Preferred Project will be reduced from that described in the EA. Therefore, the predicted impacts due to the Preferred Project will be adequately mitigated through the implementation of a suite of measures proposed in the EA and the infrastructure revisions proposed for the Preferred Project will remain consistent with the BOP developed for the EA.

Chapter 1

Introduction

Cumberland Ecology Pty Ltd (Cumberland Ecology) has been engaged by Hansen Bailey Environmental Consultants (Hansen Bailey) on behalf of Anglo American Metallurgical Coal Pty Ltd (Anglo American) to prepare an addendum to the Ecology Impact Assessment (EIA) completed as part of the *Drayton South Coal Project Environmental Assessment* (EA) (Hansen Bailey, 2012) for the Drayton South Coal Project (the Project). The purpose of this addendum is to form an appendix to a Preferred Project Report (PPR) being prepared by Hansen Bailey to support project application 11_0062 under section 75H, Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Specifically, this addendum to the EIA aims to:

- Describe the biodiversity values within the amended infrastructure areas;
- Quantify the change in the areas of direct disturbance that will result from the Preferred Project;
- Determine whether there will any significant impact on threatened flora and fauna associated with the Preferred Project beyond that which was predicted in the EA;
- Present updated tables of impact for the Project that include the predicted impacts of the Preferred Project; and
- Determine whether the Preferred Project will remain consistent with the compensatory measures developed for the Project.

Note that this assessment focuses particularly upon threatened flora and fauna listed by the NSW *Threatened Species Conservation Act 1995* (TSC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)

1.1 Background

Drayton Mine commenced production in 1983 and is managed by Anglo American, the controlling partner of the Drayton Joint Venture. Drayton Mine currently operates under Project Approval (PA) 06_0202, approved 1 February 2008, to provide predominantly steaming coal to export and domestic markets at a maximum of 8 Million tonnes per annum (Mtpa) of Run of Mine (ROM) coal. The Antiene Rail Spur (approved under Development Consent 106-04-00) is utilised to transport export steaming coal to the Port of Newcastle via the Main Northern Railway. PA 06_0202 expires in 2017 at which time operations will cease.

The Project will allow for the continuation of the existing Drayton Mine by the development of open cut and high wall mining operations within the Drayton South area, which is located within Exploration Licence (EL) 5460. The continued operations will utilise the existing workforce, infrastructure and equipment. A transport corridor will be constructed to link Drayton Mine and the Drayton South area (collectively referred to as the Drayton Complex).

The Drayton Complex is located approximately 10 kilometres (km) north-west of the village of Jerrys Plains and approximately 13 km south of the township of Muswellbrook in the Upper Hunter Valley of New South Wales (NSW). The Drayton Complex is predominately situated within the Muswellbrook Local Government Area (LGA).

Anglo American is seeking approval for the Project under Part 3A of the EP&A Act. A major project application (11_0062) and supporting Preliminary Environmental Assessment was submitted to the NSW Department of Planning and Infrastructure (DP&I) in March 2011.

The EA was prepared by Hansen Bailey on behalf of Anglo American to support the major project application. The EA was placed on public exhibition between 7 November and 21 December 2012. Following the public exhibition of the EA, DP&I requested a formal response to submissions (RTS) on 22 January 2013. The Response to Submissions document (RTS) was prepared and submitted to DP&I on 7 May 2013.

1.2 Preferred Project: Description

Following submission and public exhibition of the EA in late 2012, Anglo American has further evaluated and tested the functionality of the conceptual Project layout presented in the EA as part of the detailed engineering design phase. This work has resulted in the development of an optimised design for key infrastructure components required to facilitate the Project and amendments to the conceptual Project layout for which approval is being sought. Further to this following a review of the Project mine plan by DP&I Anglo American has agreed to make additional changes to the Project in order to improve the outcomes for neighbouring stakeholders and the environment.

The amendments sought as part of the Preferred Project are described below and shown on **Figure 1.1**:

- Minor amendments to the required infrastructure (collectively referred to as the amended infrastructure areas) including;
  - A modified alignment for a portion of the haul road and conveyor option within the transport corridor. This includes repositioning the required Macquarie Generation conveyor overpass and associated infrastructure to accommodate the modified alignment for the haul road and conveyor option;
  - An alternative alignment for the required discharge pipeline from the Houston Dam to the Hunter River; and
  - Subsequent revision of the Project Boundary to encompass the infrastructure amendments proposed above.
- Amendments to the Houston Visual Bund in order to comply with the option proposed in the public submission received from Coolmore Australia;
- A revised conceptual final landform design to reduce the size of the final void, reduce the slope of the final highwall and provide a more natural landscape incorporating principles of micro-relief; and
- Amendments to the Project to ensure the set back from Saddlers Creek for the mine plan is 40 metres in all areas.

With regard to the above, only the amended infrastructure areas require additional assessment for inclusion in this report. The changes to the Houston visual bund, final landform and additional set back from Saddlers Creek are all within the disturbance boundary that has previously been assessed and included in the EIA completed for the EA. As such these components are not discussed any further in this report.

Figure 1.2 and **Figure 1.3** provides a comparison of the Preferred Project amended infrastructure areas with that presented in the EA.

The haul road alignment within the transport corridor has been revised to provide an improved geometric design. The radius (or tightness) of the horizontal curve in the haul road design has been increased to significantly optimise efficiency and safety performance. The revised design also avoids complex terrain, reduces fill requirements and drainage complications.

The discharge pipeline alignment has been revised to allow water to be transferred by means of gravity feed from the Houston Dam, which is situated at a higher elevation, to the Hunter River. The relocation of the pipeline also avoids complex terrain and minimises issues with erosion.

All residual components of the Project remain consistent with the EA.

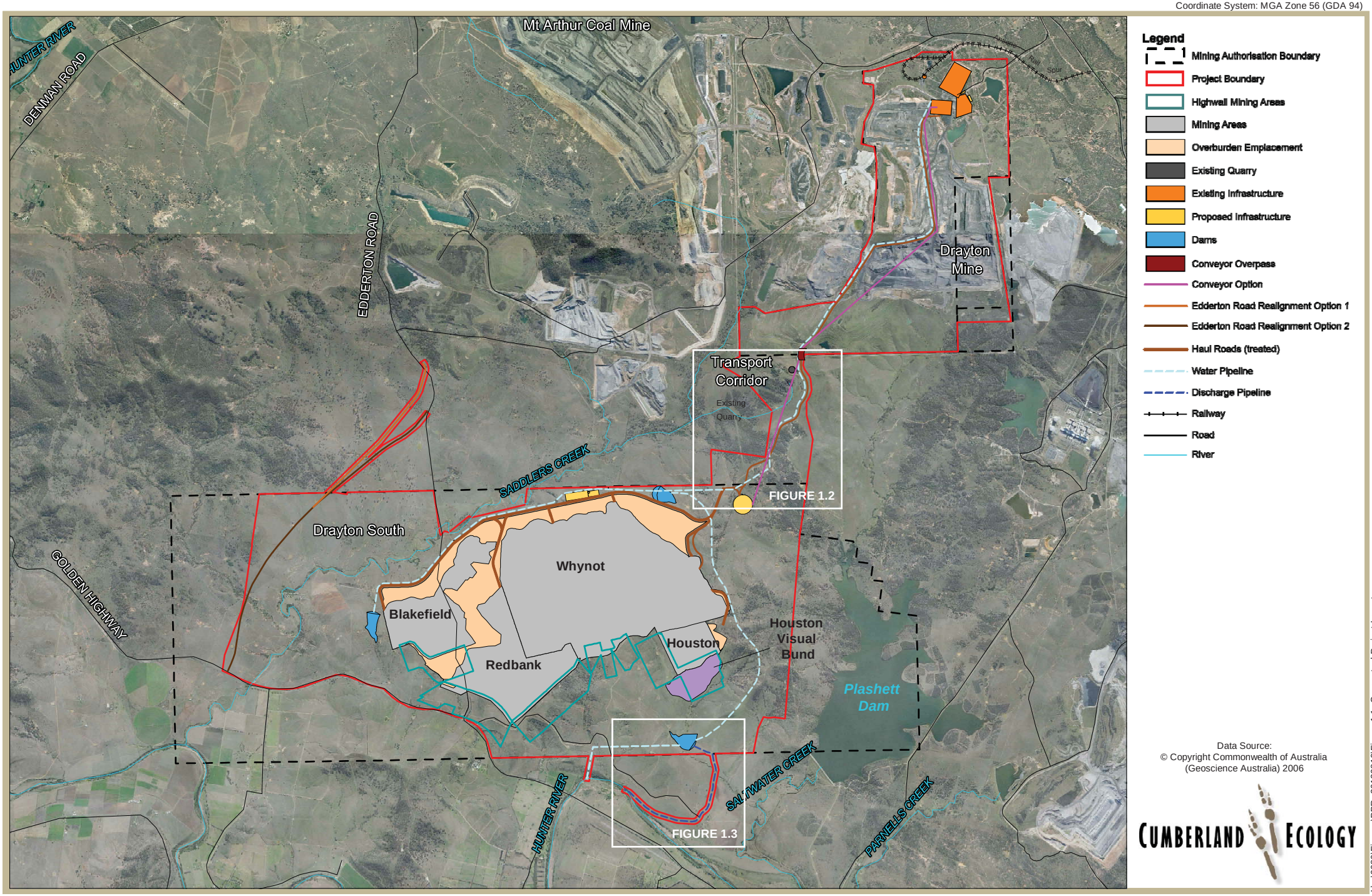

Figure 1.1. Conceptual Preferred Project Layout

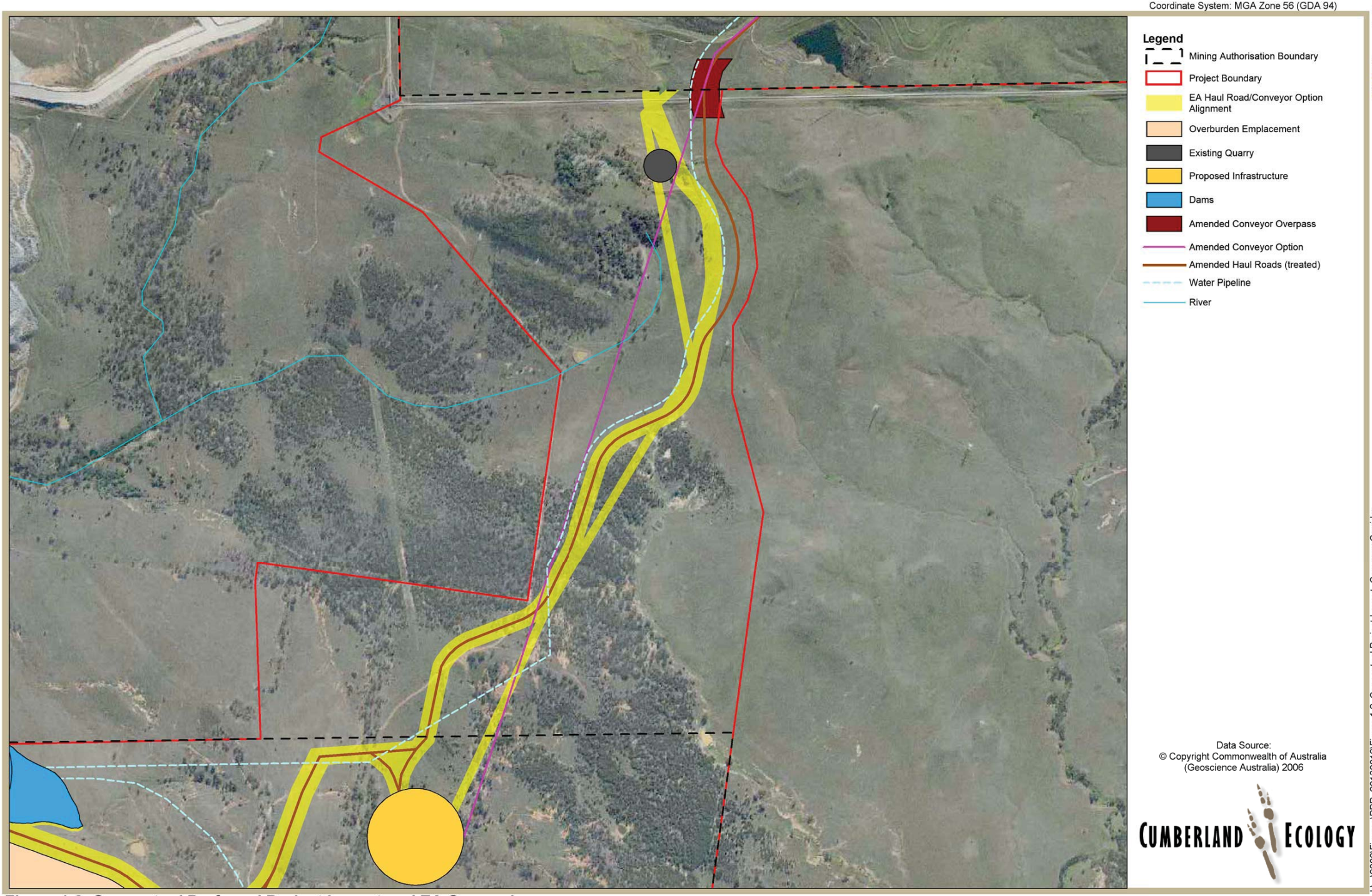

Figure 1.2. Conceptual Preferred Project Layout and EA Comparison (Amended Haul Road/Conveyor Option Alignment)

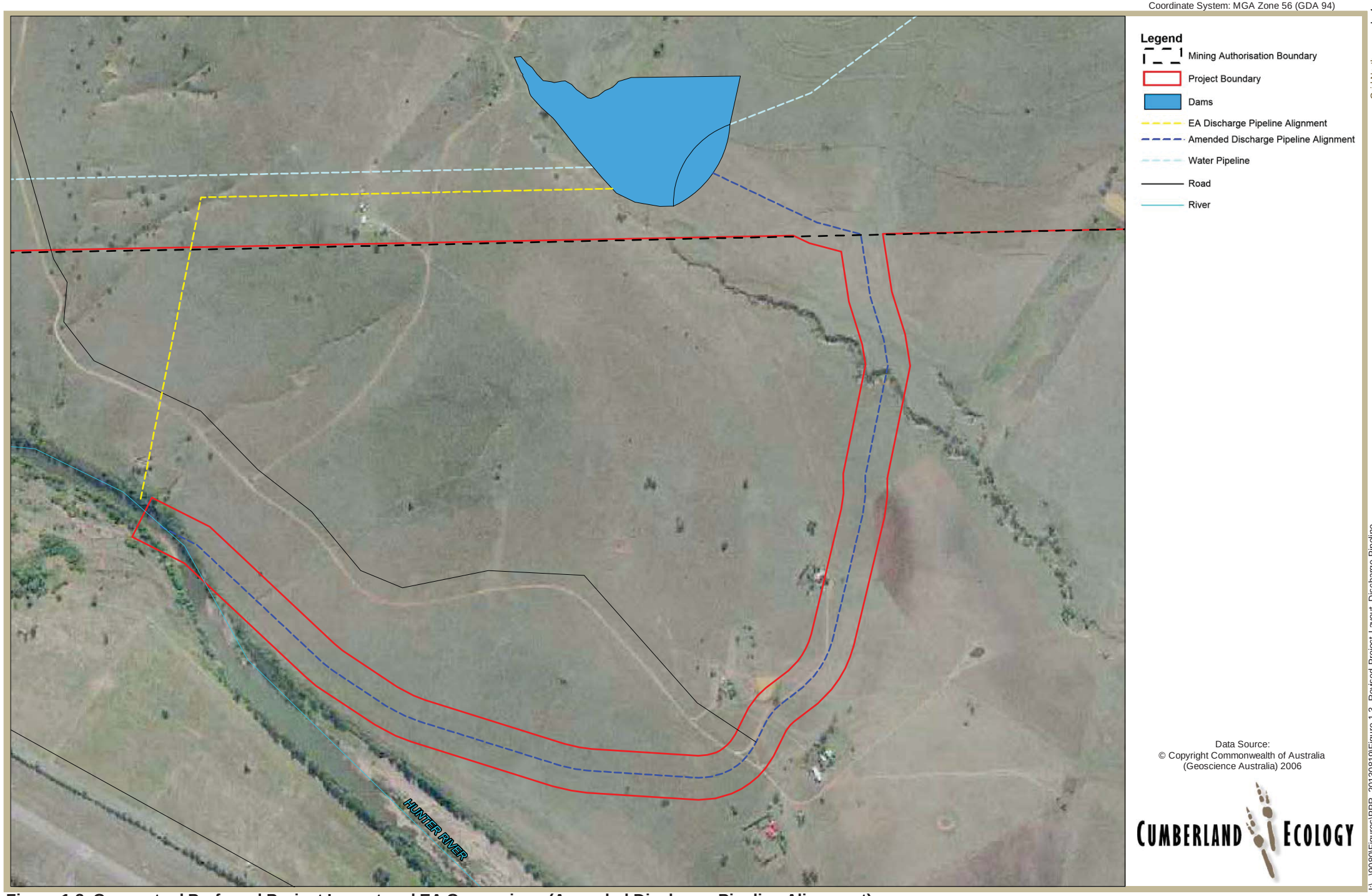

Figure 1.3. Conceptual Preferred Project Layout and EA Comparison (Amended Discharge Pipeline Alignment)

1.3 EA Ecology Impact Assessment

An EIA was prepared for the Project as a component of the EA (see Appendix J of the EA). The assessment considered an overall area of approximately 4,597 ha, which includes the proposed Drayton South Disturbance Footprint, transport corridor, Edderton Road realignment, water pipelines to the Hunter River (collectively referred to as the Study Area) and additional mining areas proposed at Drayton Mine.

The purpose of the assessment was to characterise the terrestrial and aquatic flora and fauna within the additional mining areas at Drayton Mine and within the Study Area, including threatened species, populations and ecological communities protected under the *Threatened Species Conservation Act 1995* (TSC Act), *Fisheries Management Act 1994* (FM Act) and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), assess the impacts of the Project on biodiversity values and recommend measures to mitigate, manage and offset these impacts.

A summary of the key components provided in the EIA are reiterated in this addendum to provide context with regards to the amendments sought as part of the Preferred Project.

1.4 Relevant Legislation

1.4.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act is the Australian Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places — defined in the EPBC Act as Matters of National Environmental Significance (MNES). Under the EPBC Act, any action (which includes a development, project or activity) that is considered likely to have a significant impact on MNES (including nationally threatened ecological communities and species, and listed migratory species) must be referred to the Australian Government Minister for Sustainability, Environment, Water, Population and Communities (the minister). The purpose of the referral is to allow a decision to be made about whether an action requires approval on a Commonwealth level. If an action is declared a “controlled action”, then Commonwealth approval is required.

1.4.2 Environmental Planning and Assessment Act 1979

The EP&A Act is the overarching planning legislation in NSW. This act provides for the creation of planning instruments that guide land use. The EP&A Act also provides for the consideration of the environment and biodiversity values, which is addressed in Section 5A (Significant effect on species, populations or ecological communities or their habitats). This includes threatened species, communities, habitat and processes as listed under the TSC Act and FM Act.

1.4.3 Threatened Species Conservation Act 1995

The TSC Act is the key piece of legislation in NSW relating to the protection and management of biodiversity and threatened species. The TSC Act aims to protect and encourage the recovery of threatened species, populations and communities that are listed under the Act through threat abatement and species recovery programs.

1.4.4 Fisheries Management Act 1994

Threatened species legislation in NSW consists of both the FM Act, and the TSC Act. The FM Act deals with threatened fish and marine vegetation and associated threatening processes and is administered by the NSW Department of Primary Industries (DPI). The TSC Act deals with all other threatened biota and threatening processes in the State and is administered by the OEH. Under the FM Act, "fish" means marine, estuarine or freshwater fish or other aquatic animal life at any stage of their life history and includes molluscs, crustaceans, echinoderms, beach worms and other polychaetes.

1.4.5 State Environmental Planning Policy 44 – Koala Habitat Protection

Schedule 1 of NSW *State Environmental Planning Policy 44 – Koala Habitat Protection* (SEPP 44) identifies Muswellbrook and Singleton as LGAs to which this planning instrument applies (Department of Planning, 1995). In accordance with this SEPP, it must be ascertained whether the amended infrastructure areas contain potential koala habitat; if so, whether the amended infrastructure areas then contain core koala habitat.

Chapter 2

Methods

2.1 EA Ecology Impact Assessment

The EIA prepared for the Project (see Appendix J of the EA) included a detailed investigation to identify the key ecological attributes within the Study Area. A brief summary of the methods adopted in the assessment are provided in the following sections.

2.1.1 Literature Review

A literature review was completed to identify the key ecological attributes and issues of the Study Area. A comprehensive database of information relevant to the Study Area and surrounds exists as a result of numerous ecological studies conducted for nearby mining and conservation projects, including the Project (Ecotone, 2000; The Ecology Lab Pty Ltd, 2000; Cumberland Ecology, 2012), Drayton Mine (Hansen Bailey, 2007a; Hansen Bailey, 2009), Mt Arthur Coal Complex (Cumberland Ecology, 2009), Mount Pleasant (ERM Mitchell McCotter, 1997; Cumberland Ecology, 2010b), Bengalla Mine (Envirosciences Pty Ltd, 1993; Hansen Consulting, 2006; Hansen Bailey, 2007b; Cumberland Ecology, 2010a), Muswellbrook Coal (HLA-Envirosciences, 2002; Hansen Bailey, 2010) and Bayswater B Power Station (Resource Planning Pty Limited, 1993; Eco Logical Australia Pty Ltd, 2009). The information available was reviewed and used to assist in the preparation of this addendum to the EIA.

Regional-scale vegetation mapping that was completed on behalf of the Hunter-Central Rivers Catchment Management Authority (CMA) (Peake, 2006) was also reviewed.

2.1.2 Database Records

Existing information on the biodiversity values of the Study Area and surrounds were obtained through the Office of Environment and Heritage (OEH) *Atlas of NSW Wildlife* database (OEH, 2013) and the Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) *EPBC Protected Matters Search Tool*. The number and age of records of threatened species recorded within the locality of the Study Area was used to assess the likelihood of threatened species occurring. The Protected Matters Search Tool provides a list of Matters of National Environmental Significance (MNES) that are predicted to occur based on the presence of suitable habitat, which was useful to guide threatened species searches during field surveys.

2.1.3 Field Survey

Surveys were conducted, where practicable, in accordance with accepted conventional guidelines (DEC (NSW), 2004) and included:

- **Flora surveys**: quadrat sampling, random meanders and targeted threatened flora searches;
- **Fauna surveys**: habitat assessments, targeted threatened fauna searches and fauna both passive and active trapping techniques including:
  - arboreal and terrestrial trap lines and hair tubes;
  - cage traps;
  - infra-red cameras;
  - systematic diurnal bird surveys;
  - nocturnal surveys using spotlighting and call playback; and
- **Aquatic assessments**: visual habitat assessments of Saddlers Creek and the Hunter River, water quality sampling and analysis.

Field surveys completed for the Project were very comprehensive and were conducted across all seasons to account for flowering schedules, breeding times and patterns, seasonal migration, and other variations affecting detectability. In addition to this, the presence of suitable habitat was considered when assessing the potential occurrence of a given threatened species. Where potential habitat was present and the species was known to occur at other locations in the locality of the Study Area, it was assumed that the species had potential to occur and were thus assessed accordingly.

2.2 Preferred Project

As a result of the EIA carried out for the EA, the biodiversity values within the Study Area and hence the areas amended infrastructure areas required to facilitate the Preferred Project are well known and understood. For this reason, the methods of assessment for this addendum EIA draws largely upon a review of existing information and the results of the field surveys conducted for the Project as part of the EA and is deemed sufficiently comprehensive and reliable to adequately support this addendum EIA for the Preferred Project.

To supplement the work undertaken as part of the EA, a field survey of the amended infrastructure areas was completed on February 28, 2013. This survey was undertaken by foot to verify vegetation mapping and assess the presence of flora and fauna and their habitat. Where appropriate, the following information was recorded in areas of interest, along with locational coordinates and photographs:

- Notes on general condition of vegetation within the amended infrastructure areas, including:
  - Dominant canopy species and evidence of natural regeneration;
  - Understorey structure;
  - Evidence of disturbance (current land use, weed infestation etc.);
- Presence of any threatened flora; and
- Presence of any threatened fauna and/or important habitat features, including tree hollows, fallen logs, bush rock and wetland areas (i.e. creeks and soaks).

Chapter 3

Results

This chapter provides a description and discussion of the flora and fauna values of the Study Area with a particular focus on the Preferred Project amended infrastructure areas.

3.1 Study Area

The original character of the vegetation in the Study Area has been greatly altered as a result of historical and current land uses. Originally the vegetation in the Study Area and surrounds would have been dominated by open forest and woodland. Following European settlement, the majority of the treed vegetation was cleared to provide grasslands for livestock. As a result, a high proportion of the Study Area is now dominated by extensive areas of native perennial grassland of various diversity and floristic composition. Weed and feral animal invasion, in combination with cattle grazing, has also contributed to the contemporary landscape observed during this ecology impact assessment. The resultant mosaic of grasslands and remnant woodland patches is typical of the Muswellbrook locality and a result of extensive agricultural practices.

The remnant forest and woodland now exist as scattered patches across the landscape, typically in gully and riparian areas that have historically been difficult to farm. There are a few occurrences of old growth trees (i.e. trees that are greater than 90-100 years old) within the Study Area, particularly in association with deep gully lines. However, the majority of the remnant woodland is comprised of a mixture of relatively new regrowth, particularly of *Allocasuarina luehmannii* (Bulloak) and *Acacia salicina* (Cooba), and young but mature woodland (i.e. intact woodland of age between 40-90 years old). Scattered paddock trees that do not form woodland are also present across the Study Area

3.1.1 Vegetation Communities

The major vegetation communities that occur within the Study Area and their distribution are listed in **Table 3.1** and shown in **Figure 3.1**. The predominant vegetation unit within the Study Area is native grassland that has been derived from the clearing of the original woodland and forest communities. Many of the woodland communities in the Study Area conform to communities that are listed as Threatened Ecological Communities (TECs) under the TSC Act and/or the EPBC Act. Some of these vegetation communities conform to Box-Gum Woodland, which is an Endangered Ecological Community (EEC) under the TSC Act and a Critically Endangered Ecological Community (CEEC) under the EPBC Act.

Table 3.1 Vegetation Communities in the Study Area

Vegetation Community*	TSC Act	EPBC Act	Area (ha)
Central Hunter Bulloak Forest Regeneration	-	-	26
Hunter Valley River Oak Forest	-	-	2
Central Hunter Box-Ironbark Woodland	EEC	-	479
Hunter Floodplain Red Gum Woodland	EEC	CEEC	40
Narrabeen Footslopes Slaty Box Woodland	VEC	-	100
Upper Hunter White Box-Ironbark Grassy Woodland	EEC	CEEC	94
Cooba Scrub	-	-	65
Planted Vegetation	-	-	9
Derived Native Grassland - Hunter Floodplain Red Gum Woodland Complex	EEC	CEEC	10
Derived Native Grassland - Upper Hunter White Box-Ironbark Grassy Woodland	EEC	CEEC	159
Other Grassland	-	-	3643
TOTAL			**4627**

**nomenclature based on Peake (2006)*

VEC = Vulnerable Ecological Community; EEC = Endangered Ecological Community; CEEC = Critically Endangered Ecological Community

3.1.2 Threatened Species

The woodland and grassland vegetation in the Study Area is known to provide habitat for a number of threatened flora and fauna species. The EIA prepared for the Project (see Appendix J of the EA) included a detailed discussion of the threatened species that were recorded in the Study Area as part of the assessment. The threatened flora and fauna species recorded in the Study Area are all terrestrial or epiphytic and are summarised in **Table 3.2** and shown in **Figure 3.2** and **Figure 3.3**. The threatened fauna recorded were represented by highly mobile species such as woodland birds and microchiropteran bats (microbats).

No threatened aquatic vertebrate species were recorded during vertebrate surveys of Saddlers Creek and the Hunter River and no threatened species are likely. The aquatic habitat in the Study Area provides low quality habitat as it is frequently accessed by livestock, has been cleared to the banks and hence has little shading from riparian vegetation, has low macrophyte diversity and few snags and rocks that provide in-stream habitat for vertebrate aquatic fauna.

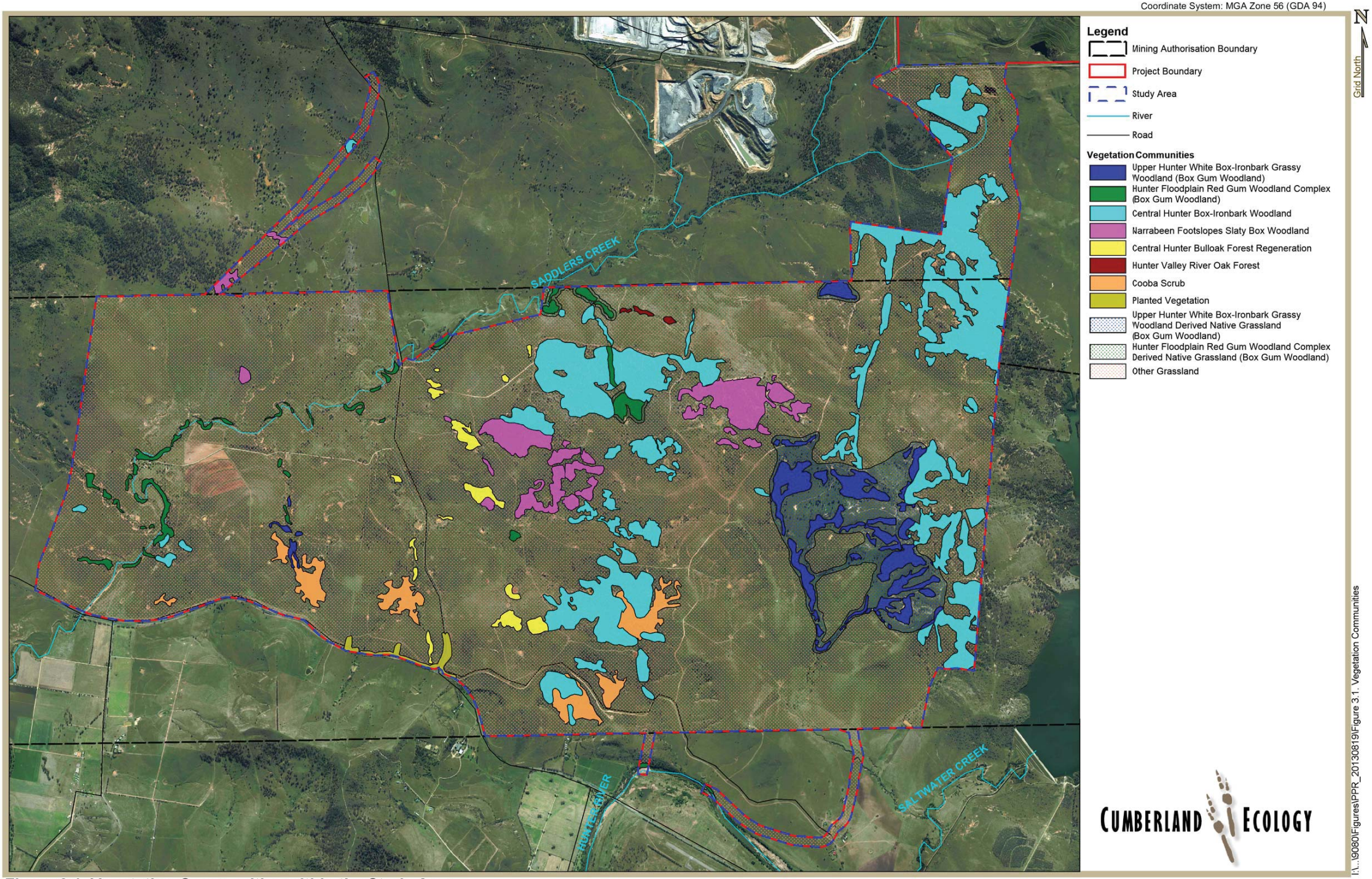

Figure 3.1. Vegetation Communities within the Study Area

Table 3.2 Threatened Flora and Fauna Species Recorded in the Study Area

Family	Scientific Name	Common Name	TSC Act	EPBC Act
PLANTS				
Fabaceae (Mimosoideae)	*Acacia pendula*	Weeping Myall	E2	
Myrtaceae	*Eucalyptus camaldulensis*	River Red Gum	E2	
Orchidaceae	*Cymbidium canaliculatum*	Tiger Orchid	E2	
Orchidaceae	*Diuris tricolor*	Pine Donkey Orchid	E; E2	
Poaceae	*Bothriochloa biloba*	Lobed Blue-grass		V
AVES				
Apodidae	*Hirundapus caudacutus*	White-throated Needletail		Mi
Accipitridae	*Circus assimilis*	Spotted Harrier	V	
Accipitridae	*Hieraaetus morphinoides*	Little Eagle	V	
Psittacidae	*Lathamus discolour*	Swift Parrot	E	E; Ma
Strigidae	*Ninox connivens*	Barking Owl	V	
Meropidae	*Merops ornatus*	Rainbow Bee-eater		Mi
Climacteridae	*Climacteris picumnus*	Brown Treecreeper	V	
Acanthizidae	*Pyrrholaemus saggitatus*	Speckled Warbler	V	
Meliphagidae	*Melithreptus gularis gularis*	Black-chinned Honeyeater (eastern subspecies)	V	
Pomatostomidae	*Pomatostomus temporalis temporalis*	Grey-crowned Babbler (eastern subspecies)	V	
Petroicidae	*Petroica boodang*	Scarlet Robin	V	
Petroicidae	*Melanodryas cucullata*	Hooded Robin	V	
Estrildidae	*Stagonopleura guttata*	Diamond Firetail	V	

Table 3.2 Threatened Flora and Fauna Species Recorded in the Study Area

Family	Scientific Name	Common Name	TSC Act	EPBC Act
MAMMALIA- BATS				
Emballonuridae	*Saccolaimus flaviventris*	Yellow-bellied Sheathtail-bat	V	
Molossidae	*Mormopterus norfolkensis*	Eastern Freetail-bat	V	
Vespertilionidae	*Chalinolobus dwyeri*	Large-eared Pied Bat	V	V
Vespertilionidae	*Miniopterus orianae oceanensis*	Eastern Bentwing-bat	V	
Vespertilionidae	*Myotis macropus*	Southern Myotis	V	
Vespertilionidae	*Nyctophilus corbeni*	Greater Long-eared Bat	V	V
Vespertilionidae	*Scoteanax rueppellii*	Greater Broad-nosed Bat	V	
Vespertilionidae	*Vespadelus troughtoni*	Eastern Cave Bat	V	

Key: V = Vulnerable; E = Endangered; E2 = Endangered Population; Mi = Migratory; Ma = Marine

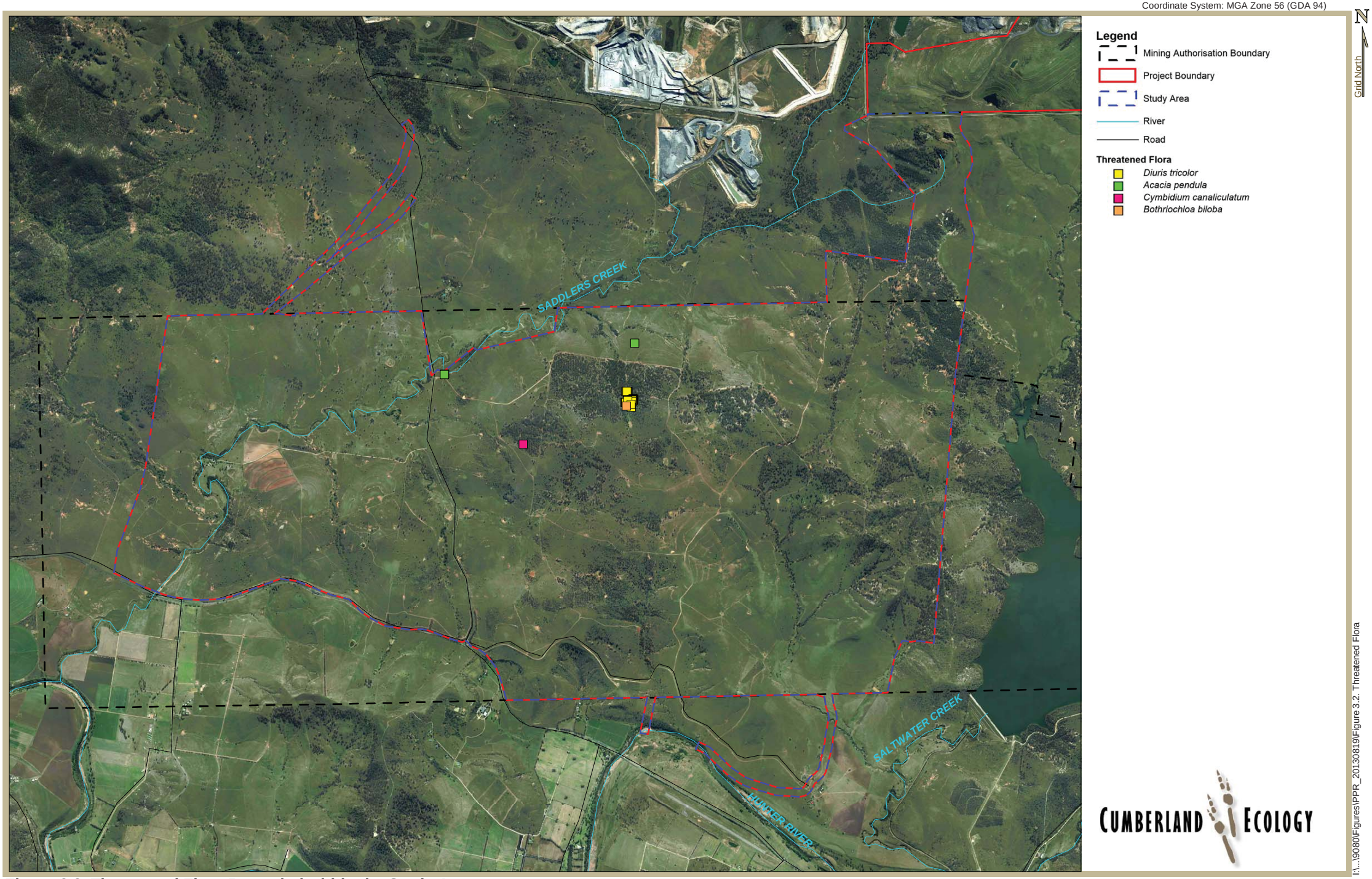

Figure 3.2. Threatened Flora Recorded within the Study Area

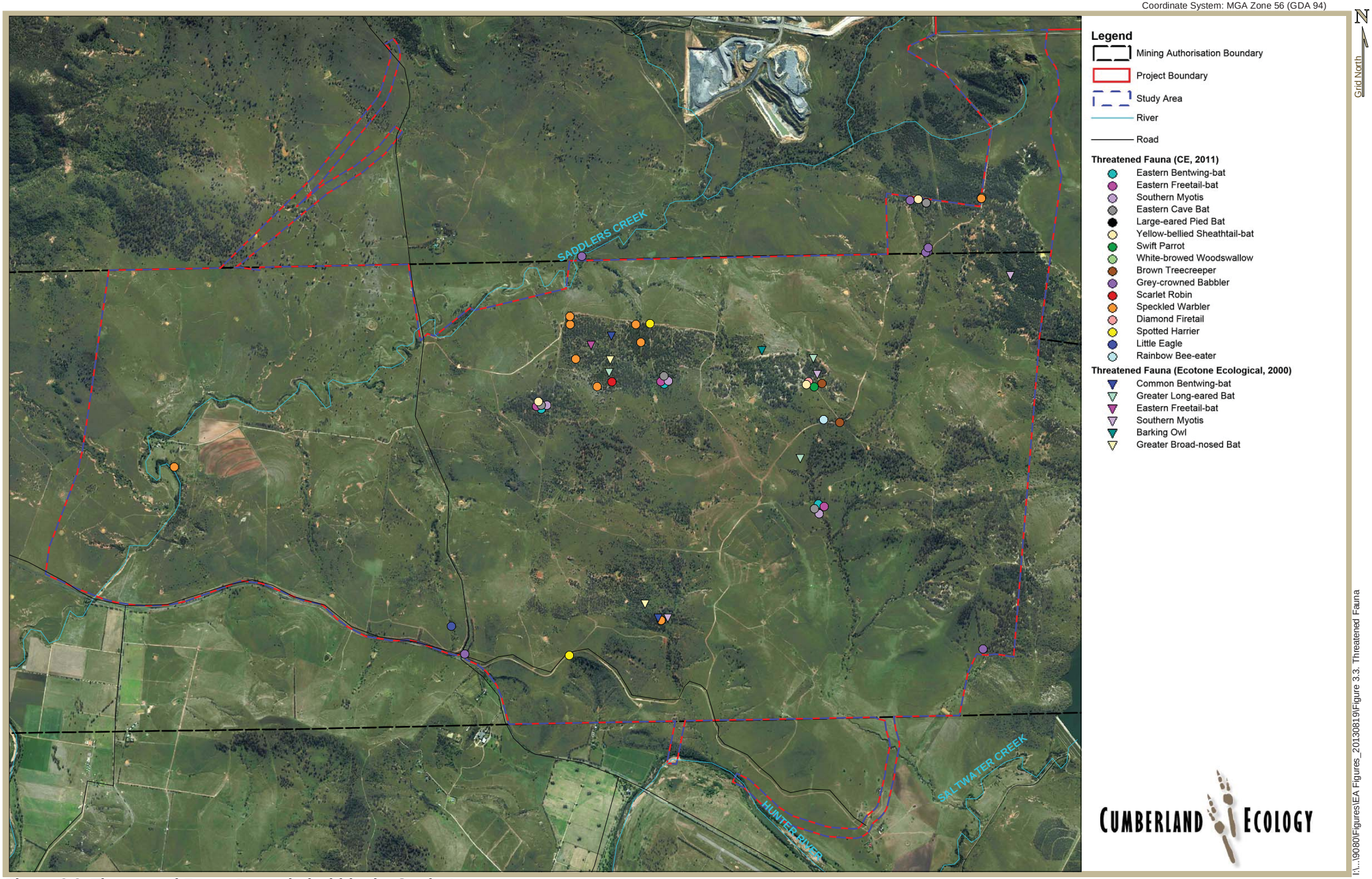

Figure 3.3. Threatened Fauna Recorded within the Study Area

3.2 Preferred Project Amended Infrastructure Areas

3.2.1 Vegetation Communities

A relatively small proportion of the amended infrastructure areas contain some remnant woodland. This woodland occurs along the amended haul road/conveyor option alignment in the transport corridor and is listed as an EEC under the TSC Act. The remaining portions of the amended infrastructure areas contain grassland vegetation derived from the historical removal of woodland vegetation (**Table 3.3**).

Table 3.3 Vegetation in the Amended Infrastructure Areas

Vegetation Community	Status	Amended Haul Road/Conveyor Option Alignment	Amended Discharge Pipeline Alignment	Total Amended Infrastructure Area (ha)
Central Hunter Box-Ironbark Woodland	EEC (TSC Act)	2	0	2
Other Grassland	Not listed	9	7	16
TOTAL (ha)		**11**	**7**	**18**

EEC = Endangered Ecological Community

Brief descriptions of the woodland and grassland vegetation present in the amended infrastructure areas are provided below.

i. Central Hunter Box-Ironbark Woodland

Status: EEC (TSC Act)

Approximately 2 hectares of Central Hunter Box – Ironbark Woodland EEC along the haul road/conveyor option alignment in the transport corridor.

Central Hunter Box-Ironbark Woodland typically occurs as a mid to high woodland in areas of high temperatures and low rainfall on undulating hills, slopes and valleys. This community is highly variable in its assemblage and degree of floristic structure as a consequence of widespread distribution across the central Hunter Valley and variations in underlying Permian geology, soil type and landform.

Toward Muswellbrook, the community grades into Upper Hunter White Box-Ironbark Grassy Woodland. Varying levels of hybridisation between *Eucalyptus moluccana* (Grey Box) and *Eucalyptus albens* (White Box) make it highly difficult to distinguish between pure species and intergrades in the Study Area (Ecotone, 2000). Mixed stands or closely occurring mixed stands of these species and intergrades of varying degrees can occur as a result of backcrossing between intergrades and parent individuals. This makes it difficult to delineate the boundaries of Central Hunter Box-Ironbark Woodland and Upper Hunter White Box-

Ironbark Grassy Woodland in the Study Area. However, the lack of intergrades with particularly strong influences of White Box is notable in the Central Hunter Box- Ironbark Woodland occurrences in the Study Area. This community is the most abundant and widespread community within the Study Area and has been calculated to cover approximately 479 ha. It occurs on all aspects of gently undulating hills, slopes and valleys on moderately deep soils. The condition of this community is variable across the Study Area and has been influenced by historical and current patterns of land use. Where grazing intensity has been reduced for a period of time, the community shows evidence of healthy regeneration.

The tree canopy in this community typically consists of *Eucalyptus moluccana* (Grey Box) and *Eucalyptus crebra* (Narrow-leaved Ironbark), although the latter is very rare in the Study Area. The small tree layer is dominated by *Allocasuarina luehmannii* (Bulloak), with *Acacia salicina* (Cooba) and *Notelaea microcarpa* (Native Olive) commonly co-occurring in the shrub layer. Other common understorey species observed includes *Myoporum montanum* (Western Boobialla), *Acacia decora* (Western Silver Wattle) and *Maireana microphylla* (Black Saltbush).

The understorey is moderately dense and comprised of a variety of grasses, forbs, ferns and twiners. Abundant species include *Aristida ramosa*, *Cymbopogon refractus*, *Austrostipa scabra* (Corkscrew Grass), *Bothriochloa decipiens* (Red Leg Grass), *Chloris ventricosa*, *Cheilanthes sieberi* ssp. *sieberi* (Poison Rock Fern), *Cheilanthes distans* (Bristly Cloak Fern), *Calotis lappulaccea* (Yellow Burr-daisy), *Vittadinia cuneata* (Fuzzweed), *Chrysocephalum apiculatum* (Common Everlasting), *Eremophila debilis* (Winter Apple), *Brunoniella australis* (Blue Trumpet), *Ajuga australis* (Austral Bugle), *Lomandra multiflora* ssp. *multiflora* (Many-flowered Mat-rush), *Dichondra repens*, *Desmodium varians*, *Sida corrugata* (Corrugated Sida), *Einadia nutans* and *Einadia trigonos* (Fishweed).

ii. Grassland Communities

Status: Not listed.

Approximately 16 ha of grassland vegetation occur in the amended infrastructure areas (**Photograph 3.1** and **Photograph 3.2**).

The grassland within the amended infrastructure areas were derived from the historical clearing of native woodland or forest vegetation. This grassland does not represent a natural grassland community but still retains a species mix that is largely comprised of native ground cover species. This grassland is referred to generally as “derived native grassland”.

In the EA, two forms of derived native grassland were recognised and mapped in the Study Area. The first form was specifically derived from the clearing of the TEC Box-Gum Woodland. Derived native grassland resulting from the clearing of Box-Gum Woodland is protected under the TSC Act and EPBC Act.

The second form of derived grassland has been derived from a number of other native woodland communities (i.e. not Box-Gum Woodland) and is not protected under the TSC Act or EPBC Act. All areas of grassland derived from other native woodland communities and not Box-Gum Woodland has been referred to collectively as "Other Grassland" in the EA.

In determining the original community that was once present in the grassland areas, a number of factors were considered:

- History of clearing of the land;
- Topography of the land;
- Soil and underlying geology;
- Surrounding woody vegetation; and
- Residual paddock trees and stands of regrowth.

Based on the above considerations, the grassland in the amended infrastructure areas is likely to be part of the grassland unit referred to as "Other Grassland". It is highly likely that the grassland in the amended infrastructure areas was derived from the historical clearing of Central Hunter Grey Box - Ironbark Woodland and not Box-Gum Woodland. Thus, the grassland within the amended infrastructure areas is not listed as a TEC under the TSC Act and EPBC Act.

The grassland is currently dominated by a variety of native perennial grass and varies in composition with a low to high diversity of native herbaceous species but also contains exotic species typical of grazing lands. These areas are still dominated by native grasses, including *Aristida* spp. (Three-awn Grass) and *Austrostipa* spp. (Spear Grass) with minor proportions of *Themeda australis* (Kangaroo Grass), *Austrodanthonia* spp. (Wallaby Grass) and *Bothriochloa* spp. A lower frequency of herbs such as *Asperula conferta*, *Glycine* spp., *Dichondra repens* (Kidney Weed), *Desmodium varians* and *Cyperus gracilis* (Slender Flat-sedge) are present. They also contain a relatively high percentage cover of exotic species, including broad-leaved plants such as *Plantago lanceolata* (Lamb's Tongues) and *Gnaphalium* spp. (Cudweeds).

Photograph 3.1 Grasslands along the Amended Haul Road/Conveyor Option Alignment

Note: dominated by Aristida spp. (Three-awn Grass) and Austrostipa spp. (Spear Grass)

Photograph 3.2 Grasslands along the Amended Discharge Pipeline Alignment

Note: dominated by Aristida spp. (Three-awn Grass) and Austrostipa spp. (Spear Grass)

3.2.2 Threatened Flora

No threatened flora species were recorded within the amended infrastructure areas during the field survey in February 2013. No threatened flora species have previously been found in the amended infrastructure areas during targeted surveys conducted for the Project.

Of the species previously recorded in the Study Area, only the grass *Bothriochloa biloba* (Lobed Blue-grass), epiphytic orchid *Cymbidium canaliculatum* (Tiger Orchid) and terrestrial orchid *Diuris tricolor* (Pine Donkey Orchid) are considered to have some potential to occur within the amended infrastructure areas due to the presence of grassland and woodland habitat. The grassland habitat largely occurs on dry hillsides and is only likely to provide low to moderate quality habitat for *Diuris tricolor* (Pine Donkey Orchid) and *Bothriochloa biloba* (Lobed Blue-grass). These grassland areas continue to be subject to grazing.

A full likelihood of occurrence assessment is provided for threatened flora species known from the locality (i.e. 10km radius) in **Appendix A**.

3.2.3 Fauna Habitat

i. Terrestrial Habitat

The woodland habitat along the amended haul road/conveyor option alignment in the transport corridor comprises a small proportion of the overall amended infrastructure area; however, it is part of a larger patch of woodland located around the upper reaches of Saddlers Creek in the Study Area. The woodland vegetation in the transport corridor represents a mixture of moderately valuable to highly valuable foraging and roosting habitat for bats, and woodland and nectar-feeding birds. The woodland habitat is also moderately valuable for arboreal mammals and reptiles but does not provide much habitat for amphibians and terrestrial mammals.

The grassland habitat within the amended infrastructure areas is generally limited and of low value for most native fauna as it is situated on dry hillsides that lack trees and other important habitat features such as a complex understorey structure, large tree hollows, and ground habitat such as leaf litter and woody debris.

However, areas of grassland containing large native tussock species can still provide sparse habitat for native fauna because they provide a degree of ground stratum complexity and seed resources, even where the grasslands are still used for light grazing. Some of the native fauna species that typically forage in such grasslands include:

- Large mammals like Eastern Grey Kangaroo (*Macropus giganteus*) and Red-necked Wallaby (*Macropus rufogriseus*);
- Common birds such as the Galah (*Eolophus roseicapillus*), Sulphur-crested Cockatoo (*Cacatua galerita*), Australian Raven (*Corvus coronoides*) and Australian Magpie (*Gymnorhina tibicen*); and
- Raptors, owls and some bat species.

ii. Aquatic Habitat

The amended infrastructure areas will not impact on aquatic habitats and riparian habitat. The condition and extent of aquatic habitat within the amended infrastructure areas is limited to the discharge pipeline outlet at the Hunter River, which has already been assessed as part of the Project. However, to summarise, this area is currently degraded by erosion from the clearing of riparian vegetation that has impacted on bank instability. Livestock access, loss of large snags and rocks, general absence of macrophytes or fringing vegetation and lack of shading from riparian habitat also limit the aquatic habitat available.

3.2.4 General Fauna Assemblage

The woodland habitats within the amended infrastructure areas provide habitat for a number of common woodland birds and bats. The grasslands provide suitable foraging habitat for large mammals including Eastern Grey Kangaroo (*Macropus giganteus*) and Red-necked Wallaby (*Macropus rufogriseus*).

Birds recorded flying over the amended infrastructure areas during field surveys were common species such as the Wedge-tailed Eagle (*Aquila audax),* Galah (*Eolophus roseicapillus*), Australian Raven (*Corvus coronoides*), Australian Magpie (*Gymnorhina tibicen*) and Pied Currawong (*Strepera graculina*). Common bats such as the White-striped Freetail-bat (*Austronomus australis*) and Gould's Wattled Bat (*Chalinolobus gouldii*) are likely to utilise grassland habitat on occasion, as are some reptiles, and to a lesser extent frogs, that can feed within grassland areas. Cattle (*Bos taurus)* and feral animals such as foxes (*Vulpes vulpes)*, rabbits (*Oryctolagus cuniculus)* and hares (*Lepus capensis)* also occur. Due to the lack of trees, tree-dependent species such as possums and gliders, Koala, and tree-dependent birds are rare or absent.

3.2.5 Threatened Fauna

No threatened fauna species have been recorded in the amended infrastructure areas but the woodland habitat in vicinity of the transport corridor is known to support occurrences of Southern Myotis (*Myotis macropus*), Eastern Cave Bat (*Vespadelus troughtoni*), Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*), Grey-crowned Babbler (*Pomatostomus temporalis temporalis*) and Speckled Warbler (*Pyrrholaemus saggitatus*) (see **Figure 3.3**). The woodland habitat within the transport corridor provides foraging habitat for the above threatened species and provides roosting or nesting habitat for the Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*), Grey-crowned Babbler (*Pomatostomus temporalis temporalis*) and Speckled Warbler (*Pyrrholaemus saggitatus*).

Other threatened species recorded in or near the Study Area that have potential to occur in the amended infrastructure areas include those listed in **Table 3.4**. Many of the species that have a low potential to occur are unlikely to be dependent on habitat in the amended infrastructure areas or are unlikely to occur frequently. For the threatened fauna that have some potential to occur, these species are likely to be restricted to mobile species such as birds and bats that may forage or overfly the amended infrastructure areas on occasion. These species are unlikely to depend on habitat within the amended infrastructure areas for breeding or roosting.

Table 3.4 Likely Occurrence of Threatened Fauna within the Amended Infrastructure Areas

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Likelihood of Occurrence
BIRDS					
Apodidae	*Hirundapus caudacutus*	White-throated Needletail		Mi	Low Potential
Accipitridae	*Circus assimilis*	Spotted Harrier	V		Low Potential
Accipitridae	*Hieraaetus morphinoides*	Little Eagle	V		Low Potential
Psittacidae	*Lathamus discolour*	Swift Parrot	E	E; Ma	Low Potential
Strigidae	*Ninox connivens*	Barking Owl	V		Low Potential
Meropidae	*Merops ornatus*	Rainbow Bee-eater		Mi	Low Potential
Climacteridae	*Climacteris picumnus*	Brown Treecreeper	V		Potential in the vicinity of transport corridor during ecology surveys for the EA
Acanthizidae	*Pyrrholaemus saggitatus*	Speckled Warbler	V		Recorded in the vicinity of the transport corridor during ecology surveys for the EA
Meliphagidae	*Melithreptus gularis gularis*	Black-chinned Honeyeater (eastern subspecies)	V		Potential in the transport corridor
Pomatostomidae	*Pomatostomus temporalis temporalis*	Grey-crowned Babbler (eastern subspecies)	V		Recorded in the vicinity of the transport corridor during ecology surveys for the EA
Petroicidae	*Petroica boodang*	Scarlet Robin	V		Potential in the transport corridor
Petroicidae	*Melanodryas cucullata*	Hooded Robin	V		Potential in the transport corridor
Estrildidae	*Stagonopleura guttata*	Diamond Firetail	V		Potential in the transport corridor

Table 3.4 Likely Occurrence of Threatened Fauna within the Amended Infrastructure Areas

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Likelihood of Occurrence
MAMMALS					
Emballonuridae	*Saccolaimus flaviventris*	Yellow-bellied Sheathtail-bat	V		Recorded in the vicinity of the transport corridor during ecology surveys for the EA
Molossidae	*Mormopterus norfolkensis*	Eastern Freetail-bat	V		Potential in the transport corridor
Petauridae	*Petaurus norfolcensis*	Squirrel Glider	V		Potential in the transport corridor. Recorded in the vicinity of the transport corridor within the adjacent Mt Arthur Mine lease area.
Vespertilionidae	*Chalinolobus dwyeri*	Large-eared Pied Bat	V	V	Potential in the transport corridor
Vespertilionidae	*Miniopterus orianae oceanensis*	Eastern Bentwing-bat	V		Potential in the transport corridor
Vespertilionidae	*Myotis macropus*	Southern Myotis	V		Recorded in the vicinity of the transport corridor during ecology surveys for the EA
Vespertilionidae	*Nyctophilus corbeni*	Greater Long-eared Bat	V	V	Potential in the transport corridor
Vespertilionidae	*Scoteanax rueppellii*	Greater Broad-nosed Bat	V		Potential in the transport corridor
Vespertilionidae	*Vespadelus troughtoni*	Eastern Cave Bat	V		Recorded in the vicinity of the transport corridor during ecology surveys for the EA

E = Endangered; V = Vulnerable; Ma = Marine (EPBC Act); M = Migratory (EPBC Act)

No evidence of Koala (*Phascolarctos cinereus*) activity or area representing core habitat was observed in the amended infrastructure areas. No further consideration under SEPP 44 is required. There is also unlikely to be any threatened aquatic fauna present within the amended infrastructure areas.

A full likelihood of occurrence assessment is provided for fauna species known from the locality (i.e. 10km radius) in **Appendix A**.

Impact Assessment

4.1 Direct Disturbance Areas

4.1.1 Amended Infrastructure Areas

The Preferred Project includes amendments to the alignment of the haul road/conveyor option and discharge pipeline to the Hunter River. These amendments encompass a total disturbance footprint of 18 ha (see **Table 3.1**). In reality, the construction of the haul road, conveyor option and the discharge pipeline will not require the disturbance of the entire corridor, and so the actual disturbance will be less than 18 ha.

The Preferred Project disturbance footprint presented in **Table 4.1** is compared to the original disturbance footprint as assessed in the EA. This comparison indicates that the Preferred Project will result in an increased disturbance area of 7 ha and that this additional disturbance will comprise non-listed derived native grassland, or "Other Grassland". There will be no increase in the project impacts to woodland from that assessed in the EA as a result of the amended infrastructure alignments.

Table 4.1 Revised Areas of Direct Impact within the Amended Infrastructure Areas

Vegetation Community	Status	Disturbance Footprint – EA (ha)			Disturbance Footprint – Preferred Project (ha)			Impact Increase (ha)
		Transport Corridor	Discharge Pipeline	TOTAL	Transport Corridor	Discharge Pipeline	TOTAL	
Central Hunter Box-Ironbark Woodland	EEC (TSC Act)	2	0	2	2	0	2	0
Other Grassland	Not listed	9	0	9	9	7	16	7
TOTAL (ha)		**11**	**0**	**11**	**11**	**7**	**18**	**7**

EEC = Endangered Ecological Community

4.1.2 Amended Houston Visual Bund and Set back from Saddlers Creek

The Preferred Project also includes amendments to the Houston visual bund and the mine plan to ensure a 40 m set back from Saddlers Creek in all areas. The amendments to the Houston visual bund and Saddlers Creek set back will result in the overall reduction of the disturbance footprint from 1,928 ha (as reported in the EA) to 1,875 ha (see **Table 4.2**). This includes a 39 ha decrease in the area of Box-Gum Woodland that will be impacted by the Project, comprising:

- 19 ha of Upper Hunter White Box-Ironbark Grassy Woodland from the Houston visual bund; and
- 20 ha of Derived Native Grassland - Upper Hunter White Box-Ironbark Grassy Woodland from the Houston visual bund.

The amended Houston visual bund and Saddlers Creek set back will also reduce the impact to non-listed "Other Grassland" by 21 ha. No other native woodland types will be affected by the amendments to the Houston visual bund and Saddlers Creek set back.

The Preferred Project disturbance footprint presented in **Table 4.2** summarises the overall changes to the original disturbance footprint as assessed in the EA.

4.1.3 Overall Disturbance to Native Vegetation

When the amended infrastructure areas, amended Houston visual bund and amendments to the mine plan are considered together, there will be a net decrease in the projected impacts to woodland from that assessed in the EA. This includes a projected decrease in the area of Box-Gum Woodland that will be impacted by the Project.

Table 4.2 Revised Direct Impact on Vegetation Communities

Vegetation Community*	Status		EA (ha)			Preferred Project (ha)			Change in Disturbance (ha)
	TSC Act	EPBC Act	Study Area	Disturbance Footprint	Proportion to be Disturbed (%)	Study Area	Disturbance Footprint	Proportion to be Disturbed (%)	
Central Hunter Bulloak Forest Regeneration	-	-	26	25	94%	26	25	94%	0
Hunter Valley River Oak Forest	-	-	2	2	100%	2	2	100%	0
Central Hunter Box-Ironbark Woodland	EEC	-	479	181	38%	479	181	38%	0
Hunter Floodplain Red Gum Woodland	EEC	CEEC	40	11	28%	40	11	28%	0
Narrabeen Footslopes Slaty Box Woodland	VEC	-	100	98	98%	100	98	98%	0
Upper Hunter White Box-Ironbark Grassy Woodland	EEC	CEEC	94	63	68%	94	44	47%	-19
Cooba Scrub	-	-	65	9	13%	65	9	13%	0
Planted Vegetation	-	-	9	0	0%	9	0	0%	0
Derived Native Grassland - Hunter Floodplain Red Gum Woodland Complex	EEC	CEEC	10	4	39%	10	4	39%	0
Derived Native Grassland - Upper Hunter White Box-Ironbark Grassy Woodland	EEC	CEEC	159	103	65%	159	83	52%	-20
Other Grassland	-	-	3613	1432	40%	3643	1418	39%	-14
TOTAL			**4597**	**1928**	**42%**	**4627**	**1875**	**41%**	**-53**

**nomenclature based on Peake (2006)*

VEC = Vulnerable Ecological Community; EEC = Endangered Ecological Community; CEEC = Critically Endangered Ecological Community

4.2 Threatened Species and Community Impacts

The threatened species and community impacts of the Preferred Project are expected to be similar to those described for the equivalent infrastructure components exhibited for the Project in the EA.

4.2.1 Threatened Ecological Communities

The Preferred Project amended infrastructure areas will require the direct disturbance of approximately 2 ha of Central Hunter Box – Ironbark Woodland (EEC) in the transport corridor (see **Figure 4.1**). This area of impact has not increased from the impacts reported in the EA (see **Table 4.1** and **Table 4.2**). No additional areas of TEC will be impacted as a result of the Preferred Project. Furthermore, the amendments to the Houston visual bund and Saddlers Creek set back will decrease the area of Box-Gum Woodland to be impacted by the Project by 39 ha.

Considering the above, the total impacts of the Preferred Project on TECs are considered to be consistent with the impacts identified and assessed in the EA.

4.2.2 Threatened Species

i. Threatened Flora

The Preferred Project amended infrastructure areas will not remove any individuals of threatened flora species but is likely to remove potential habitat for *Cymbidium canaliculatum* (Tiger Orchid), *Diuris tricolor* (Pine Donkey Orchid) and *Bothriochloa biloba* (Lobed Blue-grass). Approximately 2 ha of woodland habitat and approximately 16 ha of non-listed grassland habitat will be collectively removed as a result of the amended infrastructure areas.

The potential impact of the Preferred Project amended infrastructure areas on woodland habitat for threatened flora species will remain unchanged from the impacts predicted in the EA. However, the amended infrastructure areas will remove an additional 7 ha of non-listed grassland habitat as a result of the realignment of the discharge pipeline. The grassland habitat in the amended discharge pipeline occurs on dry hillsides that are only likely to provide low to moderate quality habitat for *Diuris tricolor* (Pine Donkey Orchid) and *Bothriochloa biloba* (Lobed Blue-grass). Thus, the loss of additional areas potential habitat for threatened flora species due to the Preferred Project is unlikely to be significant.

When the amendments to the Houston visual bund and Saddlers Creek set back are considered, the Preferred Project will decrease the area of impact on potential woodland and grassland habitat for threatened flora species.

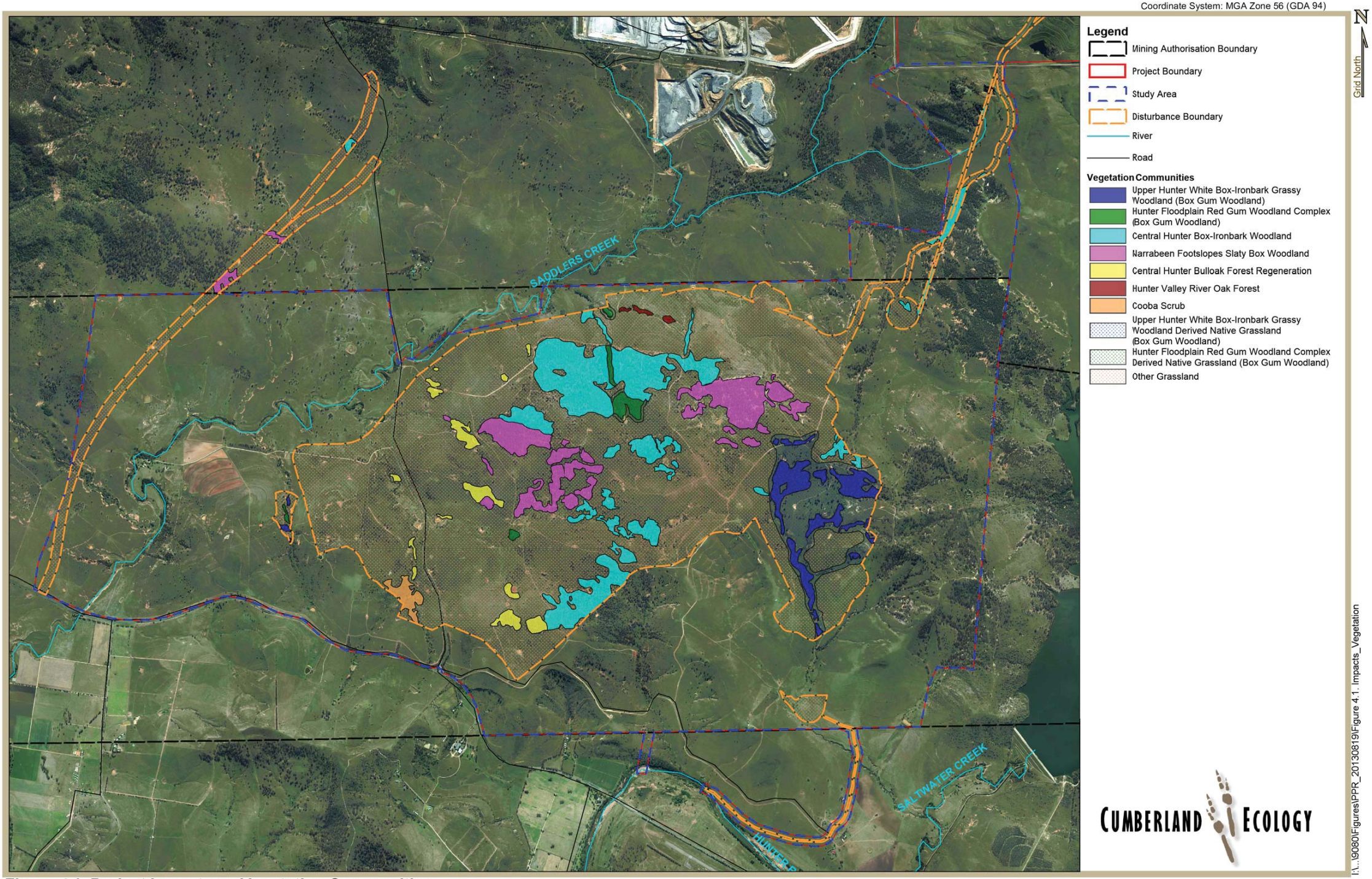

Figure 4.1. Project Impacts on Vegetation Communities

ii. Threatened Fauna

No threatened fauna species have been recorded in the amended infrastructure areas but the woodland habitat in vicinity of the transport corridor is known to support occurrences of Southern Myotis (*Myotis macropus*), Eastern Cave Bat (*Vespadelus troughtoni*), Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*), Grey-crowned Babbler (*Pomatostomus temporalis temporalis*) and Speckled Warbler (*Pyrrholaemus saggitatus*). Thus, the woodland habitat within the transport corridor provides potential foraging and roosting habitat for these woodland species.

Notwithstanding this, the area of impact on woodland habitat will remain unchanged from the impacts predicted in the EA; therefore, the removal of 2 ha of woodland habitat from the transport corridor is not additional and its potential impacts on threatened fauna habitat has been addressed in the EA.

The grassland habitat within the amended infrastructure areas is generally limited and of low value for most native fauna as it is situated on dry hillsides that lack trees and other important habitat features such as a complex understorey structure, large tree hollows, and ground habitat such as leaf litter and woody debris. Many of the threatened fauna species that have potential to use these grassland habitats for foraging are likely to be mobile species such as birds and bats that may forage or overfly the amended infrastructure areas on occasion. These species are unlikely to depend on the grassland habitat within the amended infrastructure areas for their persistence in the locality.

No evidence of Koala (*Phascolarctos cinereus*) activity or area representing core habitat was observed in the amended infrastructure areas. No further consideration under SEPP 44 is required. There is also unlikely to be any threatened aquatic fauna present within the amended infrastructure areas.

4.2.3 Impacts to the Hunter River Catchment

The Preferred Project amended infrastructure areas will not result in any impacts to the Hunter River in addition to those already proposed as part of the Project and assessed in the EA.

The discharge pipeline outlet and pumping infrastructure will remain in the same location on the Hunter River as described in the EA. Limited clearing of vegetation may be required for the construction, operation and maintenance of the pipelines; however, these impacts are expected to be minimal. No additional disturbances are likely for the Preferred Project.

The amended infrastructure areas are unlikely to result in significant or long-term adverse impacts to the Hunter River or wider catchment, or upon threatened flora and fauna or fish habitats. The Preferred Project will have limited interaction with the watercourse and is unlikely to adversely affect downstream water quality, result in the disturbance or loss of in-stream macrophytes and fringing riparian vegetation, or disrupt fauna communities.

According to the threatened species schedules of the FM Act, the Hunter River drainage basin is outside the known distribution of any listed species or ecological communities. As indicated by the FM Act, no threatened species, populations or ecological communities are expected to occur in the Study Area, and are expected to be impacted by the Preferred Project. No further considerations under the FM Act are required.

4.3 Indirect Impacts

4.3.1 Terrestrial Impacts

The Preferred Project amended infrastructure areas will not result in any further indirect impacts to those already assessed and discussed in the EA for the equivalent infrastructure components. Indirect impacts resulting from the Preferred Project are not likely to be significant.

The Preferred Project will not exacerbate indirect impacts associated with the Project such as competition for resources, noise, light, dust, erosion, vehicle strike and increased weeds and feral animals. As the removal of grassland will not result in significant habitat degradation, it is unlikely that the Preferred Project will force fauna to compete for resources or relocate. The impacts of vehicle strike are likely to remain comparable to the impacts discussed for the original haul road alignment for the Project and mortality rates are not considered likely to be significant. Indirect impacts such as light and noise are not likely to be significant; it is expected that most species will habituate and become accustomed to these forms of environmental pollution.

4.3.2 Downstream Impacts

The Preferred Project is unlikely to result in erosion, sedimentation or weed impacts to the Hunter River additional to those already discussed as part of the EA. The Preferred Project design represents an attempt to minimise impacts to the Hunter River and catchment. Potential downstream impacts can be managed and minimised through the implementation of various mitigation measures during construction. With appropriate controls in place, these impacts are unlikely to be significant.

Chapter 5

Mitigation and Offset Measures

5.1 Biodiversity Offset Package

In recognition of the unavoidable impacts of the Project and as presented in the EA, a comprehensive Biodiversity Offsets Package (BOP) was developed to offset the residual ecological impacts that would remain after avoidance and mitigation measures have been implemented. The BOP is designed to ensure that the Project does not result in a net loss of biodiversity values, and that the area and condition of habitat for flora and fauna is maintained or improved over the life of the Project. The BOP includes the following components:

- Onsite Offsets, which is the protection and improvement of conservation areas within the Study Area:
  - Conservation of vegetation along the primary ridgeline in the Study Area;
  - The restoration and enhancement of Saddlers Creek and the wildlife corridor;
  - Rehabilitation of the Drayton South Disturbance Footprint; and
- Offsite Offset, which is the acquisition, long-term protection and improvement of an offset property located outside of the Study Area.

Site-specific Biodiversity Offset Management Plans (BOMPs) will be prepared as part of the BOP to prescribe ongoing management actions for the onsite offsets and offsite offset property. This is a key component of the BOP to ensure that the biodiversity values of the Project's offsets can be maintained and improved.

5.2 Consistency with the Biodiversity Offset Strategy

The potential impacts of the Project were assessed previously in the EA; these predicted impacts will be mitigated through the implementation of a suite of measures and offset through the Project's BOP.

As explained in the EA, the BOP aims to provide a minimum offset ratio of 6:1 of offset to impact area for Box-Gum Woodland vegetation types and a ratio of 3:1 of offset to impact area for other vegetation types. The minimum offsetting requirements of the Preferred Project are summarised in **Table 5.1** below.

Table 5.1 Minimum Offset Areas Required for the Preferred Project

Vegetation Community	Area in Disturbance Footprint (ha)	Ratio	Offsets Required (ha)
Central Hunter Bulloak Forest Regeneration	25	3:1	75
Hunter Valley River Oak Forest	2	3:1	6
Upper Hunter White Box-Ironbark Grassy Woodland	44	6:1	264
Hunter Floodplain Red Gum Woodland Complex	11	6:1	66
Central Hunter Box-Ironbark Woodland	181	3:1	543
Narrabeen Footslopes Slaty Gum Woodland	98	3:1	294
Cooba Scrub	9	3:1	27
Planted Vegetation	0	N/A	N/A
Derived Native Grassland - Hunter Floodplain Red Gum Woodland Complex	4	6:1	24
Derived Native Grassland - Upper Hunter White Box-Ironbark Grassy Woodland	83	6:1	498
Other Grassland	1,418	N/A	N/A
TOTAL	**1,875**		**1,797**

The Preferred Project amended infrastructure areas are not likely to increase the impact on the local occurrence of TECs, threatened species and populations or their habitats. Potential indirect impacts on surrounding land and downstream habitats are also not likely to be significant. When the amendments to the Houston visual bund and the Saddlers Creek set back are considered, the Preferred Project will reduce the overall ecological impacts of the Project below that predicted in the EA.

As no significant change to the impacts predicted in the EA is likely to arise as a result of the Preferred Project amended infrastructure areas, the BOP that was presented in the EA (see **Table 5.2**) is considered to be appropriate for the Preferred Project and will be improved as a result of the reduced impacts on Box-Gum Woodland due to the amended Houston visual bund and Saddlers Creek set back. The revised BOP now provides a 12.4:1 offset ratio for Box-Gum Woodland; an improvement on the 9.7:1 offset ratio assessed in the EA. No further offsets are required to address changes due to the Preferred Project.

Furthermore, no additional mitigation measures beyond those proposed in the EA are considered necessary for the Preferred Project. Nevertheless, care should be taken to manage all potential Project impacts throughout the life of the Project, particularly during the construction phase. Some mitigation measures relevant to the construction of the amended haul road/conveyor option and the discharge pipeline alignments have been reproduced below.

Table 5.2 Summary of Areas in the BOP Compared with the Offset Requirements of the Preferred Project

	IMPACTS				BOP								
Vegetation Community	Area of Vegetation within Study Area (ha)	[A] Area of Vegetation within Disturbance Footprint (ha)	Minimum Ratio	[B] Offsets Required (ha)	Saddlers Ck Restoration (ha)		Ridgeline (ha)	Onsite Rehabilitation (ha)		Offsite Offset (ha)	[C] Total Offset (ha)	Difference (ha) [C]-[B]	Offset Ratio [C] : [A]
					Existing Available Offsets	Restoration Offsets	Existing Available Offsets	Ratio	Available Offsets				
Box - gum grassy woodlands, Brigalow Belt South and Nandewar										67	67		
Hunter Floodplain Red Gum Woodland Complex	40	11	6:1	66	20	62					82		
River Oak riparian woodland, eastern NSW*										33	33		
Rough-barked Apple - Blakely's Red Gum riparian grassy woodlands, Brigalow Belt South and Nandewar										25	25		
Silvertop Stringybark grassy open forests, eastern Nandewar and New England Tablelands										253	253		
Upper Hunter White Box-Ironbark Grassy Woodland	94	44	6:1	264									
White Box grassy woodland, Brigalow Belt South and Nandewar										396	396		
Box-Gum Woodland (CEEC, EPBC Act; EEC, TSC Act)	**134**	**55**	**6:1**	**330**	**20**	**62**				**774**	**856**	**526**	**15.6**
Derived grasslands, Brigalow Belt South and Nandewar										343	343		
Derived Native Grassland-Hunter Floodplain Red Gum Woodland Complex	10	4	6:1	24									
Derived Native Grassland-Upper Hunter White Box-Ironbark Grassy Woodland	159	83	6:1	498									
Low Diversity Derived Native Grassland**										555	555		
Box-Gum Woodland Derived Native Grassland (CEEC, EPBC Act; EEC, TSC Act)	**169**	**87**	**6:1**	**522**						**898**	**898**	**376**	**10.3**
Central Hunter Box-Ironbark Woodland (EEC)	479	181	3:1	543	4		50	0.5:1	777		831		
Narrabeen Footslopes Slaty Gum Woodland (VEC)	100	98	3:1	294				0.5:1	626		626		
Other Threatened Woodland and Forest communities	**579**	**279**	**3:1**	**837**	**4**		**50**		**1403**		**1457**	**620**	**5.2**
Central Hunter Bulloak Forest Regeneration	26	25	3:1	75									
Cooba Scrub	65	9	3:1	27			35				35		
Hunter Valley River Oak Forest***	2	2	3:1	6									
Planted Vegetation	9		N/A	N/A	N/A	N/A	N/A		N/A	N/A		N/A	N/A
Silvertop Stringybark - gum open forest on basalts of the Liverpool Range, Brigalow Belt South and Nandewar										71	71		

Table 5.2 Summary of Areas in the BOP Compared with the Offset Requirements of the Preferred Project

	IMPACTS				BOP								
Vegetation Community	Area of Vegetation within Study Area (ha)	[A] Area of Vegetation within Disturbance Footprint (ha)	Minimum Ratio	[B] Offsets Required (ha)	Saddlers Ck Restoration (ha)		Ridgeline (ha)	Onsite Rehabilitation (ha)		Offsite Offset (ha)	[C] Total Offset (ha)	Difference (ha) [C]-[B]	Offset Ratio [C] : [A]
					Existing Available Offsets	Restoration Offsets	Existing Available Offsets	Ratio	Available Offsets				
White Box - stringybark shrubby woodlands, Brigalow Belt South and Nandewar										336	336		
Other non-listed Forest and Woodland communities	**102**	**36**	**3:1**	**108**			**35**			**407**	**442**	**334**	**12.3**
Other Grassland	3643	1418	N/A	N/A	N/A	N/A	N/A		N/A	N/A	N/A		
Other Grassland	**3643**	**1418**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**		**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
TOTAL All Vegetation	**4627**	**1875**		**1797**	**24**	**62**	**85**		**1403**	**2079**	**3653**	**1856**	**1.9**
TOTAL Box-Gum Woodland	**303**	**142**		**852**	**20**	**62**	**0**		**0**	**1672**	**1754**	**902**	**12.4**

*Co-dominated by *Eucalyptus melliodora* or *Eucalyptus blakelyi* x *Eucalyptus teretecornis*

**Only listed under the TSC Act

***Equivalent vegetation in the offsite offset property is *River Oak riparian woodland, eastern NSW*, which also conforms to Box Gum Woodland

5.3 Disturbance Protocols and Limits of Disturbance

There is limited risk of impacts to remnant woodland vegetation during construction of the amended infrastructure areas. However, operators should be made aware of potential risks to ensure there are no secondary impacts on the surrounding vegetation. As a minimum, the following should be observed and signed off by the site manager or another appropriate person before ground disturbance commences:

- Ensure all relevant permits are obtained prior to commencement of work;
- Clearly demarcate the limits of disturbance (include plant access areas, turning circles etc). This will assist to:
  - Maintain the disturbances within the designated footprint; and
  - Retain potential habitat and other ecologically significant features that are present outside of the clearing limits;
- Develop and implement protocols for work within or in proximity of a creek to control disturbances; and
- Communicate the above measures to all contractors to ensure that the measures are understood and observed.

5.4 Erosion and Sediment Control

Suitable erosion and sediment control plans are recommended as part of the construction of the amended infrastructure to mitigate the impact of soil disturbance and to prevent secondary or offsite impacts. It should include protocols for vehicle access and measures to manage stockpiles of overburden to limit unintended soil movement away from designated areas. Any stockpiled or reapplied topsoils should be stabilised by seeding using either a sterile cover crop or a grass species native to the area rather than exotic species such as *Chloris gayana* (Rhodes Grass), or an appropriate alternative method to seeding.

5.5 Weed Monitoring and Management

Within the six months following construction, amended infrastructure areas and immediate surrounds should be monitored for significant increases in weed diversity or abundance. If a weed problem is identified (as evidenced by the establishment of noxious weed species or the significant increase in diversity and abundance of other problem weeds) then management of those weeds will be undertaken.

Conclusion

The Preferred Project as proposed will involve amendments to the haul road and conveyor option alignments within the transport corridor and the discharge pipeline alignment to the Hunter River. The Preferred Project amended infrastructure areas will have a potential direct impact of 18 ha, comprising 2 ha of Central Hunter Box-Ironbark Woodland EEC and 16 ha of non-listed derived grassland varying from low to high diversity of native herbaceous species.

The Preferred Project will not change the quantum of impact to TECs or potential habitat for threatened woodland species that may utilise the woodland habitat along the haul road/conveyor option alignment in the transport corridor. However, the amended infrastructure areas will remove an additional 7 ha of non-listed grassland habitat as a result of the realignment of the discharge pipeline.

The Preferred Project also includes amendments to the Houston visual bund and the mine plan to ensure a 40 m set back from Saddlers Creek in all areas. When the amended infrastructure areas, amended Houston visual bund and amendments to the mine plan are considered together, there will be a net decrease in the projected impacts to woodland from that assessed in the EA. This includes a projected decrease in the area of Box-Gum Woodland that will be impacted by the Project.

Considering the above, the Preferred Project is not likely to increase the impact on TECs, threatened species and populations or their habitats. The predicted ecological impacts of the Preferred Project will be reduced from that described in the EA. Therefore, the predicted impacts due to the Preferred Project will be adequately mitigated through the implementation of a suite of measures proposed in the EA and the infrastructure revisions proposed for the Preferred Project will remain consistent with the BOP developed for the EA.

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Appendix A

Likelihood of Occurrence Assessments

Table A.1 Likelihood of Threatened Flora Occurring in the Amended Infrastructure Areas (from Atlas locality records)

Scientific Name	Common Name	EPBC Status	TSC Status	Atlas Locality Records*	Habitat Requirements	Likelihood of Occurrence
Acacia pendula	Acacia pendula population in the Hunter catchment	V	E2	10	Restricted to 6 known locations (1000 individuals) within the Muswellbrook and Singleton LGAs. Hunter population is disjunct and at the eastern limit of the species' distributional range. Occur on heavy soils on margins of small floodplains but also in more undulating locations.	Unlikely to occur. This is a conspicuous species and typically occurs in a copse. The species was not recorded during surveys of the amended infrastructure areas. Presence confirmed elsewhere in the Study Area, although individuals do not conform to the listing for EPBC Weeping Myall Woodland.
Eucalyptus camaldulensis	Eucalyptus camaldulensis population in the Hunter catchment	-	E2	94	River Red Gums are the most widespread eucalypt in Australia. In NSW, occurs along western-flowing rivers. Hunter population is the only known coastal catchment and occurs on the major floodplains of the Hunter and Goulburn rivers. Currently restricted to 19 known stands in small remnants occupying a total of 100 ha and comprising 600-1000 mature and semi-mature individuals. Regeneration is limited due to hydrology, cropping, clearing and grazing pressures.	Unlikely to occur. Not recorded during surveys of the amended infrastructure areas. Usually occurs on the banks of creeks and rivers, not on dry hillsides. Presence confirmed elsewhere in the Study Area along Saddlers Creek.
Eucalyptus glaucina	Slaty Red Gum	V	V	3	Locally frequent but sporadic in occurrence. Known to occur in the Hunter/Central River	Unlikely to occur. Not recorded during surveys of the amended infrastructure areas.

Table A.1 Likelihood of Threatened Flora Occurring in the Amended Infrastructure Areas (from Atlas locality records)

Scientific Name	Common Name	EPBC Status	TSC Status	Atlas Locality Records*	Habitat Requirements	Likelihood of Occurrence
					Region. Found in a variety of habitats including shallow soils or stony hillsides, but not on poor sandstones; grassy woodlands on deep, moderately fertile and well watered soil; and gentle slopes near drainage lines in alluvial and clayey soils.	Has not been detected during surveys of the Study Area.
Eucalyptus nicholii	Narrow-leaved Black Peppermint	V	V	1	Restricted, and uncommon, to the New England Tablelands; also a widely planted urban street tree. Tree to 20m that grows in dry grassy or sclerophyll woodland, on shallow and infertile soils, mainly on shales and granite.	Unlikely to occur. Not recorded during surveys of the amended infrastructure areas. Presence confirmed elsewhere in the Study Area; individuals have been planted as a visual screen along Edderton Road and as they are not locally endemic or of local provenance stock, are not considered to be eligible for legislative listing.
Cymbidium canaliculatum	Cymbidium canaliculatum in the Hunter Catchment	V	E2	5	Hunter catchment population is at the south-eastern limit of the species' geographic range and significant as it is one of the few epiphytic orchids occurring at temperate latitudes. Population estimated between 90-500 individuals. Large epiphytic orchid that grows in tree hollows, particularly White Box, in dry sclerophyll forests and woodlands.	Potential to occur in the woodland areas of the transport corridor. Often grows in box trees or stags. Presence confirmed elsewhere in the Study Area.

Table A.1 Likelihood of Threatened Flora Occurring in the Amended Infrastructure Areas (from Atlas locality records)

Scientific Name	Common Name	EPBC Status	TSC Status	Atlas Locality Records*	Habitat Requirements	Likelihood of Occurrence
Diuris tricolor	Diuris tricolor Fitzg., the Pine Donkey Orchid, in the Muswellbrook local government area	-	V, E2	30	Found in sclerophyll vegetation on flats or small rises, on a range of substrates including sandy or loamy soils derived from granite, porphyry, laterite or alluvium.	Low potential to occur. Some suitable habitat present in the amended infrastructure areas. However, very sensitive to grazing and small changes in microhabitat. Presence confirmed elsewhere in the Study Area.
Bothriochloa biloba	Lobed Blue-grass	V	-	15	Broad distribution in northern NSW; majority of records from the northern portions of the Brigalow Belt South and Nandewar bioregions. Perennial grass that grows on heavier textured soils such as brown or black clay soils. Found in cleared eucalypt forests and relict grassland; also known from the community 'White Box Yellow Box Blakely's Red Gum Woodland'. More prevalent in areas that are moderately disturbed or conservatively grazed e.g. on roadsides, paddocks and travelling stock routes.	Potential to occur. Suitable cleared eucalypt woodland habitat present in the amended infrastructure areas. Presence confirmed elsewhere in the Study Area.

**Locality = 10km radius*

Key: V = Vulnerable; E = Endangered (EPBC); E1 Endangered (TSC Act); E2 = Endangered population; CE = Critically Endangered

Table A.2 Likelihood of Threatened Fauna Occurring in the Amended Infrastructure Areas (from Atlas locality records)

Family	Scientific Name	Common Name	EPBC Status	TSC Status	Atlas Locality Records*	Preferred Habitat	Likelihood of Occurrence
Amphibians							
Hylidae	*Litoria aurea*	Green and Golden Bell Frog	V	E1	1	Restricted across much of former distribution along NSW coast to approximately 50 widely separated and isolated populations. Inhabit disturbed sites including abandoned mines, grassy habitats and fringing aquatic vegetation. Marshes, dams and stream sides, particularly those containing bullrushes or spikerushes. Unshaded water bodies free of Gambusia (mosquito fish) form optimum habitat. Vegetation and/or rocks needed for shelter. Species breeds in still, shallow, ephemeral ponds.	Unlikely to occur. No suitable aquatic habitat present in the amended infrastructure areas.
Birds							
Acanthizidae	*Pyrrholaemus saggitatus*	Speckled Warbler	-	V	10	Patchy distribution in south-east Australia; frequently recorded from hills and tablelands of Great Dividing Range and rarely from the coast. Inhabit a wide range of eucalypt-dominated	Potential to occur in the woodland areas of the transport corridor. Presence confirmed elsewhere in the Study Area.

Table A.2 Likelihood of Threatened Fauna Occurring in the Amended Infrastructure Areas (from Atlas locality records)

Family	Scientific Name	Common Name	EPBC Status	TSC Status	Atlas Locality Records*	Preferred Habitat	Likelihood of Occurrence
						communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy. Large, relatively undisturbed remnants required for species to persist in an area. Sedentary with non-breeding range greater than 10 ha. Build nests in hollows at base of trees or low dense shrub among fallen debris.	
Accipitridae	*Circus assimilis*	Spotted Harrier	-	V	4	Widespread distribution across mainland Australia except in densely wooded habitats of the coast and ranges. Wide dispersal in NSW comprising a single population. Inhabit grassy open woodland including acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe and in native grassland and agricultural land. Prey on terrestrial mammals,	Low potential to occur. Some suitable forage habitat is present in the amended infrastructure areas. Presence confirmed elsewhere in the Study Area.

Table A.2 Likelihood of Threatened Fauna Occurring in the Amended Infrastructure Areas (from Atlas locality records)

Family	Scientific Name	Common Name	EPBC Status	TSC Status	Atlas Locality Records*	Preferred Habitat	Likelihood of Occurrence
						birds, reptiles and insects.	
Accipitridae	*Hieraaetus morphnoides*	Little Eagle	-	V	1	Widespread distribution across mainland Australia and New Guinea. Partly migratory; juveniles are dispersive and adults are mainly sedentary. Often seen over woodland and forested lands and open country, extending into the arid zone. It tends to avoid rainforest and heavy forest. Nest in mature living trees in woodland or along tree-lined watercourses. Prey on terrestrial mammals.	Low potential to occur. Some suitable forage habitat is present in the amended infrastructure areas. Presence confirmed elsewhere in the Study Area.
Climacteridae	*Climacteris picumnus victoriae*	Brown Treecreeper (eastern subspecies)	-	V	1	Distributed along the inland slopes and plains of the Great Dividing Range. Inhabits eucalypt woodlands (including Box-Gum Woodland) and dry open forest; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species; fallen timber is an important habitat	Potential to occur in the woodland areas of the transport corridor. Presence confirmed elsewhere in the Study Area.

Table A.2 Likelihood of Threatened Fauna Occurring in the Amended Infrastructure Areas (from Atlas locality records)

Family	Scientific Name	Common Name	EPBC Status	TSC Status	Atlas Locality Records*	Preferred Habitat	Likelihood of Occurrence
						component for foraging; also recorded, though less commonly, in similar woodland habitats on the coastal ranges and plains. Hollows in standing dead or live trees and tree stumps are essential for nesting.	
Estrildidae	*Stagonopleura guttata*	Diamond Firetail	-	V	2	Endemic to south-eastern Australia with wide distribution in NSW. Not common in coastal areas, though recorded in Hunter Valley. Inhabit edges of eucalypt woodland and riparian vegetation adjoining clearings, timbered ridges and creeks in farmland. Nests built in shrubby understorey, and breeding occurs from August to December. Feeds exclusively on the ground for seeds and insects.	Potential to occur in the woodland areas of the transport corridor. Presence confirmed elsewhere in the Study Area.
Meliphagidae	*Melithreptus gularis gularis*	Black-chinned Honeyeater (eastern subspecies)	-	V	1	Eastern subspecies distributed from central QLD to southern Victoria. Widespread in NSW though rarely recorded east of Great Dividing Range. Inhabits upper levels of drier open	Potential to occur in the woodland areas of the transport corridor. Presence confirmed elsewhere in the Study Area.

Table A.2 Likelihood of Threatened Fauna Occurring in the Amended Infrastructure Areas (from Atlas locality records)

Family	Scientific Name	Common Name	EPBC Status	TSC Status	Atlas Locality Records*	Preferred Habitat	Likelihood of Occurrence
						forests or woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark, White Box, Grey Box, Yellow Box, and Forest Red Gum. Have large feeding territories (over 5 ha) making the species locally nomadic. Nest in crown of high trees hidden by foliage.	
Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella	-	V	2	Distribution nearly continuous in NSW from the coast to the far west. Inhabits eucalypt forests and woodlands, especially rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland.	Potential to occur in the woodland areas of the transport corridor. Presence confirmed from adjoining mine lease.
Petroicidae	*Melanodryas cucullata*	Hooded Robin	-	V	1	South-eastern form distributed along east coast and inland NSW. Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs	Potential to occur in the woodland areas of the transport corridor. Presence confirmed elsewhere in the Study Area.

Table A.2 Likelihood of Threatened Fauna Occurring in the Amended Infrastructure Areas (from Atlas locality records)

Family	Scientific Name	Common Name	EPBC Status	TSC Status	Atlas Locality Records*	Preferred Habitat	Likelihood of Occurrence
						and a ground layer of moderately tall native grasses.	
Petroicidae	*Petroica boodang*	Scarlet Robin	-	V	1	In NSW, distributed from the coast to the inland slopes; after breeding may disperse to lower valleys and plains of tablelands and slopes. Inhabit open forests and grassy woodlands and breed in drier eucalypt forests and temperate woodlands, often on ridges and slopes, within an open understorey of shrubs and grasses and sometimes in open areas.	Potential to occur in the woodland areas of the transport corridor. Presence confirmed elsewhere in the Study Area.
Pomatostomidae	*Pomatostomus temporalis temporalis*	Grey-crowned Babbler (eastern subspecies)	-	V	10	In NSW the eastern subspecies occurs on the western slopes of the Great Dividing Range, Hunter Valley and north coast. Inhabits open Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains. Species has laboured flight and is unable to cross large open areas. Feed on invertebrates on tree trunks and on the ground amongst litter	Potential to occur in the woodland areas of the transport corridor. Presence confirmed elsewhere in the Study Area.

Table A.2 Likelihood of Threatened Fauna Occurring in the Amended Infrastructure Areas (from Atlas locality records)

Family	Scientific Name	Common Name	EPBC Status	TSC Status	Atlas Locality Records*	Preferred Habitat	Likelihood of Occurrence
						and debris. Nest in sapling or mature eucalypts and shrubs.	
Psittacidae	*Lathamus discolor*	Swift Parrot	E1; M	E1	0	Distributed across south-eastern mainland Australia and Tasmania. Migrate to the mainland from Tasmania from February to September to forage on winter-flowering mistletoes and eucalypt species, particularly Red Ironbark, Mugga Ironbark, Grey Box, White Box and Yellow Gum. Inhabit open eucalypt forests and woodlands, including box–ironbark communities, and farmland with remnant patches of eucalypt woodland. Mainland forage locations vary with changing annual conditions and availability of forage resources.	Low potential to occur in the woodland areas of the transport corridor. Presence confirmed elsewhere in the Study Area.
Psittacidae	*Glossopsitta pusilla*	Little Lorikeet	-	V	1	Wide distribution across coastal and Great Divide regions of eastern Australia; much of the species' core habitat is in NSW. Nomadic movements influenced by food and habitat	Potential to occur in the woodland areas of the transport corridor. Presence confirmed from adjoining mine lease.

Table A.2 Likelihood of Threatened Fauna Occurring in the Amended Infrastructure Areas (from Atlas locality records)

Family	Scientific Name	Common Name	EPBC Status	TSC Status	Atlas Locality Records*	Preferred Habitat	Likelihood of Occurrence
						availability. Inhabit dry growth and logged sclerophyll forests in the eastern part of their range, and in remnant woodland patches on the western slopes. Roost in treetops distant from feeding areas. Feed on flowering eucalypts and paperbarks, and mistletoe fruits. Show high nest site fidelity; use small hollows in smooth barked eucalypts and riparian trees.	
Strigidae	*Ninox connivens*	Barking Owl	-	V	1	Distributed throughout mainland Australia with wide but sparse distribution in NSW. Inhabits eucalypt woodland, open forest, swamp woodlands and, especially in inland areas, timber along watercourses. Dense vegetation is used occasionally for roosting. During the day they roost along creek lines, usually in tall understorey trees with dense foliage such as Acacia and Casuarina species, or the dense clumps of canopy leaves in	Potential to occur in the woodland areas of the transport corridor. Presence confirmed elsewhere in the Study Area.

Table A.2 Likelihood of Threatened Fauna Occurring in the Amended Infrastructure Areas (from Atlas locality records)

Family	Scientific Name	Common Name	EPBC Status	TSC Status	Atlas Locality Records*	Preferred Habitat	Likelihood of Occurrence
						large Eucalypts.	
Apodidae	*Hirundapus caudacutus*	White-throated Needletail	Mar. M	-	0	Marine & migratory non-breeding visitor to Australia, with widespread distribution in eastern and south-eastern Australia. Almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Occur over most types of habitat, particularly above wooded areas including open forest and rainforest, between trees or in clearings and below the canopy. Less commonly recorded flying above woodland and treeless areas, such as grassland or swamps. Roost in trees in forests and woodlands among dense foliage in the canopy or in hollows.	Low potential to occur. Migratory species found over most types of habitat; potential to overfly amended infrastructure areas. Presence confirmed elsewhere in the Study Area.
Meropidae	*Merops ornatus*	Rainbow Bee-eater	Mar. M	-	0	Marine & migratory species widely distributed throughout Australia, Indonesia, Japan and Pacific Island. Breeding populations in southern Australia migrate north and remain there for the duration of the Australian winter	Potential to occur. Some suitable nesting habitat is present along tributary banks adjacent to the pipeline corridor. Presence confirmed elsewhere in the Study Area.

Table A.2 Likelihood of Threatened Fauna Occurring in the Amended Infrastructure Areas (from Atlas locality records)

Family	Scientific Name	Common Name	EPBC Status	TSC Status	Atlas Locality Records*	Preferred Habitat	Likelihood of Occurrence
						after breeding. Inhabit healthland, open forests and woodlands, shrublands, and various cleared or semi-cleared habitats, including farmland and areas of human habitation. Often occur in open, cleared or lightly-timbered areas located in close proximity to permanent water. Nest in enlarged chambers at the end of long burrow or tunnel in flat or sloping ground, in the banks of rivers, creeks or dams, roadside cuttings, the walls of gravel pits or quarries, in mounds of gravel, or in cliff-faces. Forages from open perches and captures most prey in flight, although it also takes food items from the ground and from foliage.	
Mammals							
Dasyuridae	*Dasyurus maculatus*	Spotted-tailed Quoll	E1	V	2	Restricted in its former distribution to eastern Australia. Inhabits a range of habitat types, including rainforest, open forest, woodland, coastal heath and	Unlikely to occur. Little suitable timbered areas, riparian forest or den sites within the amended

Table A.2 Likelihood of Threatened Fauna Occurring in the Amended Infrastructure Areas (from Atlas locality records)

Family	Scientific Name	Common Name	EPBC Status	TSC Status	Atlas Locality Records*	Preferred Habitat	Likelihood of Occurrence
						inland riparian forest, from the sub-alpine zone to the coastline. Use hollow-bearing trees, logs, caves, crevices and rocky cliff-faces as den sites. Large home ranges from 750 ha (female) to 3500 ha (males), generally traversing ranges along densely vegetated creeklines. Ground and tree-climbing nocturnal mammal that may raid bird and arboreal mammal nests.	infrastructure areas. Presence confirmed from adjoining mine lease.
Emballonuridae	*Saccolaimus flaviventris*	Yellow-bellied Sheathtail-bat	-	V	3	Wide-ranging species distributed through northern and eastern Australia. Possible seasonal migrations from southern Australia in late summer and autumn. Roosts singly or in small groups in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. Forage in most habitats and appear to defend aerial territories. When foraging for insects, flies high and fast over the forest canopy, but lower in more open country.	Potential to occur in the woodland areas of the transport corridor. Presence confirmed elsewhere in the Study Area.

Table A.2 Likelihood of Threatened Fauna Occurring in the Amended Infrastructure Areas (from Atlas locality records)

Family	Scientific Name	Common Name	EPBC Status	TSC Status	Atlas Locality Records*	Preferred Habitat	Likelihood of Occurrence
Molossidae	*Mormopterus norfolkensis*	Eastern Freetail-bat	-	V	4	Distributed along the east coast from southern QLD to southern NSW. Inhabits dry sclerophyll forest and woodland east of the Great Dividing Range. Roost singly and communally, mainly in tree hollows but will also roost under decorticating bark or in man-made structures.	Potential to occur in the woodland areas of the transport corridor. Presence confirmed elsewhere in the Study Area.
Petauridae	*Petaurus norfolcensis*	Squirrel Glider	-	V	2	Wide but sparse distribution in eastern Australia. Inhabit mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. Prefers mixed species stands with a shrub or Acacia midstorey. Require abundant tree hollows for refuge and nest sites. Diet is seasonal and includes sap, pollen, nectar, insects and eucalypt gum.	Potential to occur in the woodland areas of the transport corridor. Recorded in the vicinity of the transport corridor within the adjacent Mt Arthur Mine lease area.

Table A.2 Likelihood of Threatened Fauna Occurring in the Amended Infrastructure Areas (from Atlas locality records)

Family	Scientific Name	Common Name	EPBC Status	TSC Status	Atlas Locality Records*	Preferred Habitat	Likelihood of Occurrence
Phascolarctidae	*Phascolarctos cinereus*	Koala	V	V	1	Distributed throughout eastern Australia; mainly on the central and north coasts of NSW. Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Spend majority of time in trees but will traverse open ground to move between trees. Home ranges vary depending on habitat quality, generally less than 2 ha to several hundred hectares.	Unlikely to occur. No suitable timbered habitat; the amended infrastructure areas are unlikely to provide good movement corridors because of surrounding land use and poor connectivity in open areas. Presence confirmed from adjoining mine lease.
Vespertilionidae	*Chalinolobus dwyeri*	Large-eared Pied Bat	V	V	0	Distributed along the east coast in areas with extensive cliffs and caves. In NSW, rare and patchy distribution in southern highlands, tablelands and north west slopes. Inhabit well-timbered areas containing gullies. High site fidelity and roost in caves, crevices in cliffs and old mine workings frequenting low to mid-elevation dry open forest and woodland	Potential to occur in the woodland areas of the transport corridor. Has potential to overfly amended infrastructure areas during forage movements. Presence confirmed elsewhere in the Study Area.

Table A.2 Likelihood of Threatened Fauna Occurring in the Amended Infrastructure Areas (from Atlas locality records)

Family	Scientific Name	Common Name	EPBC Status	TSC Status	Atlas Locality Records*	Preferred Habitat	Likelihood of Occurrence
						close to these features. Hibernate in cooler months.	
Vespertilionidae	*Miniopterus schreibersii oceanensis*	Eastern Bentwing-bat	-	V	7	Distributed along the east and north-east coast of Australia. Inhabit forested valleys but also found in rainforests, wet/dry sclerophyll forests, monsoon forests, open woodlands, paperbark forests & open grasslands. Roost in caves, tunnels and other artificial structures. Maternity caves have specific temperature and humidity regimes. Prey on flying insects above the treetops in forested areas. Disperse within 300km of maternity caves in non-breeding season.	Potential to occur in the woodland areas of the transport corridor. Has potential to overfly amended infrastructure areas during forage movements. Presence confirmed elsewhere in the Study Area.
Vespertilionidae	*Myotis macropus*	Southern Myotis	-	V	5	Distributed along coastal band from north-east Australia to western Victoria. Rarely found more than 100km inland, except along major rivers. Fishing bat that occurs in habitats near water, including mangroves, paperbark swamps, riverine monsoon forest,	Potential to occur in the woodland areas of the transport corridor. Has potential to overfly amended infrastructure areas during forage movements. Presence confirmed

Table A.2 Likelihood of Threatened Fauna Occurring in the Amended Infrastructure Areas (from Atlas locality records)

Family	Scientific Name	Common Name	EPBC Status	TSC Status	Atlas Locality Records*	Preferred Habitat	Likelihood of Occurrence
						rainforest, wet and dry sclerophyll forest, open woodland and River red gum woodland. Roost in groups in caves, hollow-bearing trees, dense foliage and artificial structures. Forage for insects and small fish over streams and pools.	elsewhere in the Study Area.
Vespertilionidae	*Nyctophilus corbeni*	Greater Long-eared Bat	V	V	1	Distribution of south-eastern form associated with Murray Darling Basin. Inhabits variety of vegetation types, including mallee, Bulloak and Box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland. Roost in tree hollows, crevices and under loose bark. Hunt for non-flying prey in the understorey.	Potential to occur in the woodland areas of the transport corridor. Has potential to overfly amended infrastructure areas during forage movements. Presence confirmed elsewhere in the Study Area.
Vespertilionidae	*Scoteanax rueppellii*	Greater Broad-nosed Bat	-	V	2	Distributed along gullies and river systems that drain the Great Dividing Range and to the coast. In NSW,	Potential to occur in the woodland areas of the transport corridor. Has

Table A.2 Likelihood of Threatened Fauna Occurring in the Amended Infrastructure Areas (from Atlas locality records)

Family	Scientific Name	Common Name	EPBC Status	TSC Status	Atlas Locality Records*	Preferred Habitat	Likelihood of Occurrence
						widespread on New England Tablelands. Inhabit cool temperate to tropical moist forests, woodland and rainforest. Prefer moist gullies within mature coastal forest or rainforest. May roost in tree hollows and buildings. Forages in open woodland and forest edges and flies directly along creek corridors at 3-6m altitude. Maternity sites located in suitable trees.	potential to overfly amended infrastructure areas during forage movements. Presence confirmed elsewhere in the Study Area.
Vespertilionidae	*Vespadelus troughtoni*	Eastern Cave Bat	-	V	0	Distributed in a broad band on both sides of Great Dividing Range. Cave-roosting species that usually inhabits dry open forest and woodland and occasionally in wet rainforest, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings.	Potential to occur in the woodland areas of the transport corridor. Has potential to overfly amended infrastructure areas during forage movements. Unconfirmed records from elsewhere in the Study Area.

**Locality = 10km radius*

E = Endangered; V = Vulnerable; Ma = Marine (EPBC Act); M = Migratory (EPBC Act)

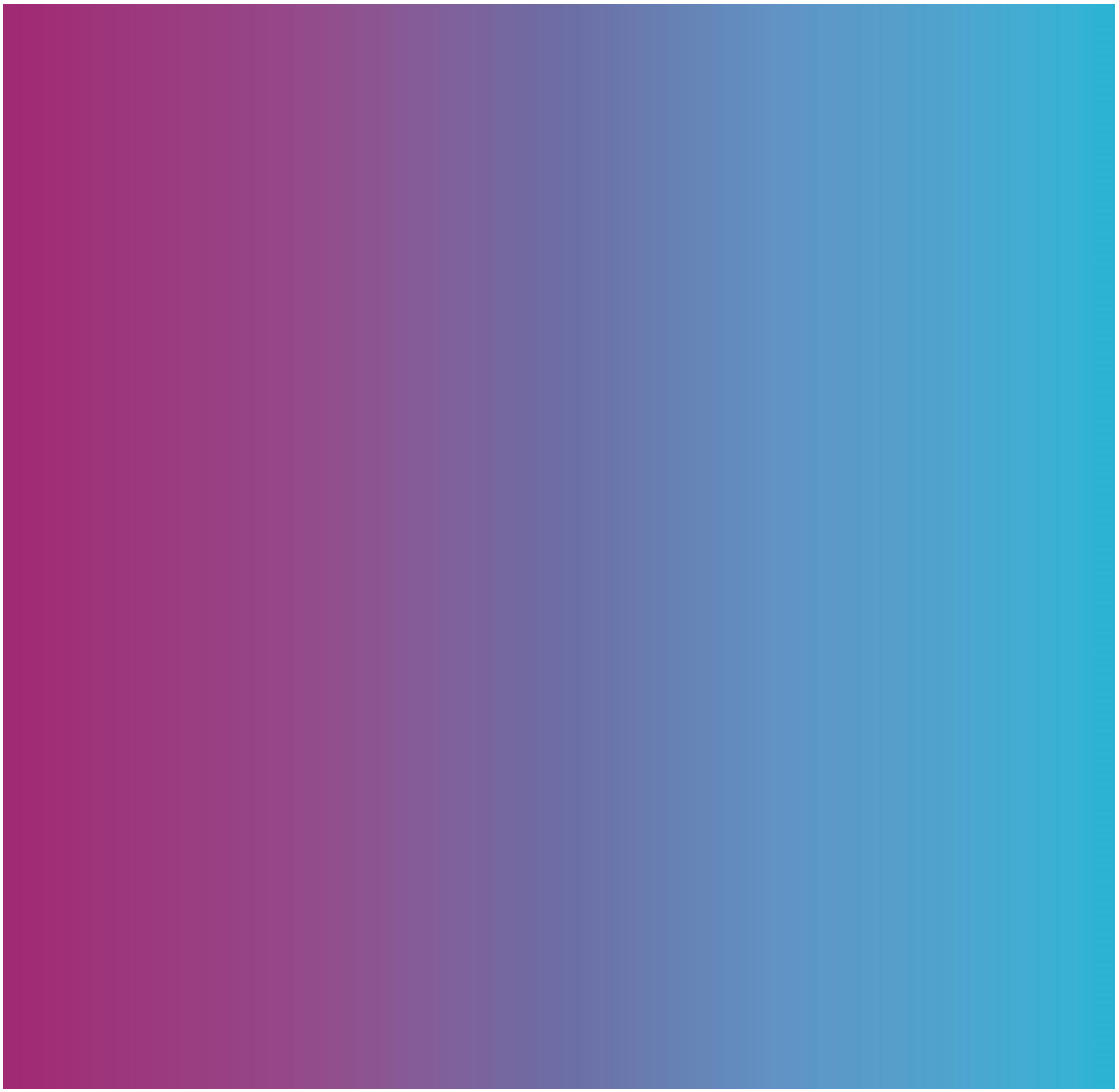
Aboriginal Archaeological and Cultural Heritage Impact Assessment Addendum

D

Hansen Bailey Environmental Consultants
12-Aug-2013

Drayton South Coal Project Preferred Project Report

Aboriginal Archaeological and Cultural Heritage Impact Assessment Addendum, August 2013



Drayton South Coal Project Preferred Project Report

Aboriginal Archaeological and Cultural Heritage Impact Assessment Addendum, May 2013

Client: Hansen Bailey Environmental Consultants

ABN: N/A

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Prepared by Geordie Oakes

Reviewed by Luke Kirkwood

Revision History

Revision	Revision Date	Details	Name/Position
1	28-Mar-2013	Technical Review	Luke Kirkwood (Principal Archaeologist)
2	08-Aug-2013	Project update	Geordie Oakes (Archaeologist)

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Executive Summary

AECOM Australia Pty Ltd (AECOM) has been engaged by Hansen Bailey Environmental Consultants (Hansen Bailey) on behalf of Anglo American Metallurgical Coal Pty Ltd (Anglo American) to prepare an addendum to the Aboriginal archaeological and cultural heritage impact assessment completed as part of the *Drayton South Coal Project Environmental Assessment* (EA) (Hansen Bailey, 2012) for the Drayton South Coal Project (the Project). The purpose of this addendum is to form an appendix to a Preferred Project Report (PPR) being prepared by Hansen Bailey to support project application 11_0062 under section 75H, Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Since exhibiting the EA, Anglo American has completed further detailed design work for the infrastructure required to facilitate the Project. As a result, minor amendments to the Project layout, including modifications to the haul road/conveyor option within the transport corridor and an alternate alignment for the discharge pipeline to the Hunter River have been made for which approval is now being sought.

A search of the AHIMS database for land within the amended haul road/conveyor option and discharge pipeline alignments was undertaken on 27 February 2013. The AHIMS search did not identify Aboriginal archaeological sites along the amended haul road/conveyor option and discharge pipeline alignments.

Archaeological survey was undertaken for the amendments on 28 February 2013 by AECOM archaeologist Geordie Oakes. No surface artefacts were identified as a result of the archaeological survey. However, during the survey it was determined that sections of the proposed discharge pipeline occur within land that has high subsurface archaeological potential.

To manage potential impacts to Aboriginal heritage from the Project, a program of archaeological test and salvage excavation are planned. Details for the excavation program will be addressed within the Aboriginal Cultural Heritage Management Plan (ACHMP) to be prepared upon Project Approval. Where deemed appropriate within the broader archaeological test and salvage excavations planned for the Project, a program of archaeological test excavation should be undertaken where the discharge pipeline occurs in areas of high subsurface archaeological potential.

1.0 Introduction

AECOM Australia Pty Ltd (AECOM) has been engaged by Hansen Bailey on behalf of Anglo American to prepare an addendum to the Aboriginal archaeological and cultural heritage impact assessment completed as part of the *Drayton South Coal Project Environmental Assessment* (EA) (Hansen Bailey, 2012)for the Project. The purpose of this addendum is to form an appendix to a PPR being prepared by Hansen Bailey to support project application 11_0062 under section 75H, Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

1.1 Background

Drayton Mine commenced production in 1983 and is managed by Anglo American, the controlling partner of the Drayton Joint Venture. Drayton Mine currently operates under Project Approval (PA) 06_0202, approved 1 February 2008, to provide predominantly steaming coal to export and domestic markets at a maximum of 8 Million tonnes per annum (Mtpa) of Run of Mine (ROM) coal. The Antiene Rail Spur (approved under Development Consent 106-04-00) is utilised to transport export steaming coal to the Port of Newcastle via the Main Northern Railway. PA 06_0202 expires in 2017 at which time operations will cease.

The Project will allow for the continuation of the existing Drayton Mine by the development of open cut and highwall mining operations within the Drayton South area, which is located within Exploration Licence (EL) 5460. The continued operations will utilise the existing workforce, infrastructure and equipment. A transport corridor will be constructed to link Drayton Mine and the Drayton South area (collectively referred to as the Drayton Complex).

The Drayton Complex is located approximately 10 kilometres (km) north-west of the village of Jerrys Plains and approximately 13 km south of the township of Muswellbrook in the Upper Hunter Valley of New South Wales (NSW). The Drayton Complex is predominately situated within the Muswellbrook Local Government Area (LGA).

Anglo American is seeking approval for the Project under Part 3A of the EP&A Act. A major project application (11_0062) and supporting Preliminary Environmental Assessment was submitted to the NSW Department of Planning and Infrastructure (DP&I) in March 2011.

The EA was prepared by Hansen Bailey on behalf of Anglo American to support the major project application. The EA was placed on public exhibition between 7 November and 21 December 2012. Following the public exhibition of the EA DP&I requested a formal response to submissions (RTS) on 22 January 2013. The Response to Submissions document (RTS) was prepared and submitted to DP&I on 7 May 2013.

1.2 Preferred Project Description

Following submission and public exhibition of the EA in late 2012, Anglo American has further evaluated and tested the functionality of the conceptual Project layout presented in the EA as part of the detailed engineering design phase. This work has resulted in the development of an optimised design for key infrastructure components required to facilitate the Project and amendments to the conceptual Project layout for which approval is being sought. Further to this following a review of the Project mine plan by DP&I Anglo American has agreed to make additional changes to the Project in order to improve the outcomes for neighbouring stakeholders and the environment.

The amendments sought as part of the Preferred Project are described below and are shown on Figure 1:

- Minor amendments to the required infrastructure (collectively referred to as the amended infrastructure areas) including;
    - A modified alignment for a portion of the haul road and conveyor option within the transport corridor. This includes repositioning the required Macquarie Generation conveyor overpass and associated infrastructure to accommodate the modified alignment for the haul road and conveyor option;
    - An alternative alignment for the required discharge pipeline from the Houston Dam to the Hunter River; and
    - Subsequent revision of the Project Boundary to encompass the infrastructure amendments proposed above.
- Amendments to the Houston Visual Bund in order to comply with the option proposed in the public submission received from Coolmore Australia;

- A revised conceptual final landform design to reduce the size of the final void, reduce the slope of the final highwall and provide a more natural landscape incorporating principles of micro-relief; and
- Amendments to the Project to ensure the set back from Saddlers Creek for the mine plan is 40 metres in all areas.

With regard to the above only the amended infrastructure areas require additional assessment for inclusion in this report. The changes to the Houston visual bund, final landform and additional set back from Saddlers Creek are all within the disturbance boundary that has previously been assessed and included in the Aboriginal archaeological and cultural heritage impact assessment completed for the EA. As such these components are not discussed any further in this report.

The haul road alignment within the transport corridor has been revised to provide an improved geometric design. The radius (or tightness) of the horizontal curve in the haul road design has been increased to significantly optimise efficiency and safety performance. The revised design also avoids complex terrain, reduces fill requirements and drainage complications.

The discharge pipeline alignment has been revised to allow water to be transferred by means of gravity feed from the Houston Dam, which is situated at a higher elevation, to the Hunter River. The relocation of the pipeline also avoids complex terrain and minimises issues with erosion.

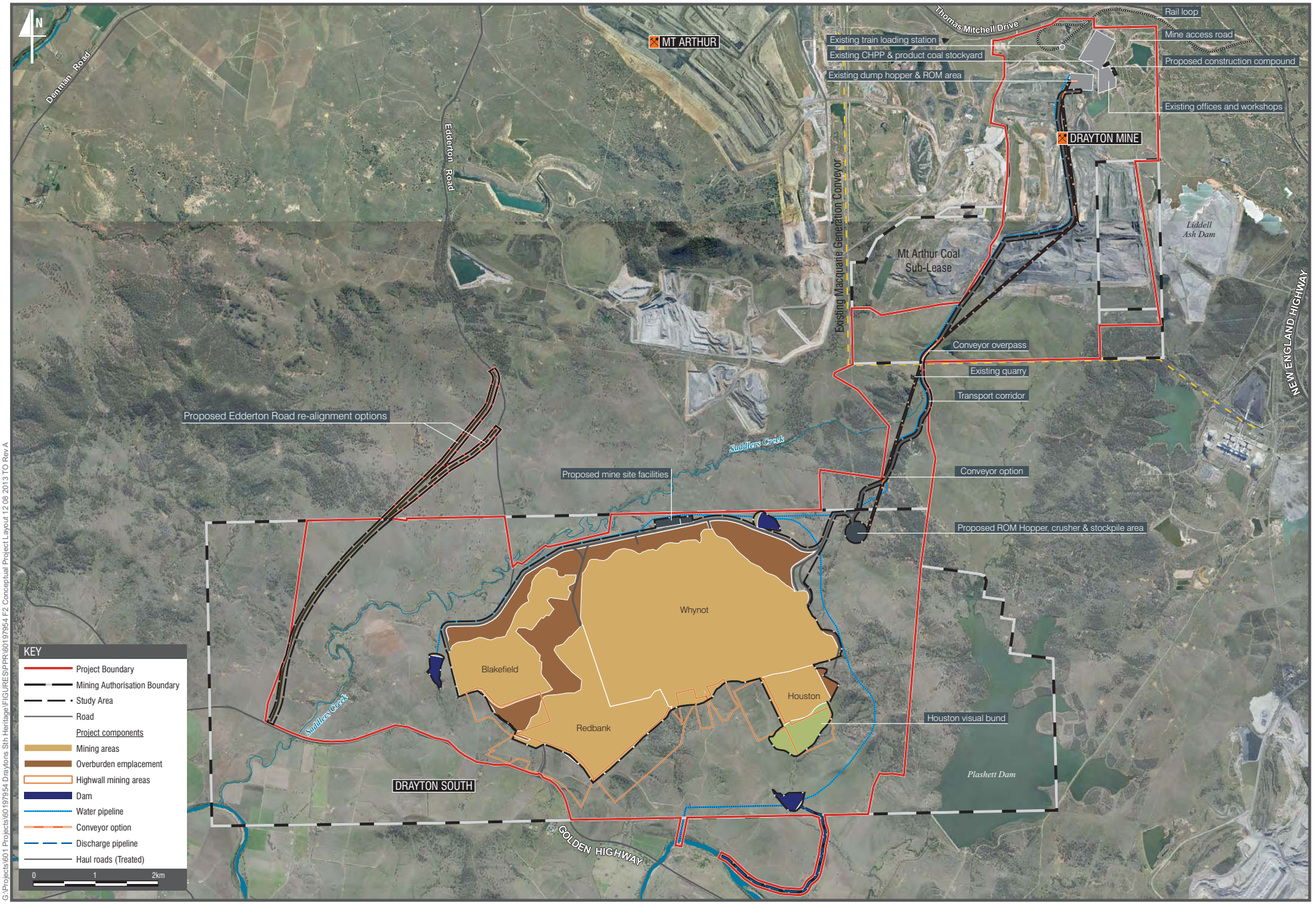
All remaining components of the Project are consistent with the EA.

1.3 EA Aboriginal Archaeological and Cultural Heritage Impact Assessment

An Aboriginal archaeological and cultural heritage impact assessment was prepared for the Project as a component of the EA (see Appendix K of the EA). The assessment considered an overall area of approximately 2,267 ha (Study Area), which incorporated the surface disturbance footprint of 1,928 ha (including a 100 m corridor allowed for the Edderton Road realignment) and a 100 m buffer around the mining areas and associated infrastructure.

The purpose of the assessment was to describe the nature of the archaeological landscape within Drayton South area, assess the potential impacts that the Project may have on Aboriginal archaeological and cultural heritage values, and recommend measures to mitigate and manage these impacts.

A summary of the key components of the assessment are provided in this addendum to give context to the amendments sought as part of the Preferred Project.



G:\Projects\601 Projects\60197954 Draytons Sth Heritage\FIGURES\PPR\60197954 F2 Conceptual Project Layout 12 08 2013 TO Rev A

AECOM

CONCEPTUAL LAYOUT PLAN

Drayton South Coal Project
Preferred Project Report
New South Wales

FIGURE 2

2.0 Regulatory Framework

2.1 Commonwealth Legislation

2.1.1 Aboriginal and Torres Strait Islander Heritage Protection Act 1984

The *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (the ATSIHP Act) provides for the preservation and protection of places, areas and objects of particular significance to Indigenous Australians. The stated purpose of the ATSIHP Act is the 'preservation and protection from injury or desecration of areas and objects in Australia and in Australian waters, being areas and objects that are of particular significance to Aboriginals in accordance with Aboriginal tradition' (section 4).

Under the Act, 'Aboriginal tradition' is defined as "the body of traditions, observances, customs and beliefs of Aboriginals generally or of a particular community or group of Aboriginals, and includes any such traditions, observances, customs or beliefs relating to particular persons, areas, objects or relationships" (Section 3). A 'significant Aboriginal area' is an area of land or water in Australia that is of 'particular significance to Aboriginals in accordance with Aboriginal tradition' (Section 3). A 'significant Aboriginal object', on the other hand, refers to an object (including Aboriginal remains) of like significance.

2.1.2 Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) took effect on 16 July 2000. Under Part 9 of the EPBC Act, any action that is likely to have a significant impact on a matter of National Environmental Significance may only progress with the approval of the Commonwealth Minister for Sustainability, Environment, Water, Population and Communities (SEWPaC).

An action is defined as a project, development, undertaking, activity, series of activities, or alteration. An action will also require approval if:

- It is undertaken on Commonwealth land and will have or is likely to have a significant impact;
- It is undertaken outside Commonwealth land and will have or is likely to have a significant impact on the environment on Commonwealth land; and
- It is undertaken by the Commonwealth and will have or is likely to have a significant impact.

The EPBC Act defines 'environment' as both natural and cultural environments and therefore includes Aboriginal and historic heritage items. Under the Act, protected heritage items are listed on the National Heritage List (items of significance to the nation) or the Commonwealth Heritage List (items belonging to the Commonwealth or its agencies). These two lists replaced the Register of the National Estate (RNE). While the RNE has been suspended and is no longer a statutory list, Section 391A of the Act requires the Minister to consider RNE listing if a referral is made. This requirement expires in 2012, by which time all RNE listings are to be transferred to a relevant heritage register. Items on the RNE can have a variety of statuses, including Registered (it is inscribed on the Register) and Indicative (it is in the database, but no formal nomination has been received or an assessment has not been completed).

The heritage registers mandated by the EPBC Act have been consulted and there are no Aboriginal heritage items located within the Project Boundary.

2.2 State Legislation

2.2.1 Environmental Planning and Assessment Act 1979

The EP&A Act requires that consideration be given to environmental impacts as part of the land use planning process. In NSW, environmental impacts are interpreted as including impacts to cultural heritage.

Part 3A of the EP&A Act provides an approvals regime for all 'major projects'. Major projects are defined under Schedule 1 of the *State Environmental Planning Policy (Major Development) 2005* (SEPP (Major Development)) and are identified by way of declaration as a listed project in the SEPP (Major Development) or by notice in the NSW Government Gazette. The Minister is the consent authority for all projects to which Part 3A applies. Under Part 3A, the Minister can issue a project approval or a concept approval. Both maintain the requirement for consultation with the community and relevant State Government agencies. The requirement for certain other permits and licences is removed under Part 3A.

Aboriginal archaeological and cultural heritage impact assessments carried out under Part 3A of the EP&A Act must address the steps and requirements outlined in *Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (DECCW 2005) to ensure statutory compliance.

In October 2011, Part 3A of the EP&A Act was repealed. However the Project has been granted the benefit of transitional provisions, and despite the recent repeal, is a project to which Part 3A applies.

2.2.2 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NPW Act), administered by OEH, is the primary legislation for the protection of Aboriginal cultural heritage in NSW. The NPW Act gives the Director General of OEH responsibility for the proper care, preservation and protection of 'Aboriginal objects' and 'Aboriginal places', defined under the Act as follows:

- An *Aboriginal object* is any deposit, object or material evidence (that is not a handicraft made for sale) relating to Aboriginal habitation of NSW, before or during the occupation of that area by persons of non-Aboriginal extraction (and includes Aboriginal remains).
- An *Aboriginal place* is a place declared so by the Minister administering the NPW Act because the place is or was of special significance to Aboriginal culture. It may or may not contain Aboriginal objects.

Part 6 of the NPW Act provides specific protection for Aboriginal objects and places by making it an offence to harm them. An Aboriginal Heritage Impact Permit (AHIP) must be obtained if impacts to Aboriginal objects and or places are anticipated. AHIPs are issued under Section 90 of the NPW Act. Consultation with Aboriginal communities is required under OEH policy when an application for an AHIP is considered and is an integral part of the process. AHIPs may be issued in relation to a specified Aboriginal object, Aboriginal place, land, activity or person or specified types or classes of Aboriginal objects, Aboriginal places, land, activities or persons.

Pursuant to Section 75U of the EP&A Act, any project approved under Part 3A of the EP&A Act is exempt from the requirement to obtain an AHIP under Section 90 of the NPW Act.

Section 89A of the NPW Act requires notification of the location of identified Aboriginal objects within a reasonable time, with penalties for non-notification, including daily penalties. Section 89A is binding in all instances, including Part 3A projects.

2.3 Local Government

2.3.1 Muswellbrook Local Environmental Plan 2009

The Muswellbrook Local Environmental Plan (LEP) is the comprehensive statutory planning document that applies to the Muswellbrook LGA. Clause 5.10 of the LEP provides specific provisions for the protection of heritage items and relics within Muswellbrook LGA.

Schedule 5 of the LEP provides a list of heritage items and relics within Muswellbrook LGA. There are no Aboriginal heritage items listed in the heritage schedule that fall within the boundaries of the Study Area.

2.3.2 Singleton Local Environmental Plan 1996

The Singleton Local Environmental Plan (LEP) is the comprehensive statutory planning document that applies to the Singleton LGA. Part 9 of the LEP provides specific provisions for the protection of heritage items and relics within Singleton LGA.

Schedule 3 of the LEP provides a list of heritage items and relics within Singleton LGA. There are no Aboriginal heritage items listed in the heritage schedule that fall within the boundaries of the Study Area.

3.0 Summary of the Aboriginal Archaeological and Cultural Heritage Impact Assessment undertaken for the Project

The Aboriginal archaeological and cultural heritage impact assessment prepared for the Project (see Appendix K of the EA) provided a detailed investigation to identify the Aboriginal archaeological and cultural heritage values of the Study Area and broader Drayton South area. A brief summary of the assessment is provided in the following sections.

3.1 Methodology

The methodology adopted for the assessment included the following:

- Desktop assessment comprising:
    - A search of the AHIMS database for land within the Project Boundary undertaken on the 14 March 2011; and
    - A review of previous archaeological studies undertaken within the Project Boundary and immediate vicinity to gain an understanding of the Aboriginal archaeological and cultural heritage values of the area. Relevant studies included Dyall (1980), Koettig & Hughes (1985), Mills (2000), (HLA-Envirosciences Pty Ltd, 2002a, 2002b) and Archaeological Risk Assessment Services) 2002, 2006, 2010a.
- Aboriginal stakeholder consultation conducted in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (NSW Department of Environment Climate Change & Water, 2010); and
- Archaeological field survey of the Study Area undertaken over a total of 26 days initially between 2 May and 4 June 2011, and then on 10 and 11 October 2011. The aim of the archaeological field survey was to:
    - Locate and re-record all AHIMS registered archaeological sites within the Study Area;
    - Identify previously unrecorded archaeological sites by way of targeted pedestrian transects over all landform types within the Study Area
    - Inspect, where appropriate, areas of known or potential Aboriginal cultural value, as identified by Aboriginal stakeholder representatives; and
    - Obtain sufficient data to facilitate the development of management and mitigation measures for the Project.

3.2 Results

3.2.1 Archaeological Resource

A search of the AHIMS database on the 14 March 2011 identified a total of 226 registered archaeological sites within the Project Boundary. Of these sites, 18 were listed as destroyed or deleted. The remaining 208 archaeological sites comprised of 199 artefact scatters and isolated finds, four Potential Archaeological Deposits (PADs), two stone quarries, two scarred trees, and one grinding groove. Of these sites located within the Project Boundary, 85 sites are situated within the Study Area.

In addition to the previously recorded AHIMS sites, 160 new archaeological sites were identified and recorded within the Study Area. When added to the previously identified AHIMS sites, there are 205 discrete sites situated within the Study Area. This total includes 143 artefact scatters (eight with PADs), 59 isolated finds and three stone quarries. Artefact counts for the scatter sites ranged from two to 981 artefacts, with most scatters (55%, n = 79) containing less than ten artefacts. The three stone quarry sites were composed of two previously recorded AHIMS sites (37-2-1954 and 37-2-1955 (could not be located), see Mills, 2000) and one newly recorded site (DS-QR1-11).

During the assessment, the Aboriginal community and an arborist reassessed two previously recorded scarred trees (37-2-1944 and 37-2-1945) and determined that the scarring was due to natural processes.

3.2.2 Significance Assessment

Archaeological (Scientific) Significance

A total of four archaeological sites were rated as highly significant. Three of the sites are represented by stone quarries (37-2-1954, 37-2-1955 (could not be located) and DS-QR1-11). These are considered rare in the Central Lowlands and offer high research value due to their ability to answer questions related to raw material use and procurement. Artefact scatter site DS-C8 is also considered to be highly significant due to the identification of two non-ground edge stone axes, the large artefact count (*n* = 981), and the high potential for archaeological deposit. Based on the combination of these elements, this site is considered to have the potential to answer research questions related to subsistence patterning and the organisation of technology within the Study Area.

A total of 18 archaeological sites were rated as moderately significant. This rating has been attributed to sites where artefacts of moderate rarity in the local area (i.e. axe heads and hammerstones) were identified, or where PADs or significant artefact numbers (> 100) were recorded.

The remaining 183 archaeological sites were rated as being of low significance. Low significance is attributed to sites that are common in the local and regional area, are highly disturbed, or have few artefact numbers.

Social (Cultural) Significance

The social (cultural) significance determined by the Aboriginal stakeholders is reflected in their responses to the Aboriginal archaeological and cultural heritage impact assessment (see Appendix K of the EA). These responses have identified Mt Arthur and Saddlers Creek as culturally important features in the local landscape. In addition, all stone artefacts recorded within the Study Area have been identified as culturally important as they attest to the previous occupation and use of the land by Aboriginal people, and provide an important tangible link to their heritage.

3.3 Impact Assessment

As a result of the Project, a total of 175 archaeological sites within the Study Area, comprising 173 isolated finds and artefact scatters, and two quarry sites (one of which could not be located – 37-2-1955) will be directly impacted. All remaining sites within (*n* = 30) and outside the Study Area but within the Project Boundary (*n* = 103) will not be impacted.

3.4 Management Recommendations

To manage potential impacts to Aboriginal sites from the Project, a detailed ACHMP will need to be prepared. The ACHMP will be prepared in consultation with registered Aboriginal stakeholders and the Office of Environment and Heritage, and to the satisfaction of the Department of Planning and Infrastructure. The commitment for the development of this ACHMP is outlined in this report.

To mitigate Project impacts to Aboriginal sites, it is recommended that surface artefact collection be undertaken for all artefact scatters and isolated finds impacted by the Project. This should occur prior to the commencement of the Project. Details of the surface artefact collection should be addressed within the ACHMP.

In recognition that the majority of the archaeological resource of the Study Area is not identifiable by surface survey alone, a program of subsurface test excavation and salvage excavation should be undertaken to obtain a more detailed understanding of the nature and extent of Aboriginal archaeology within the Study Area. The excavation program should include an initial detailed geomorphological assessment, followed by test excavation and salvage excavation. The excavation program will need to be developed in consultation with registered Aboriginal stakeholders and should include, at a minimum, salvage excavation of sites identified as having high significance. In addition, the excavation program should utilise the results of the archaeological survey, including identified PAD areas and areas of archaeological sensitivity, to develop an appropriate scientific research methodology. Details for the excavation program will need to be addressed within the ACHMP.

The conservation and management of all Aboriginal sites within the Project Boundary not impacted by the Project is recommended. Protected sites should be identified on site plans with mine activities avoiding those sites. Where mine activities occur in close proximity to recorded sites, fencing should be erected as necessary to protect these sites. Provisions for the long-term management of sites outside the Study Area will need to be addressed within the ACHMP.

4.0 PPR Archaeological Background

The purpose of the addendum was to identify potential impacts to Aboriginal archaeological and cultural heritage values from changes to the alignment of the haul road/conveyor option and discharge pipeline originally assessed as part of the Project and as presented in the EA. As such, the assessment methodology included the following three stages to gather information regarding the known and potential Aboriginal archaeological resource associated with the amended alignments:

- A review of the existing AHIMS data for the area obtained from OEH on 27 February 2013;
- A review of past Aboriginal archaeological assessment reports for the greater Drayton South area; and
- Visual inspections of the amended alignments on 28 February 2013.

4.1 AHIMS Search

A search of the AHIMS database for land within the amended haul road/conveyor option and discharge pipeline alignments was undertaken on 27 February 2013. The AHIMS search did not identify Aboriginal archaeological sites along the amended haul road/conveyor option and discharge pipeline alignments.

4.2 Archaeological Context

The Aboriginal archaeology of the Drayton South area and surrounding locality is well researched, having been the subject of a number of Aboriginal archaeological investigations since the early 1980s (Table 1). Major investigations include those conducted by Koettig and Hughes (1985), Mills (2000), ARAS (2006, 2010) and AECOM (2012). Key observations to be drawn from a review of the findings from these investigations are as follows:

- Artefact scatters and isolated artefacts are the most common site types;
- Scarred trees, quarries and grinding groove sites are also present but rare;
- Stone artefacts can occur within any landform element and on any class of slope, both in surface and subsurface contexts;
- Artefact exposure is highest on erosional surfaces;
- Artefacts occur at higher densities within 100 m of watercourses; and
- The complexity of archaeological assemblages found in association with watercourses tends to vary concomitantly with stream order.

Table 1 Previous Aboriginal archaeological investigations

Author	Assessment Type	Project	Results
Dyall (1980)	Survey	Aboriginal Relics on the Drayton Coal Lease, Muswellbrook	Archaeological survey was undertaken for an area immediately south of the Bayswater Colliery and north of the Drayton South area at Drayton Mine. Three sites, all artefact scatters, were recorded on the banks of Saddlers Creek. The sites contained flakes, cores and backed blades of chert, rhyolite (tuff) and quartz.
Dyall (1981)	Survey	Aboriginal Relics on the Mt Arthur Coal Lease	Archaeological survey was undertaken for an area immediately south of Mt Arthur. A total of 24 open campsites were found along creeklines (Saltwater and Saddlers Creeks) within the lease area. Two of the sites were large, containing more than 500 stone flakes scattered on the ground surface. Artefact types included stone implements such as backed blades, stone axes, choppers and grinding slabs. Other artefact types included waste flakes and cores.

Author	Assessment Type	Project	Results
Koettig & Hughes (1985)	Survey and Salvage	Archaeological Investigation at Plashett Dam, Mount Arthur North, and Mount Arthur South	Archaeological survey was undertaken within the Mt Arthur South Project Area. A total of 136 archaeological sites were located and recorded. These comprised 135 open campsites with stone artefact scatters and one site consisting of grinding grooves. The general pattern of site distribution was one of higher numbers of sites along major creeklines (i.e. Saltwater Creek), with numbers decreasing along tributaries. Indurated mudstone/tuff and silcrete were the most frequently recorded raw material. A salvage program of excavation and collection work was carried out and artefacts from eight sites were subsequently collected. Indurated mudstone/tuff, silcrete and porcellanite were the most common material in the assemblage.
Mills (2000)	Survey	An Archaeological Survey for a Feasibility Study for Saddlers Creek Mine	Archaeological survey was undertaken within the proposed mine and haul road areas for the Saddlers Creek Mine. The focus of the survey was Saddlers Creek; however, a number of its tributaries were also surveyed. Forty Aboriginal sites were identified, including seven isolated artefacts, 29 artefact scatters (nine with PADs), two quarry sites, and two scarred trees. The majority of artefact scatters and isolated artefacts were identified along ephemeral feeder creeks of Saddlers Creek. A total of 238 artefacts were recorded, including 127 flakes, 41 block fracture fragments, 28 cores, 19 flake fragments, seven scrapers, five manuports, four hammerstones, three backed blades, one sharpening stone, one millstone, one anvil and one pebble axe. Indurated mudstone/tuff was the dominant material (48.32%), followed by silcrete (31.51%), quartzite (5.46%), chert (5.04%), quartz (2.94%), porcellanite (2.10%), siltstone (2.10%), sandstone (0.84%), basalt (0.84%), fossilised wood (0.42%), and glass (0.42%).
HLA-Enviroscinces (2002)	Survey	Archaeological Assessment of Proposed Drayton Mine Extension EIS	Archaeological survey was undertaken for the Drayton Mine extension. A total of 14 artefact scatters were located during survey. Indurated mudstone/tuff was the dominant material (51%), followed by silcrete (39%), quartz (5%) and porcellanite (5%). Artefacts comprised of flakes (49%), flaked pieces (41%), cores (9%), and backed blades (1%). All sites were located along creeklines, ridgelines or crests.
ARAS (2006)	Survey	Aboriginal Archaeology & Cultural Heritage Assessment Report for the Drayton Mine Extension	Archaeological survey was undertaken for the Drayton Mine Extension. A total of 480 stone artefacts were recorded from 39 sites that were identified, comprised of 22 artefact scatters and 17 isolated artefacts. Of the 480 artefacts identified, 38% were complete flakes, 31% broken flakes, 26% flaked pieces and 5% cores. A majority of artefacts were of indurated mudstone/tuff (55%), followed by silcrete (25%), porcellanite (14%) and quartz (4.6%).

Author	Assessment Type	Project	Results
ARAS (2010)	Salvage	Cultural Heritage Management Report: Drayton Mine Extension Project	ARAS (2010) undertook a program of salvage excavation for 26 Aboriginal sites for the Drayton Mine Extension Project. The salvage included surface collection of artefacts at 22 sites, mechanical grader scrapes at 11 locations and hand excavation at three locations. A total of 8,505 artefacts were recovered as part of the works. Of these, 7,500 artefacts were recovered from three distinct knapping locations at Ramrod Creek. OSL (optically stimulated luminescence) dating of deposits at Ramrod Creek and Delpah returned dates of 3-1.4 ka years ago placing them in the Late Holocene. Raw materials utilised included porcellanite, silcrete, tuff and chert. At Ramrod Creek, porcellanite was the dominant raw material, while at Delpah, silcrete and tuff were dominant.
AECOM 2012	Survey	Drayton South Coal Project Environmental Assessment	Archaeological survey was undertaken for the Drayton South Coal Project. A total of 160 new sites were recorded comprising 101 artefact scatters, 58 isolated artefacts and one quarry site. Flakes dominated the assemblage accounting for 50% of the total. Raw material most commonly associated with both complete flakes and flake debitage consisted primarily of indurated mudstone/tuff. Cores (n = 77) comprised 3.4% of the assemblage, with indurated mudstone/tuff being the most common raw material. Retouched implements, including 20 miscellaneous retouched flakes, seven backed artefacts, six scrapers and six Bondi points, accounting for 1.7% of the total. Of these, indurated mudstone/tuff is the most common raw material. Non-ground edge axes (n = 9) are represented at 0.5% of the total. Two hammerstones, with clear pitting make up the remaining 0.1% of the assemblage. The majority of artefacts were identified within 100 m of creeklines.

4.3 Archaeological Field Survey

An archaeological survey of the amended haul road/conveyor option and pipeline alignments was undertaken 28 February 2013 by AECOM archaeologist Geordie Oakes. The purpose of the survey was to establish whether the proposed activities will, or are likely to, impact Aboriginal objects. The amended haul road/conveyor option and pipeline alignments were inspected on foot and by vehicle for the purposes of identifying surface Aboriginal objects and assessing the alignments' potential for subsurface deposit (i.e. subsurface archaeological sensitivity). Notes were taken regarding ground surface visibility, ground integrity (i.e. land condition), archaeological sensitivity and impact risk. Sensitivity was assessed on the basis of morphological landform type and distance to water variables with reference to previously demonstrated archaeological sensitivity in the wider Drayton South area.

5.0 PPR Results

5.1 Preferred Project Amended Infrastructure Areas

5.1.1 Amended Haul Road

The section of haul road/conveyor option alignment to be amended was inspected on foot for the purpose of identifying surface Aboriginal objects and potential for subsurface deposit (i.e. subsurface archaeological sensitivity). Results of the inspection were as follows:

- No surface artefacts were identified during the inspection. However, ground surface visibility was poor due to thick knee high grass cover.
- No potential subsurface archaeological deposit was identified during the inspection. This assessment was made on the basis of morphological landform types which comprised steep midslope and crest landforms, which are considered of low archaeologically sensitivity. In addition, the closest watercourse, a moderately steep ephemeral drainage line, was identified over 200 m from the proposed haul road alignment.

5.1.2 Amended Discharge Dam Pipeline

The section of the discharge pipeline alignment to be amended was inspected on foot and by vehicle for the purpose of identifying surface Aboriginal objects and subsurface archaeological sensitivity. Results of the inspection were as follows:

- No surface artefacts were identified during the inspection. However, ground surface visibility was poor due to thick knee high grass cover.
- During the inspection it was determined that sections of the proposed discharge pipeline occur within land that has high subsurface archaeological potential. Archaeological deposit, comprising stone artefacts, is predicted to occur within approximately 100 m of the Hunter River and Saltwater Creek (see AECOM's 2012 predictive model in Appendix K of the EA).

6.0 PPR Impact Assessment

6.1 PPR Amended Infrastructure Areas

6.1.1 Amended Haul Road/Conveyor Option Alignment

The haul road alignment within the transport corridor has been revised to provide an improved geometric design. The radius (or tightness) of the horizontal curve in the haul road design has been increased to significantly optimise efficiency and safety performance. The revised design also avoids complex terrain, reduces fill requirements and drainage complications. Construction of the haul road will require significant earthworks and ground surface disturbances.

If it is deemed economically feasible, an overland conveyor may be constructed to transfer coal from the Drayton South area to Drayton Mine. At this stage there is no definitive proposal or indicative timing proposed to proceed with this option. In order to maintain this option, the conveyor alignment within the transport corridor as proposed in the EA has been amended to coincide with the revised haul road alignment and to reduce the number of transfer points in the chainage.

A combination of background research and the archaeological survey has determined that no known Aboriginal sites will be impacted by the amendments to the haul road/conveyor option alignment.

6.1.2 Amended Discharge Pipeline Alignment

The discharge pipeline alignment has been revised to allow water to be transferred by means of gravity feed from the Houston Dam, which is situated at a higher elevation, to the Hunter River. The pipeline will be constructed of high-density polyethylene, placed in a shallow trench (approximately 1 m wide) and covered with fill material. Adequate surface water runoff and sediment controls will be installed along the pipeline alignment to prevent damming of water and erosion.

Archaeological deposit, comprising stone artefacts, is predicted to occur within approximately 100 m of the Hunter River and Saltwater Creek. It has been determined that portions of the amended discharge pipeline occur within these areas of predicted archaeological deposit. Therefore, on the basis of the proposed constructions works, there is potential for archaeological deposit to be impacted by the amended discharge pipeline.

7.0 Management and Mitigation

Key findings of this addendum are:

- No registered AHIMS sites were identified within the areas of impact for the amended haul road/conveyor option and discharge pipeline alignments.
- No surface archaeology has been identified along the amended haul road/conveyor option alignments.
- No surface archaeology has been identified along the amended discharge pipeline alignment.
- No areas of subsurface archaeological sensitivity have been identified along the amended haul road/conveyor option alignments.
- Areas of high subsurface archaeological potential have been identified associated with the Hunter River and Saltwater Creek where the amended discharge pipeline is to be constructed. Archaeological deposit, comprising stone artefacts, is predicted to occur within approximately 100 m of the Hunter River and Saltwater Creek.

On the basis of the above findings, the following recommendation is made:

- Where deemed appropriate within the broader archaeological test and salvage excavations planned for the Project, a program of archaeological test excavation should be undertaken where the discharge pipeline occurs in areas of high subsurface archaeological potential. Details for the test and salvage excavation program will be addressed within the ACHMP to be prepared upon Project Approval.

8.0 References

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