Table 13 Community Stakeholder Issues Raised

REF	ISSUE RAISED	EA SECTION
1	**Air Quality**	
a	Monitoring of PM2.5	7.1
b	Fitting of machinery with filters	7.1
c	Monitoring locations, responsibility and data availability	Figure 6
d	Community input into monitoring locations	7.1
e	Source and relevance of wind data	7.1
f	What dust and environmental conditions will lead to triggers to cease mining	7.1
g	Cease mining trigger thresholds and community participation in triggers	7.1
h	Dust generation from rail movements and use of chemical dust suppressants or covers	7.1
i	Dangerous gas emissions relating to blasting and monitoring of such emissions	7.4
j	Dust impact on stock, pasture and crops	7.1
2	**Water Quality and Quality**	
a	Water testing for heavy metals	7.10 & 7.11
b	Potential penetration of groundwater aquifer	7.11
c	Penetration of the aquifer by chemicals used in coal washing facility	7.10
d	Burial of chemicals inpit	7.11 & 7.12
e	Sediment deposition into Maules Creek	7.10
h	Compensation if groundwater is affected	7.11
i	Forensic water testing on grid moving out from the mine to develop baseline data	7.10 & 7.11
3	**Trains and Traffic**	
a	Rail line intersecting with Therribri Road and Kamilaroi Highway	3.4
b	Road transport of coal	3.4
c	Need for helicopter pad	3.7
d	Employee road use	3.5 & 7.14
e	Sealing of Therribri Road	7.14
f	Times of shift change	7.14
g	Control of traffic on smaller roads	7.14
h	Location of roads and Maules Creek Village on maps	Figure 32
i	Need to upgrade Iron Bridge to B-Double standard if proposed to be preferred route	7.14
j	Capability of railway to handle increased transport	7.14
k	Impact of railway on other freight and passenger trains	7.14
l	Utilising shared rail facilities with other mines	7.14
m	Absence of Browns Lane on maps and possibility of traffic studies on the road as Browns Lane provides a shorter route to the mine	7.14
n	Public road contributions	7.14
4	**Noise and Blasting**	
a	Distance of blast noise and vibration impact	7.3 & 7.4
b	Blasting schedule and communication of schedule to community	7.4

REF	ISSUE RAISED	EA SECTION
c	Operational noise levels and noise minimisation techniques	7.3
d	Train noise minimisation	7.3
e	Train line operation times	3.4
f	Operation hours	3.9
g	Assessment of noise impact on stock	7.3
5	**Land Acquisitions**	
a	Purchase of *"offset"* blocks and type and size of land of interest	7.7
b	Future use of acquired land	7.16
6	**Post-Mining**	
a	Final void	7.16
b	Plans for mining after 20 years	7.16
7	**Other**	
a	Recognition as a stakeholder and regular ongoing consultation *"at every step of the process"*	5
b	Time of two day open forum in Boggabri	5.2
c	Consultation with community as part of assessments / studies	5
d	Impacts on and communications with Fairfax Public School in Maules Creek	7.20
e	Method of calculation of net production benefit to society and period of delivery	9
f	Intentions for A 346	4.5
g	Destination of coal	3.4
h	Sale of gravel to Councils	3

5.4 ABORIGINAL COMMUNITY ENGAGEMENT

OEH released the 'Aboriginal cultural heritage consultation requirements for proponents 2010' (DECCW 2010a) on 12 April 2010 that supersede the previous 'Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation' (DECCW 2005c) and 'Interim Community Consultation Requirements for Proponents' (DECCW 2004a).

These requirements were followed throughout the planning and preparation of this EA for the Project to ensure that an appropriate level of engagement was undertaken with the Aboriginal community.

Further detail on the engagement undertaken with the local Aboriginal community stakeholders is provided below with the results of the Aboriginal Archaeology and Cultural Heritage Impact Assessment described in **Section 7.8**.

5.4.1 Notification and Registration

To identify, notify and register Aboriginal people who hold cultural knowledge relevant to determining the cultural significance of the Project, the following organisations were all notified of the Project in writing on 10 June 2010, requesting information regarding the contact details of known Aboriginal stakeholder groups in the locality who may wish to be a part of the consultation program for the Project.

Letters were sent to: OEH in Dubbo, NSC, National Native Title Tribunal, NSW Department of Aboriginal Affairs – Office of the Registrar, Red Chief Local Aboriginal Land Council (RCLALC), Native Title Services Corporation Limited (NTSCORP Limited) and Namoi CMA – Tamworth.

A public notice (with details of the Project) was included in the local newspapers (the Namoi Valley Independent and The Courier) on 15 June 2010 to further identify Aboriginal stakeholders who wished to be consulted in regard to the Aboriginal Archaeological and Cultural Heritage Impact Assessment. An extensive list was compiled, consisting of 19 known Aboriginal stakeholder groups.

Wiawa Aboriginal Corporation (WAC) which was identified by correspondence from NSC dated 24 June 2010 later indicated that they did not wish to be further consulted in relation to the Project.

A full list of all known Aboriginal stakeholder groups that were consulted is presented in **Table 14**.

5.4.2 Notification of Registration to OEH and the Local Aboriginal Land Council

A copy of the following documentation was provided to OEH and the RCLALC on 5 August 2010:

- Public notices of the Assessment;
- The original letter sent to Aboriginal organisations notifying them of the Assessment; and
- A record of the Aboriginal stakeholder groups who had registered an expression of interest for the Assessment.

Each of the registered Aboriginal stakeholder groups were afforded the opportunity to withhold their information being provided to OEH and RCLALC at this initial phase of the consultation. As a result, OEH and RCLALC were initially provided the names of thirteen and five registered Aboriginal stakeholder groups respectively.

5.4.3 Engagement Regarding Survey Strategy and Conservation Values

All registered Aboriginal stakeholders were invited to attend a Planning Meeting to discuss the various aspects of the Project including the Aboriginal Heritage consultation program, draft methodology and associated fieldwork involvement. The Planning Meeting was held at the Boggabri RSL Memorial Club on Friday, 13 August 2010.

In total, 20 Aboriginal stakeholders representing 16 of the 18 registered organisations attended the Planning Meeting. Only representatives from WWLALC and BBTP were unable to attend. Representatives from Aston, Hansen Bailey and AECOM (Archaeologist for the Project) were present to discuss the various components of the Project.

5.4.4 Summary of Responses

Correspondence was received from 18 Aboriginal groups in response to the proposed survey methodology, each expressing an interest to participate in the fieldwork. All except two groups (RCLALC and BBTP) accepted the proposed methodology. All written responses and acceptances of the methodology are provided in **Appendix J**.

Table 14 Aboriginal Stakeholder Groups

REF	NAME OF GROUP
1	RCLALC
2	Bigundi Biame Traditional People (BBTP)
3	Min Min Aboriginal Corporation (MMAC)
4	Gunida Gunyah Aboriginal Corporation (GGAC)
5	Elli Lewis Cultural Heritage Consultants (ELCHC)
6	Cacatua Cultural Consultants (Cacatua)
7	Gomeroi Narrabri Aboriginal Corporation (GNAC)
8	Aboriginal Native Title Consultants (ANTC)
9	Giwiirr Consultants (GC)
10	Hunter Valley Culture Consultants (HVCC)
11	Mingga Consultants (MC)
12	Upper Hunter Heritage and Culture Consultants (UHHCC)
13	Bullen Bullen Consultants (BBC)
14	Narrabri Local Aboriginal Land Council (NLALC)
15	Wee Waa Local Aboriginal Land Council (WWLALC)
16	Aboriginal Natural Resource Officer
17	Carrawonga Consultants (CC)
18	Mooki River Consultants
19	WAC

RCLALC indicated in their response that while the Aboriginal Heritage Information Management System (AHIMS) database shows limited cultural heritage items within the Project Boundary, the area should not be underestimated for its potential to contain additional items. RCLALC requested that two representatives from their group be included throughout the duration of the field assessment. BBTP expressed concern that by having a rotating roster developed for the completion of the field assessment, consistent results would not be achieved.

BBTP requested that a representative be present for the duration of the field assessment. No additional concerns or comments were raised by any Aboriginal stakeholder group in relation to the Project or the methodology.

After careful consideration by AECOM and Hansen Bailey, it was determined that the methodology developed for the Project would provide an adequate assessment as a means to determine Aboriginal archaeology and cultural heritage present in the vicinity of the Project Boundary.

5.4.5 Fieldwork

A total of 18 Aboriginal stakeholder groups indicated they would like to participate in the fieldwork component of the Aboriginal Archaeology and Cultural Heritage Assessment.

On 16 August 2010, a letter was sent to all registered groups confirming the dates for the upcoming fieldwork, providing a copy of the presentation from the planning meeting and a request for the provision of the relevant insurances prior to the individual group's attendance at the fieldwork.

Fieldwork was conducted over 15 working days from 23 August to 10 September 2010 with an additional three days of survey from 29 September to 1 October 2010. Archaeologists from AECOM were present to conduct the archaeological survey. Two Aboriginal stakeholder groups who originally expressed an interest in the fieldwork could not participate due to other commitments.

Approximately 3,550 ha of land within the Project Boundary and adjacent Aston owned land was surveyed in accordance with the methodology developed for the Project.

Information regarding the attendance of each Aboriginal stakeholder group and representatives who participated in the archaeological survey is presented in **Table 15**.

5.4.6 Aboriginal Archaeology and Cultural Heritage Report Engagement

A hard copy of the draft Aboriginal Archaeology and Cultural Heritage Impact Assessment was circulated to 18 registered stakeholders on 3 November 2010.

Over 36 follow up telephone calls were made during November 2010 to seek views on the Project. Nine responses were received from the Aboriginal community which were considered and incorporated into the final Aboriginal Archaeology and Cultural Heritage Impact Assessment described in **Section 7.8**.

Table 15 Archaeological Survey Participants

FIELDWORK	ABORIGINAL STAKEHOLDER GROUP	REPRESENTATIVE(S)
Group 1 **23 August – 1 September 2010**	RCLALC	Peter Beale
	BBTP	Gary Griffiths
	Cacatua	George Sampson
	ELCHC	Stephen Hands
	GC	Rodney Wortley
	HVCC	Yani Wortley
	BBC	Karen Matthews
	CC	Trent Sclberras and Josh Matthews
	ANTC	Tania Matthews
Group 2 **2 September – 10 September 2010**	RCLALC	Peter Beale
	MMAC	Allan Talbott
	GNAC	Mick Trindall
	GGAC	Chayne Gardner
	MC	Tania Matthews
	UHHCC	Karen Matthews
	NLALC	Raymond Smith
	WWLALC	Josh Trindall
Group 3 **29 September – 1 October 2010**	RCLALC	Peter Beale
	BBC	Tania Matthews
	BBTP	Karen Matthews
	NLALC	Raymond Smith

5.5 ONGOING STAKEHOLDER ENGAGEMENT

Aston is committed to the continuation of its stakeholder engagement program developed for the Project and is seeking to achieve the best possible outcomes for all Project stakeholders.

Ongoing stakeholder engagement will include regular contact with neighbouring landowners, representatives of key local and State regulatory authorities, industry bodies and the Aboriginal community and the regular production of public information on environmental performance. A Project Newsletter will be distributed upon the submission of this EA providing an update on the process and where this EA may be viewed by the community.

Mechanisms that will be implemented to ensure the effective ongoing engagement and communication with the Project stakeholders will include:

- Regular engagement with individual near neighbours;
- Development of the Maules Creek Coal Community Consultative Committee (Maules Creek CCC) should Project Approval be granted;
- Distribution of regular Project specific newsletters;
- The uploading of Management Plans and up to date monitoring data on the Aston Resources website;
- Regular presentations to NSC and mine site open days; and
- Participation at key community events (e.g. Maules Creek Campdraft, Boggabri Business Promotions Association, Boggabri Annual Christmas Market Day).

An Annual Review will be prepared subsequent to approval that will summarise company activities and performance in the areas of health, safety, environment and community. The Annual Review will be made available to the public in hard copy upon request and will be uploaded onto the Aston website.

SECTION

6

Risk Assessment

SECTION 6

Risk Assessment

A preliminary risk assessment was undertaken to identify potential environmental issues associated with the Project as part of the PEA which supported the Major Projects Application to DP&I. The primary purpose of the Risk Assessment process was to prioritise and focus the required environmental assessments for the Project. Each of the environmental issues has now been assessed and addressed to a relevant extent, and where appropriate, management and mitigation options were developed.

Following stakeholder engagement and the receipt of the EARs, a revision of this preliminary risk assessment was undertaken to incorporate additional requirements. The revised risk assessment is presented in full in **Appendix E**. The key risks identified for the Project were analysed in accordance with the Aston Risk Assessment Matrix which is based on the probability of the impact occurring and potential consequences of the impact.

Each potential environmental issue was ranked as either being of extreme, high, moderate or low risk to the environment.

Risk rankings identified for each aspect of the Project were further evaluated based on the outcomes of the stakeholder engagement program, as required.

Findings from the revised risk assessment indicated several aspects associated with the Project which, in the absence of controls, potentially posed a high to moderate environmental risk, whilst many of the aspects were rated as low risk. No extreme risks were identified as part of the risk assessment process (see **Table 16**).

Aspects identified throughout the risk assessment process as high, moderate and low have each been assessed as part of this EA. Aspects identified as having a higher environmental impact risk formed the primary focus of this EA and were more intensively assessed. Aspects which have been identified as having a moderate to low risk were also assessed however a lesser scope of work was conducted for these secondary issues, based on their lower risk rating. The detailed assessment undertaken within the EA has assessed the potential environmental impacts as a result of the Project and developed relevant management and mitigation measures to reduce the risks shown below.

Table 16 Environmental Risk Rating

EXTREME RISK	HIGH RISK	MODERATE RISK	LOW RISK
None	Ecology	Non-Indigenous Heritage	Spontaneous Combustion
	Aboriginal Archaeology and Cultural Heritage	Traffic and Transport	Hazardous Materials
	Air Quality	Visual and Lighting	Soils and Land Capability
	Surface Water and Flooding	Social	Final Land use and Closure
	Groundwater	Economics	Bushfire
	Community Concern	Geochemical	
	Final Landform	Noise and Blasting	
	Waste	Greenhouse Gas emissions	
		Rehabilitation	

SECTION

7

Impacts, Management and Mitigation

SECTION 7

Impacts, Management and Mitigation

This section provides a summary of predicted environmental and social impacts from the Project and discusses the management and mitigation measures to be implemented as appropriate. The issues have been prioritised in accordance with the EARs and the risk assessment (in consideration of stakeholder engagement) described in **Section 6**.

7.1 AIR QUALITY

7.1.1 Background

The air quality modelling has been prepared following the procedures outlined in the OEH 'Approved Methods for the Modelling and Assessment of Air Pollutants in NSW' (Approved Method) (DEC 2005b). The air quality assessment included a quantitative assessment of the potential air quality impacts of the Project, including:

- Meteorological and climatic conditions and the existing air quality conditions within the region;
- Applicable air quality criteria relevant to the Project;
- Methods used to estimate dust emissions from the Project for selected future years;
- Predicted dust dispersion patterns due to emissions from the Project and cumulative impacts from other sources;
- Comparison between the predicted dust concentrations and deposition levels to relevant criteria; and
- Management and mitigation measures, as required.

A summary of the air quality assessment is provided below.

7.1.2 Methodology

Meteorological Data

As discussed in **Section 2.4**, meteorological data was examined from a number of monitoring stations. The data was compiled for use in a meteorological modelling program (CALMET) to provide a full year of site representative data for the purposes of modelling (Maules Creek MD). Further detail on the methodology used is provided in **Appendix F**.

Background Air Quality

Aston conducts air quality monitoring at the locations as shown on **Figure 6**. Representative long term air quality monitoring data collected at the neighbouring Boggabri Coal Mine and Tarrawonga Mine (see **Figure 6** for locations) has also been used to develop the existing air quality baseline for the area. Air quality monitoring undertaken by Aston within the vicinity of the Project Boundary includes:

- Particulate matter less than 10 microns in diameter (PM_{10}), measured every sixth day using a High Volume Air Sampler (HVAS); and
- Deposited dust at three representative monitoring locations.

A comparison of the seven months of data collected from the Maules Creek monitoring program showed good correlation with the levels collected for the neighbouring mines.

A detailed review of all available monitoring data was completed for the Project and is provided in **Appendix F**. The review concluded:

- 24-hour PM_{10} concentrations generally remain well below the air quality criterion of 50 μg/m3, with the exception of periods where dust storms and high winds occur across NSW;
- Annual average PM_{10} concentrations generally remain below the OEH criterion of 30 μg/m3; and
- There are significant spatial variations in dust deposition surrounding the Project Boundary as a result of regional agricultural activities, existing mining operations and prevailing wind directions.

Assessment Criteria

Table 17 and **Table 18** summarise the OEH air quality assessment criteria relevant to the Project. Generally, these air quality criteria relate to the total dust burden in the air and not just the dust generated by the Project. As such, consideration of background levels needs to be made when using these criteria to assess impacts.

In addition to the consideration of possible health impacts, airborne dust also has the potential to cause nuisance impacts by depositing on surfaces. **Table 18** shows the maximum acceptable increase in dust deposition over the existing dust levels. The criteria for dust fallout levels are set to protect against nuisance impacts on a cumulative basis from all dust sources (DEC 2005).

Air Quality Modelling

The air quality assessment utilised the Approved Method being the most contemporary guidelines for the modelling and assessment of air pollution sources using dispersion models (DEC 2005a).

The model package used for the assessment was a modified version of the US EPA ISCST3 model (ISCMOD). Indicative mine plans for years 5, 10, 15 and 21 of the Project were modelled. These mine plans represent potential worst case impacts arising from a range of coal and overburden production rates and mining activities in various locations within the Project Boundary.

The indicative mine plans and operational description for the Project have been used to determine haul road distances and routes, the location of stockpile and pit areas, activity operating hours, truck sizes and other details that are necessary to predict dust emissions for each year.

The modelling exercise assumed the cumulative impacts of neighbouring mining operations as follows:

- Boggabri Coal Mine operating consistent with the Boggabri EA that is currently being assessed by DP&I (Hansen Bailey 2010); and
- Tarrawonga Mine operating consistent with the Tarrawonga EA which was approved in October 2010.

7.1.3 Impact Assessment

Air Quality Predictions

Figure 15 illustrates the predicted worst case air quality contours (consolidating results from the modelled mine plans) for predicted annual average Total Suspended Particulates (TSP) concentrations, annual average PM_{10} concentrations, maximum 24 hour PM_{10} concentrations (Project alone) and annual average dust deposition in relation to neighbouring private receivers. The maximum 24 hour PM_{10} contour presents the maximum air quality levels predicted from the worst case operation of the Project. With the proactive management of operations utilising real time monitoring equipment, these maximum predicted levels are not likely to be experienced as a result of the Project alone.

Table 17 Particulate Matter Assessment Criteria

POLLUTANT	CRITERIA (µg/m³)	AVERAGING PERIOD	AGENCY
Total Suspended Particulates	90	Annual mean	National Health and Medical Research Council
PM_{10}	50	24-hour maximum*	OEH
	30	Annual mean	OEH long term reporting goal

Source: DEC, 2005.

* Applies for each of i) Project alone and ii) cumulative, provided the Project is implementing best practice dust controls.

Table 18 Dust Deposition Assessment Criteria

POLLUTANT	AVERAGING PERIOD	MAXIMUM INCREASE IN DEPOSITED DUST LEVELS (g/m²/MONTH)	MAXIMUM TOTAL DEPOSITED DUST LEVELS (g/m²/MONTH)
Deposited Dust	Annual mean	2	4

Source: DEC, 2005.

The results from the dispersion modelling indicate that the Project considered alone (and cumulatively with other sources) is predicted to contribute to exceedances of air quality criteria at the receivers and properties as summarised in **Table 19**.

An analysis was also carried out to determine the probability of cumulative 24 hour average PM_{10} concentrations exceeding the 50 μg/m3 criterion at neighbouring receivers. The analysis indicated the receivers most likely to experience cumulative 24 hour PM_{10} impacts are those that are predicted to be impacted from the Project alone (**Table 19**).

There are eight additional receivers where the probability of cumulative impacts is greater than 1% (Receivers 53, 104, 105, 106, 111b, 122, 123, and 281).

Operational Discussion

There are no private receivers predicted to experience air quality levels that exceed the OEH assessment criterion for annual average TSP for the Project alone or on a cumulative basis. Similarly, there are no private receivers predicted to experience annual average dust deposition levels that exceed the OEH assessment criterion due to the Project alone or on a cumulative basis.

Two receivers are predicted to experience annual average PM_{10} levels and 24 hour PM_{10} levels greater than the relevant criterion. Aston has reached an agreement with these landholders to purchase these properties.

A further two properties are predicted to experience annual average PM_{10} levels greater than the relevant criterion over more than 25% of the property areas. Aston has an agreement in place with one landholder to purchase their property, whilst the second property has a right to acquisition upon written request from a neighbouring coal mining operation.

The modelling of the PM_{10} 24 hour maximum dust levels has shown that three additional receivers may experience air quality levels greater than the relevant criteria for up to one day per year. These maximum impacts represent the worst case operation of the Project under adverse prevailing weather conditions and it is expected that the proactive management of operations would result in modifications to operations and these impacts would not be experienced at these receivers.

No exceedances of the relevant criteria have been predicted at all other private receivers.

Rail Spur

PAEHolmes reviewed an assessment that was commissioned by Queensland Rail (QR) that provided an environmental evaluation of coal dust emissions from rail lines in the Central Queensland Coal Industry (Connell Hatch 2008). This study showed that based on results of monitoring and modelling predictions there appears to be minimal risk of adverse impacts due to fugitive coal emissions from trains. The results of monitoring and modelling indicate that nuisance coal dust levels at the edge of the rail corridor are below levels that are known to cause adverse impacts on amenity.

PAEHolmes has concluded that the findings of the QR study are mostly applicable to NSW and that the observations from this study can generally be applied to the NSW network. On this basis, the potential for environmental harm caused by the increased coal train movements from the Project is likely to be low, in terms of health and amenity impacts, beyond distances of approximately 15 m from the rail lines. As such, there are no sensitive receivers along the proposed rail spur located within 15 m of the proposed rail spur that will be affected by the Project.

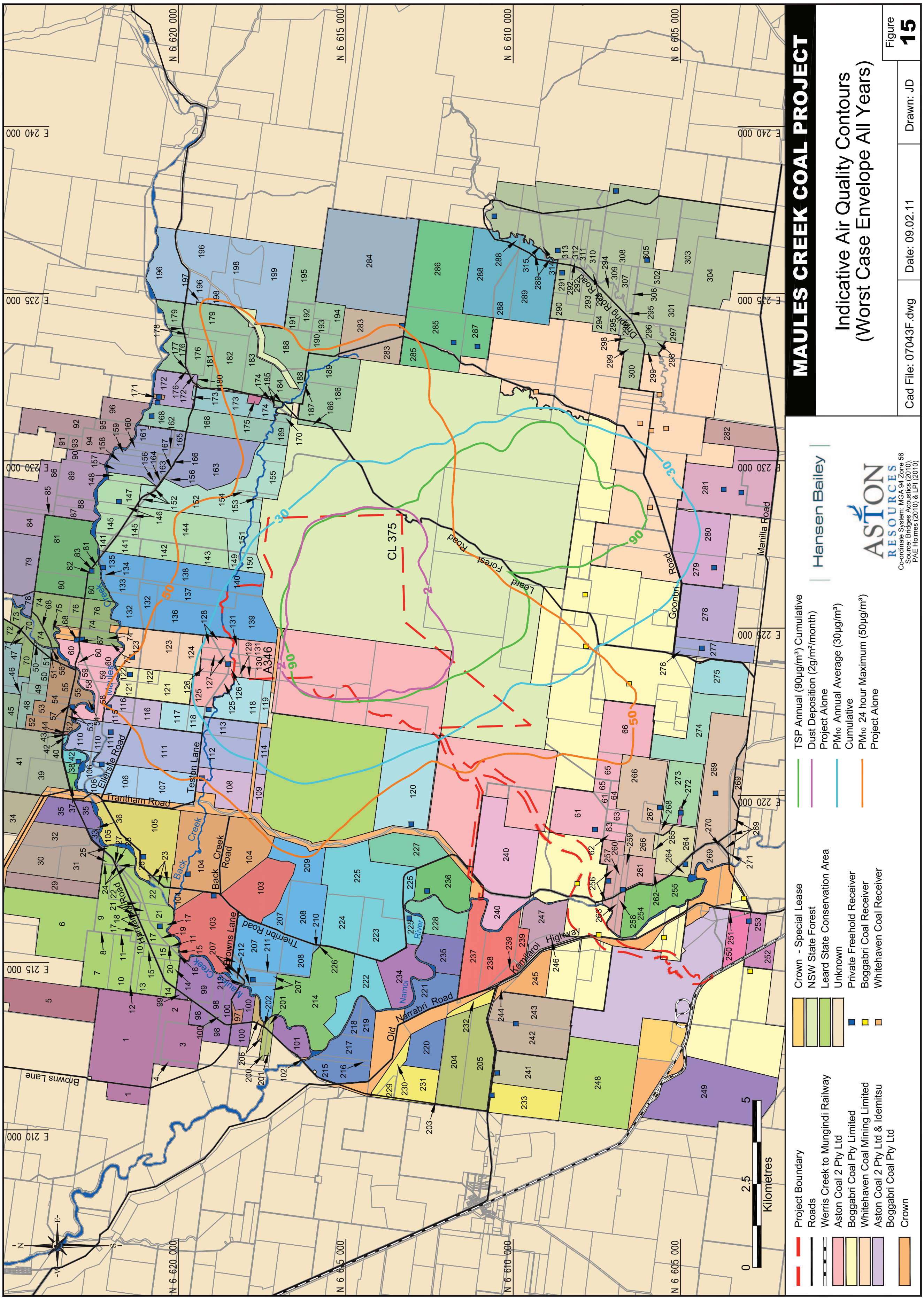
Table 19 Summary of Predicted Air Quality Exceedances

ID	RECEIVER	PM_{10} 24 HOUR PROJECT ALONE (50 µg/m³) DAYS PER YEAR ABOVE CRITERIA (> 5)	PM_{10} ANNUAL PROJECT AND OTHER SOURCES (30 µg/m³)
RESIDENCES			
118	MJ & ML Nott* ^ ^	Year 10 – 7 Days	Year 10 – 31 μg/m3
126	DJC Watson* ^ ^	Year 10 –18 days	Year 10 to Year 21– Up to 36 μg/m3
25% CONTIGUOUS PROPERTY			
125–131	DJC Watson* ^ ^	N/A	All Years - Up to 98%
132-140	VA & MA Younger* ^ ^	N/A	Years 15 and 21 – Up to 32%
117-119	MJ & ML Nott* ^ ^	N/A	All Years - Up to 35%
279-280	RP & RD McGregor**	N/A	Year 5 – Up to 35%

* Aston have purchased or reached an agreement for the purchase of this property.

** Entitled to acquisition upon request in Tarrawonga Mine EA (Resource Strategies 2010).

^ ^ Predicted to exceed noise criteria in Section 7.4.3.


MAULES CREEK COAL PROJECT
Indicative Air Quality Contours (Worst Case Envelope All Years)
Hansen Bailey
ASTON RESOURCES
Co-ordinate System: MGA 94 Zone 56
Source: Bridges Acoustics (2010), PAE Holmes (2010) & LPI (2010)
Cad File: 07043F.dwg
Date: 09.02.11
Drawn: JD
Figure 15
Project Boundary
Roads
Werris Creek to Mungindi Railway
Aston Coal 2 Pty Ltd
Boggabri Coal Pty Limited
Whitehaven Coal Mining Limited
Aston Coal 2 Pty Ltd & Idemitsu
Boggabri Coal Pty Ltd
Crown
Crown - Special Lease
NSW State Forest
Leard State Conservation Area
Unknown
Private Freehold Receiver
Boggabri Coal Receiver
Whitehaven Coal Receiver
TSP Annual (90µg/m³) Cumulative
Dust Deposition (2g/m²/month) Project Alone
PM10 Annual Average (30µg/m³) Cumulative
PM10 24 hour Maximum (50µg/m³) Project Alone
Kilometres
0
2.5
5
CL 375
Leard Forest Road
Goonbri Road
Manilla Road
Kamilaroi Highway
Old Narrabri Road
Therribri Road
Browns Lane
Teston Lane
Trantham Road
Back Creek Road
Ellerslie Road
Harparary Road
Namoi River
Maules Creek
A346
N 6 620 000
N 6 615 000
N 6 610 000
N 6 605 000
E 210 000
E 215 000
E 220 000
E 225 000
E 230 000
E 235 000
E 240 000

Worst Case Air Quality Impacts

Should the Tarrawonga Southern EL and Goonbri EL be developed in the future, cumulative air quality impacts to a few receivers near these developments may occur if all five mining operations occurred simultaneously.

Given the location of the Project relative to the other four developments, cumulative air quality impacts with a significant contribution from the Project are unlikely to occur at any receiver.

Construction Activities

Construction activities associated with the Project were considered within the air quality impact assessment. The assessment found that with utilisation of standard operational management and mitigation techniques, the construction phase of the Project will have negligible impacts on air quality. Further, these activities will remain within the air quality predictions for the operation of the Project.

Spontaneous Combustion

Spontaneous combustion in coal and other carbonaceous materials is the result of self heating which can occur from an exothermic reaction such as oxidisation.

Spontaneous combustion is not anticipated to occur within the target coal seams for the Project, consistent with adjacent operations.

7.1.4 Mitigation and Management

As part of its EMS, Aston will develop an Air Quality Management Plan for the construction and operation of the Project.

This Air Quality Management Plan will incorporate practical leading practice, dust minimisation management measures to be implemented to operations, which will include (but not be limited to):

- Minimising overburden and ROM coal haul road haulage distances;
- Using wind activated automated water sprays on coal stockpiles and motion automated water spray transfer points;
- Employing either water or a dust suppression product on all active coal and overburden haul roads;
- Minimising disturbance areas;
- Dust suppression on conveyor system and transfer points;
- Revegetating disturbed areas as soon as practical, including temporary rehabilitation of areas that are not being used for extended periods of time (e.g. western and southern ends of the Northern OEA) and obsolete haul roads;
- Monitoring, management and reporting in the unlikely event of any incidences of spontaneous combustion;
- Utilisation of a real time air quality monitoring system to proactively manage operations in order to keep air quality emissions below the relevant criteria at neighbouring receivers; and
- Provide a notification to all landholder listed in **Table 19** that are predicted to exceed the relevant assessment criteria and have the right to be acquired by Aston upon written request.

The management measures mentioned above have been devised during the preparation of the mine plan for the Project and the impact assessment process, through the investigation of a number of alternatives. During the preliminary air quality investigations, it was identified that road haulage activities generated the greatest emissions.

As a result, Aston has committed to implementing a greater level of haul road control to operations to ensure that impacts to neighbouring receivers are controlled to the maximum extent achievable. This mitigation measure will reduce the short term air quality impacts surrounding the operation and will be a significant additional operating cost throughout the life of the Project.

Air quality management and minimisation practices will be implemented to ensure that the Project does not exceed the relevant criteria at all other privately owned receivers (other than those listed in **Table 19**).

Aston will develop a leading practice air quality monitoring system surrounding the site in consultation with Boggabri Coal Mine and Tarrawonga Mine and representatives of the closest sensitive receivers; which shall include a:

- Real time meteorological monitoring station with predictive software capabilities; and
- A network of real time monitors recording PM_{10} (including a Tapered Element Oscillating Microbalance (TEOM) unit(s)) along with TSP units and dust deposition gauges.

The proposed real time meteorological monitoring station with predictive software capabilities will enable meteorological forecasts to be made for upcoming days. These predictions will be utilised in a predictive dispersion model representing the proposed operations and highlight activities with the potential to generate excessive dust. This provides the Site Manager with the information required to implement appropriate management controls to operations to keep emissions to an acceptable level. These management controls may include relocating equipment from exposed locations and shutting down certain activities during certain weather conditions.

Aston has commenced work with neighbouring mines to develop the real time air quality monitoring network. This network will assist these mines in proactively managing the air quality emissions from their operations on a mutual basis to reduce adverse impacts to neighbouring sensitive receivers.

As a component of this monitoring network, Aston proposes to install and operate a TEOM unit capable of measuring $PM_{2.5}$ at a location representative of receivers located within the Maules Creek community.

It is anticipated that the network of TEOM units will relay data in real time to a central database. The database will be accessible by relevant site personnel to assist in reviewing the operations on a continuous basis.

Trigger levels to be defined within the Air Quality Management Plan will be inserted into the database that would trigger alarms when elevated dust emissions are experienced at the units. These alarms would prompt the Site Managers to review their mining operations and incorporate modifications as required in order to keep emissions at an acceptable level. Various trigger levels will be developed, each level requiring a certain intensity of action. These trigger levels will be developed appropriate to the site conditions, and will need to be refined during the early stages of operation as the system is calibrated.

Aston will develop an EMP to the approval of DP&I which will comprise air quality monitoring (as discussed above) and the various management and mitigation measures to be implemented to operations to minimise adverse impacts on sensitive receivers.

7.2 GREENHOUSE GAS

7.2.1 Background

PAEHolmes conducted an air quality and greenhouse gas assessment for the Project which is presented in full in **Appendix F**. A summary of the greenhouse gas assessment is provided below.

7.2.2 Methodology

The greenhouse gas assessment has been based upon the methods outlined in the following documents:

- The World Resources Institute / World Business Council for Sustainable Development Greenhouse Gas Protocol;
- National Greenhouse and Energy Reporting (Measurement) Determination 2008; and
- The Australian Government Department of Climate Change and Energy Efficiency (DCCEE) National Greenhouse Accounts Factors 2010.

Consideration was also given to the *Guidelines for Energy Savings Action Plans* (DEUS 2005).

Three 'scopes' of emissions (scope 1, scope 2 and scope 3) are defined for greenhouse gas accounting and reporting purposes and have been considered in this assessment for the following gases:

- Carbon dioxide (CO_2);
- Methane (CH_4);
- Nitrous oxide (N_2O); and
- Synthetic gases (HFCs, SF_6, CF_4, C_2F_6).

Emission factors are standardised and expressed as a carbon dioxide equivalent (CO_2-e) which is calculated by multiplying the individual gas emission factor by its respective Global Warming Potential (GWP).

7.2.3 Impact Assessment

The main sources of greenhouse gas emissions from the Project have been identified as resulting from electricity consumption, fugitive emissions of CO_2 and CH_4, diesel usage, explosives usage, and the transport and end use of the product coal.

The average annual emissions from these sources are summarised in **Table 20**.

When comparing greenhouse gas emissions from the Project, including the mining, transporting the coal to the Port of Newcastle and end usage of the coal (30,028,092 t of CO_2 equivalent per annum) with the estimated current global emissions (3,000 Giga t CO_2 equivalent per annum), it has been calculated that the average annual emissions of the Project are estimated to be approximately 0.001% of the current global CO_2 emissions.

The emissions estimated to result from the Project will not individually have any significant impact on global warming. Applying the principles of ESD, it is considered that there will be no increase or measureable impact on climate change as a result of the Project.

7.2.4 Mitigation and Management

Feasible and reasonable measures that will be implemented onsite to minimise the greenhouse gas emissions of the Project to ensure it is energy efficient include:

- Contributing, through Industry bodies, into the research and promotion of low emission coal technologies;
- Improving energy use and efficiency and reducing greenhouse gas emission from the mining, processing and transport of coal;

Table 20 Total Greenhouse Gas Emission Predictions and CPRS Applicability

ACTIVITY	EMISSIONS (t CO_2-E)	CPRS APPLICABLE *
Diesel usage	203,114	Yes
Electricity consumption	60,508	No
Explosives use	1,927	No
Fugitive methane	6,755	Yes
Transport of coal (rail)	103,338	No
End use of coal	29,652,451	No
Total	**30,028,092**	

* Scope 1 emissions only are covered by the Commonwealth Government's proposed Carbon Pollution Reduction Scheme (CPRS) (DCC 2008) which has been delayed until after 2012.

- Consideration of the use of alternative fuels where economically and practically feasible;
- Review of mining practices to minimise double handling of materials and ensuring that coal and overburden haulage is undertaken using the most efficient routes;
- Ensuring that lighting and heating are only used when required;
- Ongoing scheduled and preventative maintenance to ensure that diesel and electrically powered plant operate efficiently; and
- Develop targets for greenhouse gas emissions and energy use onsite and monitor and report against these.

7.3 NOISE

7.3.1 Background

A noise and blasting impact assessment for the Project was completed by Bridges Acoustics and is presented in full in **Appendix G**.

The noise assessment included consideration of operational mining noise, construction noise, road and rail noise, sleep disturbance and low frequency noise.

The noise assessment is summarised below and has been undertaken in accordance with the following policies and guidelines:

- The *NSW Industrial Noise Policy* (INP) (EPA 2000) for operational and construction noise;
- The *Environmental Noise Control Manual* (ENCM) (EPA, 1985), specifically Chapter 19 related to sleep disturbance criteria;
- The *Environmental Criteria for Road Traffic Noise* (ECRTN) (EPA 1999) for road traffic noise; and
- The *Interim Guideline for the Assessment of Noise from Rail Infrastructure Projects* (DECC 2007b) for noise from train movements on the Werris Creek to Mungindi Railway.

A summary of this noise impact assessment is provided in the following sections.

7.3.2 Methodology

Introduction

Predicted noise levels at receivers for operations using indicative mine plans for Year 1, Year 5, Year 10, Year 15 and Year 21 of the Project were calculated using RTA Technology's Environmental Noise Model (ENM).

ENM is considered the most appropriate choice for situations involving complex terrain, a large number of noise sources and where a detailed assessment of the effect of weather conditions on noise propagation is required. It has previously been endorsed by OEH for assessing noise from Projects of this type.

The ENM model included operating scenarios for the five representative years which were chosen to represent reasonable worst case noise levels to all receivers around the Project Boundary. All operating scenarios included normal mining activities, coal handling and processing activities, operation of the rail loading facility and three locomotives operating at low speed on the loading loop. A train movement on the rail spur was included in one operating scenario for each assessed year. Additional model scenarios were used to determine construction and sleep disturbance noise levels to ensure these issues were comprehensively assessed.

Background Noise Levels

The Project is located in a quiet rural area at some distance from major sources of background noise such as arterial roads or other industrial developments. The Boggabri Coal Mine is located approximately 3 km to the south of the Project Boundary. Background noise monitoring completed for the Project has indicated background levels regularly occur below 30 dBA during all time periods at all monitoring locations. A Rating Background Level (RBL) of 30 dBA was adopted for all receivers and time periods for this assessment.

Noise Criteria

Project Operational Noise

The INP recommends two separate noise criteria be applied to operational noise, these being an intrusive criterion 5 dBA above the background noise level and an amenity criteria which depend on the nature of the receiver area and the existing level of industrial and mining noise in each time period.

The RBL and adopted noise criteria (including cumulative noise impacts from other industrial or mining developments and construction noise criteria for the Project) for all receivers are shown in **Table 21**.

Occupied areas of the Leard State Forest and the Leard State Conservation Area would be considered *"passive recreation areas"* in accordance with the INP. These properties are not typically utilised for passive recreation as they do not contain tourist or visitor facilities such as camping or picnic areas. Should these area be utilised, these areas would be subject to a criterion of 50 $L_{Aeq,15min}$ during the day, when the area is occupied. However, as they are not utilised, no criteria would apply to these areas.

Cumulative Operational Noise

Cumulative noise impacts may potentially be caused by simultaneous operation of the Project, Boggabri Coal Mine and Tarrawonga Mine. The cumulative amenity criteria for the most critical night period are expressed as $L_{Aeq(9\ hr)}$ which is the average noise level over an entire nine hour night. The $L_{Aeq(9\ hr)}$ from a typical mining operation, considering variations in operating conditions and weather conditions would be approximately 3 – 5 dBA lower than the $L_{Aeq(15\ min)}$ level. For the purposes of this assessment, the cumulative noise levels have been conservatively calculated as the $L_{Aeq(15\ min)}$ levels minus 3 dBA.

Construction Noise

Construction work has historically been assessed under the ENCM. However, OEH has recently published the *Interim Construction Noise Guideline* (ICNG) (DECC 2009) which will replace the relevant chapter in the ENCM.

However, section 1.2 of the ICNG states it does not apply to industrial sources, including construction associated with quarrying and mining, and suggests this activity be assessed under the INP. As such the assessment for construction noise for the Project has been compared to the operational criteria discussed above and provided in **Table 21**.

Table 21 Background Noise and Project Operational Noise Criteria

PERIOD	RBL ($L_{A90,15MIN}$)	INTRUSIVE CRITERIA ($L_{AEQ,15MIN}$)	AMENITY CRITERIA, RURAL CATEGORY ($L_{AEQ,PERIOD}$)
Day	30	35	50
Evening	30	35	45
Night	30	35	40

The earthmoving phase for each construction project typically produces the highest sound power level and is therefore considered in this assessment. The following components were included in the construction noise assessment which, apart from the Therribri Road upgrade, would most likely occur simultaneously within Year 1 and would therefore represent a worst case assessment:

- Water pump station, power supply and pipeline;
- Therribri Road upgrade;
- Permanent Mine Access Road and rail spur;
- Water management structures including dams;
- Power supply to the Project;
- MIA including offices, workshop, fuel storage and bathhouse; and
- CHPP.

Proposed construction activities would generally be undertaken during daytime hours only. However, some construction activity during the evening and night may also be required to meet the proposed construction schedule. Any construction activities that would extend into the evening and night periods would be subjected to the operational noise criterion of 35 $L_{Aeq,15min}$ at all non mine owned sensitive receivers.

Construction activities that would likely be undertaken during the evening and night periods would specifically exclude the following activities:

- Pile driving or rock hammering;
- Drilling footings;
- Blasting;

- Rail ballast placing or shaping; and
- Rail laying.

The following evening and night construction activities within the Project Disturbance Boundary, MIA, CHPP or along the proposed rail spur alignment may be required:

- Planning, marking and setting out;
- Limited excavation or earthmoving;
- Concrete pour preparation and finishing;
- Mechanical and electrical work such as installation of equipment;
- Welding, threading and light pre assembly; and
- Checking, testing and commissioning.

The above activities have been assessed against the criteria.

Sleep Disturbance

Sleep disturbance can occur when a short, sharp noise is clearly audible over the background noise level. The OEH recommends a conservative sleep disturbance criterion of 15 dBA above the background noise level, which for the Project would be 45 $L_{A1(1\ min)}$. The sleep disturbance criterion applies at a point 1 m outside a bedroom window during the night period.

Road Traffic Noise

The principal access route to the Project would be via Manilla Road and Therribri Road which are considered 'local' roads for the purpose of the noise assessment. Relevant traffic noise criteria are listed in Table 1 in the ECRTN.

Noise criteria for Situation 13 *"Land use developments with the potential to create additional traffic on local roads"* are 55 $L_{Aeq(1\ hr)}$ during the day and 50 $L_{Aeq(1\ hr)}$ during the night and apply to all traffic on the road including vehicles associated with the Project. Noise criteria in the ECRTN only apply to residences.

The $L_{Aeq(1\ hr)}$ parameter refers to the average traffic noise level in the loudest 10% of the hours in a day or night. As it is difficult to determine the loudest 10% of the hours during the day and night, this assessment conservatively considers the loudest hour during a 24 hour period.

Low Frequency Noise

Section 4 of the INP recommends that low frequency noise levels are considered in the normal operational noise criteria by the addition of a 'modifying factor' to either a source sound power level or a received noise level. Any modifying factors that are relevant to the assessment, including low frequency penalties, have been applied to the adopted sound power levels for mining and transportation equipment. No additional assessment of low frequency noise levels is required.

Meteorology

As discussed in **Section 2.4**, analysis of the local weather conditions was carried out by PAEHolmes and resulted in a site representative meteorological data set being produced (Maules Creek MD). The Maules Creek MD was analysed to determine the relevant meteorological parameters to be input into the noise model.

The prevailing meteorological conditions which were subsequently included in the noise model are shown in **Table 22**. Winds and temperature inversions tend to increase noise levels for downwind receivers and the effects are cumulative. A 3°/100 m temperature inversion with a 2 m/s wind from source to receiver is (according to ENM) equivalent to a strong 8°/100 m temperature inversion. The weather conditions utilised in the assessment as shown in **Table 22** therefore represent strong noise enhancing conditions and would cause increased noise levels at downwind receivers compared to a 3°/100 m temperature inversion alone.

Table 22 Adopted Noise Assessment Meteorological Conditions

ATMOSPHERIC PARAMETER	DAY		EVENING AND NIGHT *		
	NEUTRAL	PREVAILING *	INVERSION NO WIND	INVERSION ESE WIND	INVERSION SSE WIND
Temperature (°C)	20	20	10	10	10
Relative Humidity (%)	70	70	90	90	90
Wind Speed (m/s)	0	3	0	2	2
Wind Direction	-	South	-	ESE	SSE
Temp Gradient (°C/100 m)	-1	-1	3	3	3

* Noise enhancing conditions.

7.3.3 Impact Assessment

Project Operational Noise

Figure 16 shows the combined worst case predicted noise levels for the Project for all scenarios modelled. Operational key assumptions utilised for the purposes of modelling and detailed predicted noise levels for all receivers are presented in **Appendix G**.

Predicted noise levels for both construction and operational activities include all feasible and reasonable noise management and mitigation measures (see **Section 7.3.4**) and represent the worst case scenario with all equipment operating under noise enhancing weather conditions. While this situation may occur occasionally, noise levels will generally be lower than the predicted levels. A summary of the predicted worst case modelled noise levels during all conditions for the Project at receivers is presented in **Table 23**.

Some residences and or properties (shown in bold) are predicted to receive noise levels of 40 dBA or above and are therefore expected to receive significant noise impacts from the Project (including noise from the rail spur). Residences predicted to receive 37 to 40 dBA are expected to receive moderate noise impacts from the Project, while residences predicted to receive 35 to 37 dBA are expected to receive mild noise impacts from the Project. A dash represents a prediction less than the intrusive criteria.

As shown in **Table 23**, two receivers owned by two landholders (who do not have a right to acquisition upon written request from a neighbouring coal mining operation) have been predicted to receive significant noise impacts from the Project under a worst-case modelling scenario. Aston has reached a purchase agreement with both of these receivers.

Three receivers (108, 120 and 259) are predicted to experience moderate noise impacts as a result of the Project. Two of these (120 and 259) are owned by landholders who own receivers who are predicted to experience significant noise levels. Four receivers (77, 82, 134 and 236) are predicted to experience minor noise impacts from the Project. Aston is committed to meeting the intrusive criteria at receivers 77 and 82 during the life of the Project. The landowner of receiver 134 holds land that is predicted to receive significant noise impacts over 25% of the property as a result of the Project and as such Aston has reached a purchase agreement for this property. Aston has also reached a purchase agreement with receiver 236.

Seven contiguous properties under individual ownership are anticipated to receive significant noise impacts from the Project under a worst case modelling scenario over more than 25% of the property area. One of these properties (254-255) has previously been predicted to be affected by the neighbouring Boggabri Coal Mine. Aston has reached purchase agreement with one landholder (132-140) and is in ongoing discussions with the remaining receivers in relation to reaching appropriate agreements.

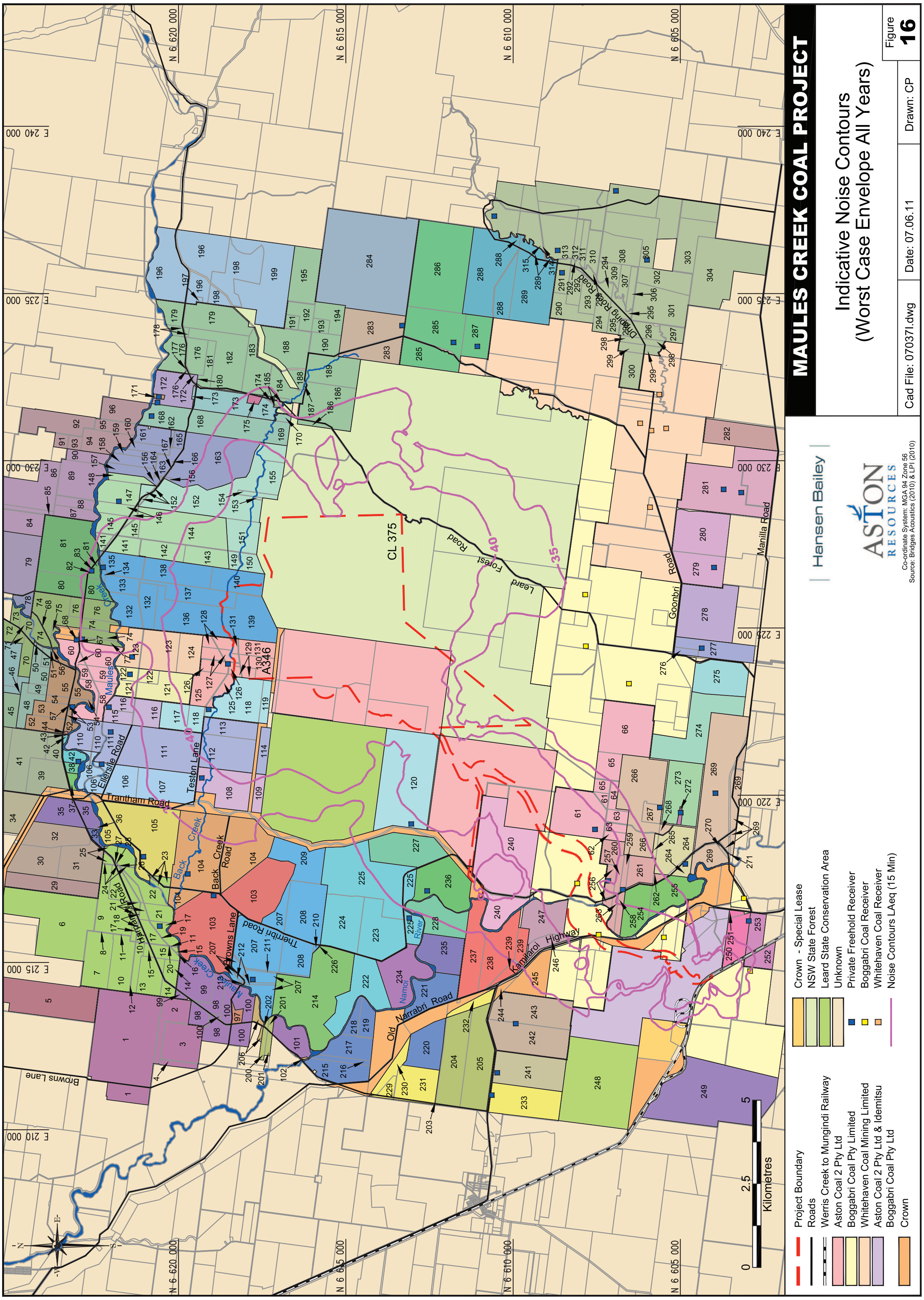
Four contiguous properties are predicted to receive moderate noise impacts over more than 25% of the property area and a further seven contiguous properties are predicted to receive mild noise impacts over more than 25% of their property area as a result of the Project.

All other private receivers and properties are predicted to receive impacts less than the intrusive criterion.

Cumulative Operational Noise

The assessment of worst case night time levels considered mine operations and train movements for Boggabri Coal Mine and Tarrawonga Mine with the Project, for the closest representative receivers 186, 168, 120 and 61. The assessment found that any cumulative noise impacts over 40 $L_{Aeq(9\ hr)}$ during the most sensitive night period must coincide with a predicted noise level of over 40 $L_{Aeq,15min}$ from either the Boggabri Coal Mine or the Project. Therefore, any receiver that is likely to be affected by cumulative noise impacts would also be affected by noise from one or both mining developments operating alone and would be subject to acquisition by that mining development upon request from the landowner.

As an exceedance of the cumulative noise criterion cannot occur without a corresponding exceedance of the intrusive criterion from one or both mining developments, no further assessment of cumulative noise impacts is required.


MAULES CREEK COAL PROJECT
Indicative Noise Contours
(Worst Case Envelope All Years)
Figure 16
Cad File: 07037l.dwg
Date: 07.06.11
Drawn: CP
Hansen Bailey
ASTON RESOURCES
Co-ordinate System: MGA 94 Zone 56
Source: Bridges Acoustics (2010) & LPI (2010)
Project Boundary
Roads
Werris Creek to Mungindi Railway
Aston Coal 2 Pty Ltd
Boggabri Coal Pty Limited
Whitehaven Coal Mining Limited
Aston Coal 2 Pty Ltd & Idemitsu
Boggabri Coal Pty Ltd
Crown
Crown - Special Lease
NSW State Forest
Leard State Conservation Area
Unknown
Private Freehold Receiver
Boggabri Coal Receiver
Whitehaven Coal Receiver
Noise Contours LAeq (15 Min)
Kilometres
CL 375
Leard Forest Road
Kamilaroi Highway
Manilla Road
Goonbri Road
Therribri Road
Harparary Road
Browns Lane
Teston Lane
Elfershe Road
Back Creek Road
Old Narrabri Road
Tranthams Road
Maules Creek
Namoi River
A346

Construction Noise

The assessment for construction noise indicates that the construction noise criterion would potentially be exceeded on occasions at the following receivers (additional to those presented in **Table 23**):

- Receiver 264 – Due to Therribri Road upgrade work;
- Receiver 236 – Primarily from water pipeline construction work with a minor contribution from rail spur construction work; and
- Receiver 225 – Primarily from water pipeline construction work with a minor contribution from rail spur construction work.

Table 23 Predicted Noise Level Exceedance of Intrusive Criteria

ID	DESCRIPTION	INTRUSIVE CRITERIA	PREDICTED NOISE LEVEL (DBA $L_{AEQ,15MIN}$)				
			YEAR 1	YEAR 5	YEAR 10	YEAR 15	YEAR 21
RESIDENCES							
61	KR Druce** ^	35	**43.0**	**43.1**	**43.0**	**43.0**	**43.0**
108	JM Morris	35	39.1	38.7	37.6	36.4	36.5
118	MJ & ML Nott* ^ ^	35	**44.0**	**42.2**	**40.2**	39.7	39.6
120	MJ & ML Nott* ^ ^	35	38.9	39.1	39.0	38.5	38.3
126	DJC Watson* ^ ^	35	**48.4**	**42.8**	39.6	**40.5**	**40.5**
134	VA & MA Younger* ^ ^	35	-	35.8	35.3	-	-
236	JA Bastardo* ^	35	35.3	35.9	35.6	35.1	-
256	RW & A Grover** ^	35	39.9	40.0	**40.1**	**40.1**	40.0
259	RW & A Grover** ^	35	38.9	39.0	39.1	39.1	39.0
77	S & J Bradshaw	35	-	35.0	-	-	-
82	Roman Catholic Church for the Diocese of Armidale	35	-	35.2	-	-	-
25% CONTIGUOUS VACANT LAND UNDER SINGLE OWNERSHIP (ADDITIONAL TO RESIDENCES)							
106-107	PC Leitch	35	36.1	36.0	-	-	-
110-114	PF Murphy	35	**41.9**	**40.9**	39.7	38.4	38.4
115-116	PR Hobden	35	-	36.1	-	-	-
121-122	L & SN Compton	35	39	39.8	36.9	35.5	36.8
123-124	JR Holmes	35	**42.9**	**42.3**	39.4	38.1	39.5
132-140	VA & MA Younger* ^ ^	35	**45.0**	**43.4**	**43.0**	**40.8**	**42.5**
141-148	CM Morse	35	38.5	39.4	**40.7**	37.2	38.6
149-155	CM & RRF Morse	35	**40.1**	**42.1**	**43.3**	**42.3**	**44.4**
156-167	Morse Investments Pty Limited	35	-	-	36.1	-	36.5
168-170	PD & LA Finlay	35	-	35.2	36.3	35.7	38.3
173-174	LA & KA & PD Finlay	35	-	-	-	-	36.8
227-228	Bresrow Pty Ltd ^	35	37.3	37.8	37.6	36.8	36.6
237-239	PJ Watson & G Parkin ^	35	-	35.2	35.1	35.1	-
240	MF & TT & SL Hart & PF Rice ^	35	**44.1**	**44.1**	**44.2**	**44.2**	**44.1**
244-245	PJ Watson ^	35	35.6	35.7	35.7	35.6	35.6
246-247	LE Christine-Rockliff** ^	35	39.7	39.7	39.7	39.7	39.7
250-251	DW & AM Keys ^	35	35.5	35.6	35.6	35.6	35.6
254-255	GP & LF & WP Clarke** ^	35	**40.2**	**40.2**	**40.2**	**40.2**	**40.2**

Bold text denotes noise levels exceeding intrusive criteria by more than 5 dBA.

- denotes predicted noise levels below the intrusive criteria.

* Aston has purchased or reached an agreement for the purchase of this property.

** Entitled to acquisition upon request in Boggabri EA (Hansen Bailey 2010).

^ Property predicted to be impacted by noise generated on the rail spur.

^ ^ Predicted to exceed Air quality criteria in **Section 7.1**.

All other sensitive receivers are either expected to also be affected by noise from operation of the Project or would remain unaffected by the proposed construction works. Construction noise levels at the three potentially affected receivers are expected to be acceptable due to:

- Receiver 264 would currently be exposed to occasional noise from road maintenance activities such as grading and rolling and would directly benefit from the upgraded road by a reduction in travel time, improved safety and reliability in wet weather, reduced vehicle maintenance costs due to the improved road and a reduction in future maintenance activity; and
- Receivers 236 and 225 would primarily receive noise from the pipeline construction works which would progress reasonably quickly along the pipeline route. Noise levels from the construction works would be similar to, or perhaps quieter than, typical rural activities such as ploughing, planting and harvesting crops which currently occurs intermittently on both properties and both receivers would benefit from the proposed Therribri Road upgrade works.

For the evening and night time works, the potentially loudest noise sources would include a backhoe or small loader, a forklift, concrete trucks and welders. Sound power levels produced by such equipment are unlikely to exceed 108 dBA per item. A total sound power level of 118 dBA assumes a worst case situation with ten noise sources operating simultaneously.

Night construction work within the CHPP area would therefore be quieter than normal CHPP operation, based on the modelled CHPP sound power levels. Worst case night construction work within the MIA would be similar to or quieter than a haul truck approaching or leaving the workshop, while work associated with the rail spur would be significantly quieter than a train pass-by.

As CHPP operation, truck movements and train movements are all included in the operational noise assessment during all time periods, it is clear that proposed construction work during extended hours would result in received noise levels below the operational noise levels predicted in this assessment. No further analysis of noise levels during extended construction hours is required.

Sleep Disturbance

The loudest sources of noise associated with mining operations are typically a shovel gate or dozer tracks, followed by train wheel squeal and wagon stretching and bunching. The noise assessment predicted potential sleep disturbance effects at Receiver 126 assuming occasional dozer track noise occurs at night in the mining areas or on the OEA. Receiver 126 is also predicted to receive greater than 40 $L_{Aeq,15min}$ from the Project as shown in **Table 23**.

The assessment also predicts that Receivers 61, 256 and 259 would be subject to occasional sleep disturbance when a train travels along the proposed rail spur to or from the Project. These receivers are listed in **Table 23** as predicted to receive significant noise impacts from the operation of the Project under a worst-case modelling scenario.

Road Traffic Noise

An assessment of both construction and operational road traffic has concluded that predicted worst case operational traffic noise levels would remain well below the 55 $L_{Aeq(1hr)}$ day criterion and within the 50 $L_{Aeq(1hr)}$ night criterion at all private receivers.

Rail Traffic Noise

As various trains including coal, general freight and passenger services already use the Werris Creek to Mungindi Railway Line and the proposed coal train movements would produce a similar maximum noise level as current train movements, no increase in maximum noise levels is anticipated.

As few receivers would be located closer than 30 m from the rail line, and those receivers would currently experience maximum noise levels close to or over the 85 L_{Amax} criterion, proposed train noise levels would not significantly increase at any residence and are considered acceptable.

Low Frequency Noise

Low frequency noise levels from the Project are implicitly controlled by the intrusive noise criteria, as intended by the INP, so unreasonable low frequency noise impacts are unlikely to occur at any privately owned receiver.

Worst Case Noise Impacts

Should Tarrawonga Southern EL and Goonbri EL be developed in the future, cumulative noise impacts to a few receivers near these developments may occur if all five mining operations occurred simultaneously. Given the location of the Project relative to the other four developments, cumulative noise impacts with a significant contribution from the Project are unlikely to occur at any receiver.

7.3.4 Mitigation and Management

Feasible and reasonable Noise Control

Numerous noise modelling investigations have been undertaken during the initial planning and mine plan development stages of the Project.

These investigations looked at the application of various levels of noise management and control to the Project in order to minimise adverse noise impacts on neighbouring receivers. **Appendix G** provides detail on these investigations, with a summary provided below.

As part of this EA, Aston has committed to applying a number of noise management controls for the Project as mentioned below. Aston has estimated that these measures would result in additional costs for supply of attenuation equipment totalling $54.1 Million.

Modelling has shown that these control measures reduce the predicted noise emissions from the Project by between 3 and 6 dB at most neighbouring receivers when compared to a base case with no noise controls (see **Appendix G**).

The application of the proposed measures would also result in two receivers and eight properties (over 25% of property area) that would no longer experience significant noise impacts (>5dB above intrusive criteria) as a result of the Project. A further ten receivers and eight properties (over 25% of property area) would no longer experience moderate noise impacts (2 to 5 dB above intrusive criteria) as a result of the Project.

The exhaust silencers proposed to be installed on the haul trucks for the Project will reduce the Sound Power Level (SPL) of each unit by up to 4 dBA. These exhaust silencers will focus on reducing noise emissions in the lower frequencies from the exhaust which tend to travel further when compared to the higher frequency noise emissions from the engine and other moving parts.

Two additional modelling scenarios representing further noise control were investigated (see **Appendix G**), including:

1. EA mitigation measures (above) as well as applying leading practice sound attenuation to the excavators; and
2. Full noise mitigation scenario looking at a best practice noise suppressed equipment fleet.

Scenario 1, involving the attenuation of the excavators was estimated by Aston to cost an additional $18.8 Million and would achieve a noise reduction of around 0.5 dBA from that already proposed within the EA. This would also result in one property being removed from experiencing significant noise impacts from the Project.

Scenario 2 would result in a noise reduction of around 0.5 dBA from Scenario 1 (1 dBA from the EA case) and would not result in any additional properties being removed from experiencing significant noise impacts from the Project.

Scenario 2 would not only result in additional costs for installation of sound attenuation to the mining fleet, but would result in inefficiencies to be experienced in equipment capacities, maintenance and other factors. Aston has estimated that the additional measures in this scenario would cost a further $148.2 Million over the 21 year life of the Project to that proposed within this EA, with consideration given to the attenuation equipment, additional fleet requirements, diesel usage, and maintenance costs of the fleet.

Implementing this scenario would result in a 17.6% increase in the present value (at a 7% discount factor) capital costs for the Project, with the present value (at a 7% discount factor) of total costs of the Project over the 21 years increasing by around $87 Million (1.5% of the total cost). This would result in an $87 Million (1.0%) reduction in the Project's net benefits, which are discussed in **Section 7.19**. Noise modelling for these two additional scenarios has shown that the implementation of further control measures would achieve only modest reductions in the number of noise affected properties when compared to the EA case.

Aston has committed to implementing extensive noise management measures to operations and to proactively managing operations to reduce adverse noise impacts to neighbouring receivers. This has resulted in a substantial reduction in noise emissions from the Project (up to 6 dBA). Additional noise management controls come at a significant cost to achieve an insignificant benefit to society as minimal noise reductions would be experienced.

Therefore the noise controls as committed to in this EA are considered to be feasible and reasonable while any additional noise controls are considered economically and practically unreasonable.

Noise Management Plan

As part of its EMS, Aston will develop a Noise Management Plan (NMP) for the construction and operation of the Project incorporating practical noise minimisation management including (but not limited to):

- Mining trucks and water carts will be fitted with leading practice exhaust silencers to reduce noise emissions;
- The mobile overburden fleet will be directed to higher, exposed areas during favourable weather conditions (generally during the day) and to lower, more shielded areas during noise enhancing weather conditions (shown in **Table 22**);

- Tracked dozers will be operated at slow speed, specifically in reverse in exposed locations of the site during noise enhancing weather conditions, to minimise audible track noise;
- Vehicle warning devices (e.g. reverse alarms, horns and start alarms) will be selected and installed to produce the lowest possible noise levels consistent with safe operation;
- Mobile and coal handling equipment will be maintained in good condition to minimise unnecessary noise;
- The rail spur will include relevant control measures (large radius curves to minimise wheel squeal, concrete bridges or vibration isolation material between the rails and steel bridges and continuously welded rails);
- Noise suppression on conveyor system and transfer points;
- Generally, employees will be transported to the site via bus to reduce traffic and associated noise on key rural roads;
- A real time noise monitoring system will be installed in conjunction with Boggabri Coal Mine and Tarrawonga Mine to assist with the proactive management of operations to minimise adverse noise impacts on neighbouring receivers; and
- Provide a notification to all landholder listed as bold text in **Table 23** that are predicted to exceed the relevant assessment criteria and have the right to be acquired by Aston upon written request.

Aston will continue to consult with landholders shown in **Table 23**, who are predicted to experience noise levels greater than the intrusive criteria. Aston will endeavour to establish negotiated agreements with each landholder prior to the worst case noise level predictions from the Project being experienced at the receiver.

Aston has commenced discussions with the relevant landholders as part of the ongoing process in establishing negotiated agreements. Aston will keep DP&I informed on the status of these agreements throughout the assessment of the Project.

For all other privately owned receivers not listed in **Table 23**, proactive and reactive noise minimisation practices will be implemented to ensure that the Project does not exceed the intrusive criteria. Specifically, operational controls will be adopted to ensure that impacts from the Project at Receivers 77 and 82 remain within the intrusive criterion.

As explained in **Section 7.1.4**, Aston intends installing a meteorological monitoring system with predictive software capabilities.

This will enable weather conditions for coming days to be forecast for inclusion into a noise model to understand certain operational activities that may result in adverse noise emissions. The Site Supervisors will then be able to plan operations in order to keep adverse noise emissions to a minimum.

In addition to the meteorological monitoring system, Aston will develop a leading practice noise monitoring network surrounding the site (in consultation with Boggabri Coal Mine and Tarrawonga Mine) which is representative of the closest sensitive receivers; which shall include:

- Quarterly attended noise monitoring;
- Regular correlation of real time noise monitoring results with the meteorological station to proactively manage operations during noise enhancing conditions when mining activities are approaching the intrusive criterion; and
- A network of real time noise monitors.

Similar to the air quality monitoring system, trigger levels will be developed to generate alarms to notify the Site Supervisors of noisy operations that may require attention.

Aston will develop an EMP describing noise monitoring and management for the approval of DP&I in consideration of the above.

7.4 BLASTING

7.4.1 Background

A noise and blasting impact assessment for the Project was completed by Bridges Acoustics and is presented in full in **Appendix G**. The blast assessment is summarised below and has been undertaken in accordance with the following policies and guidelines:

- The Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration, Australian and New Zealand Environment Council (ANZEC Guidelines) (ANZEC 1990) for ground vibration and overpressure limits and time restrictions for blasting;
- Assessing Vibration – a Technical Guide (DEC 2006) for assessing construction vibration;
- Australian Standard 2187.2 – 2006: Explosives – Storage and Use, Part 2: Use of Explosives; and
- DIN 4150 Part 3 – Structural Vibration: effects of vibration on structures (ISO 1999).

A summary of the blasting impact assessment undertaken is provided in the following sections.

7.4.2 Methodology

Introduction

The assessment calculated the likely ground vibration and overpressure levels generated by blasting required for the Project for each of the nearby receivers for comparison with the relevant criteria.

As described in **Section 3.2.3**, the Project is likely to require an average of up to four blast events per week to prepare overburden for removal and for coal recovery. Blasting effects to neighbouring receivers depend on the following factors:

- Ground conditions including rock types, groundwater and layers;
- Distance from the blasting site to a receiver;
- Maximum Instantaneous Charge (MIC) for the blast event;
- Topography between the blast site and receivers; and
- Atmospheric conditions including wind speed, wind direction and vertical temperature gradient.

Air blast overpressure and ground vibration levels for blast events closest to the receiver locations were calculated utilising the methods set out in AS 2187.2 for comparison with the relevant criteria.

The analysis was conducted using predicted vibration coefficients based on patterns observed in previous mining operations and assuming no topographic or other shielding between the blast and receiver.

Blasting Criteria

Current noise and vibration criteria are recommended in the ANZEC Guidelines and are reproduced in **Table 24**.

Recommended blasting criteria apply during daylight hours Monday to Saturday, excluding public holidays.

Table 24 Blasting Amenity Criteria

CRITERIA *	OVERPRESSURE (dBL)	GROUND VIBRATION (mm/s)
Less than 5% of total blasts to exceed	115	5
No blasts to exceed	120	10

* Criteria do not apply where a Private Agreement is in place.

7.4.3 Impact Assessment

The results of the vibration and overpressure assessment for each of the closest receivers are provided in **Table 25**.

These results indicate that blasting associated with the Project is predicted to produce ground vibration and overpressure levels well below the relevant amenity criteria at all privately owned residences in the absence of noise enhancing weather conditions.

Two of the properties identified in **Table 25** as being the closest receivers to blast locations have also been predicted to be impacted by noise levels greater than the relevant noise criteria as discussed in **Section 7.3**. Other receivers would be more than 5,600 m from the proposed blasting activities and therefore impacts would be well below the relevant blasting criteria.

Buildings

The application of criteria from DIN 4150 Part 3 Structural Vibration - Effects of Vibration on Structures ensures that blasting activities result in a minimal chance of building and structural damage with an acceptable level of personal comfort for residents.

Under the proposed blasting program, the Project was assessed to have an extremely low likelihood of superficial or cosmetic damage to any privately owned residence or other structures such as outbuildings or buried pipelines.

Heritage Structures

A number of buildings and structures with potential heritage value (see **Section 7.9**) have been identified in the vicinity but outside of the Project Boundary. The Warriadool Hut is located the closest to any potential blast site at approximately 2,500 m to the north of the 21 Year Mining Limit.

A substantive blast event would result in a vibration level of up to 4.4 mm/s and an overpressure level of 111 dB which would comply with the residential vibration and overpressure criteria. Therefore it is highly unlikely the Warriadool Hut will be affected as it is well within the relevant criteria. All other heritage sites are located at greater distances from proposed blasting activities and are unlikely to be affected by the Project.

Cumulative Blast Impacts

In addition to the Project, there are likely to be blasting activities associated with the neighbouring mining operations at Boggabri Coal Mine and Tarrawonga Mine. Aston will consult with neighbouring mine sites to ensure that blast events from two or more operations would not occur simultaneously. As such, overpressure and ground vibration levels from the cumulative effects of all mines would not result in exceedances of the relevant criteria.

Table 25 Blast Impact Assessment

ID (DISTANCE TO BLAST)	DESCRIPTION	GROUND VIBRATION (mm/s)		OVERPRESSURE (dBL)	
		MIC 3000kg	MIC 6000kg	MIC 3000kg	MIC 6000kg
126 (3,350 m)	DJC Watson *^	1.6	2.8	105	108
118 (3,850 m)	MJ & ML Nott *	1.3	2.2	104	106
123 (5,600 m)	JR Holmes	0.7	1.2	100	102

* Predicted to exceed air quality and / or noise criteria as shown in **Table 19** and **Table 23** respectively.

^ Aston have purchased or reached an agreement for the purchase of this property.

7.4.4 Mitigation and Management

Blasting associated with the Project has been predicted to produce ground vibration and overpressure levels below relevant amenity criteria at all privately owned residences.

Aston will implement the following management procedures:

- Development of a blast monitoring system (in consultation with Boggabri Coal Mine and Tarrawonga Mine) which is representative of the closest sensitive receivers to ensure compliance with the relevant blast criteria;
- Coordination of blasting schedules with any mining project in a 10 km radius to avoid any potential for simultaneous blast events;
- Notification of blast events to sensitive receivers upon request prior to the blast event; and
- Blast events will be designed to meet the relevant overpressure and ground vibration criteria.

Aston will develop an EMP considering blast monitoring and management to the approval of DP&I in consideration of the above.

7.5 VISUAL AND LIGHTING

Integral Landscape Architecture and Visual Planning (Integral) was commissioned to complete a visual and lighting assessment of the potential impacts of the Project.

This assessment was undertaken to identify the character of the surrounding visual landscape and provide management and mitigation measures for visual impacts associated with the Project.

A summary of this assessment is provided below and presented in full in **Appendix H**.

7.5.1 Background

The Primary Viewing Catchment (PVC) is for the greater part determined by the potential visibility of the Project in the area surrounding the Project Boundary.

The PVC represents the area surrounding the Project Boundary within which the majority of the critical views of the Project are obtained and assessed using topographic plans, aerial photography and field observations.

The existing visual environment includes a diverse range of landscape settings and views. In regards to the Project, this can create screening and visual buffers or alternatively provide view corridors. The open grazing and croplands allow for long distant views which can be buffered by the riparian vegetation along the drainage lines, creeks and rivers while also creating pleasing backdrops to the open terrain.

The rocky hills of the Leard State Conservation Area create visual features within the landscape and a screen to receivers located to the west of the Project Boundary. The surrounding mountain range creates a strong visual feature to the east and defines the visual catchment in that location. The mountains are in strong contrast to the lower lying clear and gentle slopes of the croplands, with the slopes and foothills creating visual diversity.

The forested hills within which the Project Boundary is situated are a gentle landscape that is restricted to the general view due to its limited topographic relief. Surrounding topographic features, as well as riparian vegetation along various creek fronts, break up views to the Project Boundary.

The PVC has very low ambient night light that would be generated by dispersed homesteads and vehicle travel on local roads. The cumulative effect of these lights would be unperceivable.

There will be some effect to the ambient light created by the existing Boggabri Coal Mine and Tarrawonga Mine especially on foggy nights where atmospheric particles could reflect ground lights creating a night glow.

7.5.2 Methodology

The visual impact assessment aimed to assess the existing visual settings, including how they are seen from various viewing locations and establish the predicted visual character of the Project. The visual impact of the Project was then determined by considering the visual characteristics of its various components in the context of the landscape in which it is located.

An integrated assessment of visual sensitivity and visual effects (and the interaction between these factors as shown in **Table 26**) was used to determine the overall impact of the Project and assess any mitigation and management procedures that may be required.

Table 26 Visual Impact Assessment Matrix

VISUAL SENSITIVITY	VISUAL EFFECT			
	High	**Moderate**	**Low**	**Very Low**
High	**High Impact**	**High Impact**	Moderate Impact	Low Impact
Moderate	**High Impact**	Moderate Impact	Low Impact	Low Impact
Low	Moderate Impact	Low Impact	Low Impact	Low Impact

Representative Viewing Locations

The PVC was divided into four distinct sectors with five representative viewing locations selected to illustrate the worst views of the Project from various external locations as detailed on **Figure 17**.

No viewing locations were further assessed in the Southern View Sector as the Project is screened by the Willow Tree Ranges and the neighbouring Boggabri Coal Mine and Tarrawonga Mine. These primary viewing locations include:

- Eastern View Sector: Location 1 – Northern section of Leard Forest Road;
- Northern View Sector: Location 2 - Harparary Road at Maules Creek Village, Location 3 - Maules Creek Village, Location 4 – Middle Creek Road; and
- Western View Sector: Location 5 - Harparary Road West.

At each of the representative viewing locations photographs of views towards the Project Boundary were taken to illustrate the existing environment and to develop projected photomontages during Year 5, Year 10 and Year 21 as representative phases of the Project mine life.

Visual Sensitivity

Visual sensitivity is a measure of how critically a change to the existing landscape is viewed by people from different land uses in the vicinity of a development. In this regard, residential, tourist and / or recreation areas are typically ascribed a higher visual sensitivity than industrial areas, agricultural lands and transport corridors, as lands used as part of a leisure experience make use of the scenic amenity values of the surrounding landscape and are often utilised in this way over extended viewing periods.

For any area to be given a sensitivity score, it must have visibility to the Project. The assessment of visibility for the purpose of scoring visual sensitivity was assessed based on field assessments, the evaluation of topographic information, aerial photographs to determine orientation, vegetation data and the computer assessment of these parameters.

The visual sensitivity of individual receivers may range from high to low, depending on additional factors which are particularly relevant to this Project, including:

- Screening effects of topography, buildings or vegetation;
- Viewing distance from the receiver to visible areas of the Project; and
- General orientation of receivers to landscape areas affected by the Project (for example those with verandas, decks or living room windows overlooking the Project).

Visual Effect

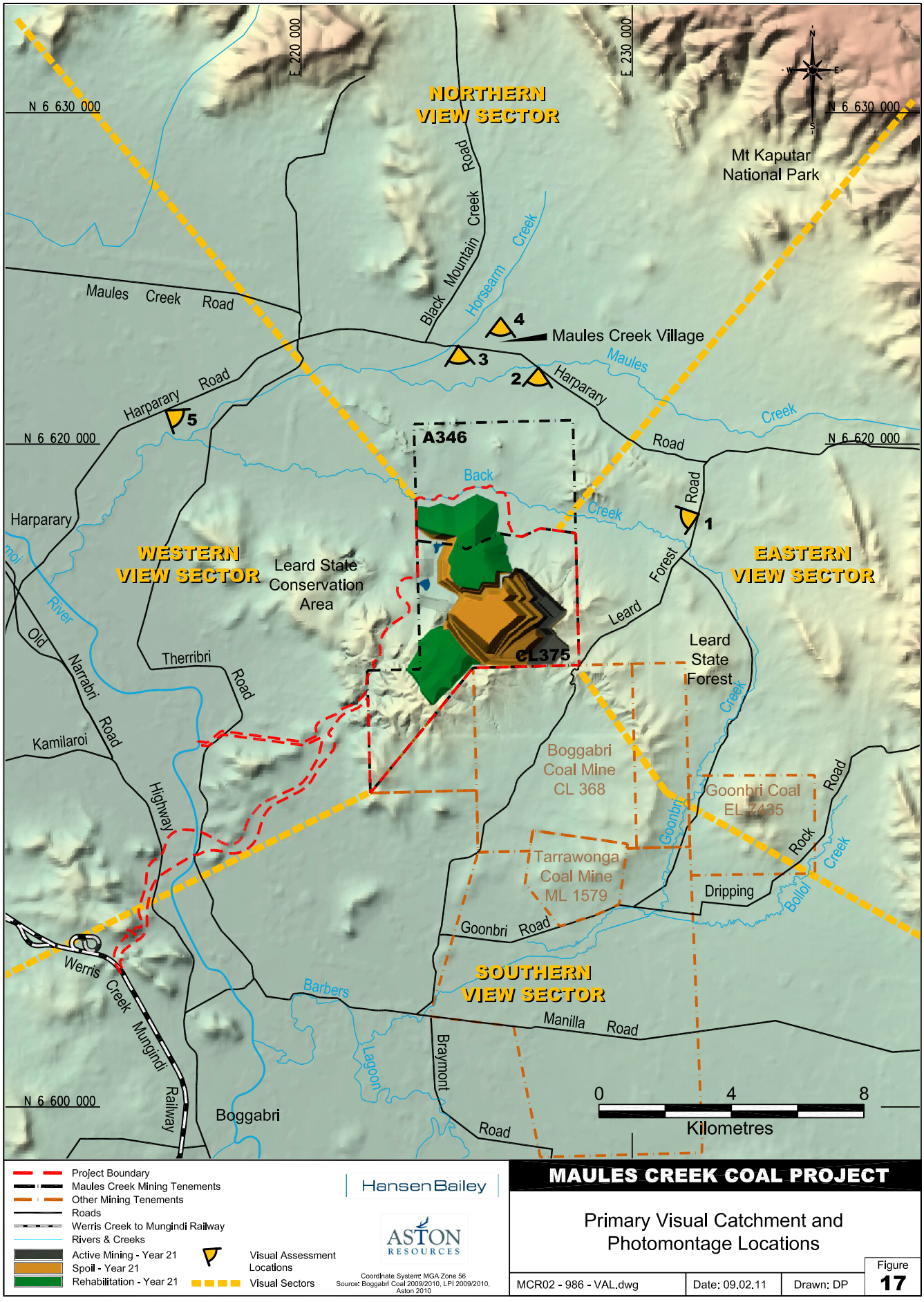
Visual effect relates to the level of visual contrast and integration of a development (i.e. the Project) with the existing landscape.

Each landscape has certain visual characteristics expressed through the visual elements including form, shape, pattern, line, colour and texture, with the relative contrast and integration between each Project element determining visual effect.

A mining development such as the Project has different visual characteristics that will create contrast with the existing landscape. The visual effects in the PVC were assessed and illustrated using photomontage images of the four primary viewing locations including the existing environment and the predicted landscape in Years 5, 10 and 21 as discussed below.

The magnitude of the visual effect of the Project was determined by a balanced consideration of the compatibility level including:

- The level of contrast and integration of the Project with its surrounding landscape. Project elements as expressed through the visual expression elements (i.e. form, shape, pattern, line and colour with minor consideration in relation to texture) contrast to varying degrees with the surrounding landscape and will also integrate with it to some extent; and
- The proportion of a view from a location that is occupied by the Project.


E 220 000
E 230 000
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N 6 620 000
N 6 600 000
NORTHERN VIEW SECTOR
WESTERN VIEW SECTOR
EASTERN VIEW SECTOR
SOUTHERN VIEW SECTOR
A346
CL375
Mt Kaputar National Park
Maules Creek Village
Maules Creek Road
Black Mountain Road
Horsearm Creek
Harparary Road
Maules Creek
Back Creek
Leard State Conservation Area
Leard State Forest
Leard Forest Road
Therribri Road
Old Narrabri Road
Kamilaroi Highway
Werris Creek Mungindi Railway
Boggabri
Boggabri Coal Mine CL 368
Tarrawonga Coal Mine ML 1579
Goonbri Coal EL 7435
Goonbri Road
Rock Creek
Dripping
Bollol Creek
Barbers Lagoon
Braymont Road
Manilla Road
1
2
3
4
5
0
4
8
Kilometres
Project Boundary
Maules Creek Mining Tenements
Other Mining Tenements
Roads
Werris Creek to Mungindi Railway
Rivers & Creeks
Active Mining - Year 21
Spoil - Year 21
Rehabilitation - Year 21
Visual Assessment Locations
Visual Sectors
HansenBailey
ASTON RESOURCES
Coordinate System: MGA Zone 56
Source: Boggabri Coal 2009/2010, LPI 2009/2010, Aston 2010
MAULES CREEK COAL PROJECT
Primary Visual Catchment and Photomontage Locations
MCR02 - 986 - VAL.dwg
Date: 09.02.11
Drawn: DP
Figure 17

Visual Impact

The visual impact of the Project was determined by considering both visual effect and visual sensitivity, which when considered together determine impact levels. The way in which visual parameters of visual sensitivity and visual effect are cross referenced and their resultant impacts is shown in **Table 26**.

Lighting Impact

Lighting impacts were evaluated qualitatively and considered both direct lighting effects and indirect lighting effects of the Project at night. Direct lighting includes all lights that may have a line of sight exposure to locations beyond the Project Boundary and were not screened by topography or vegetation. Indirect lighting was considered in terms of contribution to diffuse lighting effects whereby all lights associated with the Project contribute to the 'glow' effect that will be visible in a dark night sky.

7.5.3 Impact Assessment

A review of Project mine plans, aerial photography and the photomontages was used to determine any visual impacts as discussed below. From a visual perspective, the Project essentially relates to three components; the open pit, OEAs and mine related infrastructure. Both the major and minor components already occur within the existing environment as part of the established Boggabri Coal Mine and Tarrawonga Mine.

Eastern View Sector

The Eastern View Sector contains a number of rural residences (approximately 11), local roads (including Harparary Road, Leard Forest Road and Dripping Rock Road), the southern part of the Mt Kaputar Range, the Slopes and Foothills, Rocky Hills and Surrounding Ranges.

The visual sensitivity of the residences in the Eastern View Sector would be moderate to low as they are further than 7.5 km from the Project Boundary.

Some residences on Maules Creek Road and Thornfield Crossing Road may have views of the Project, however sensitivity is reduced as the residences are not orientated to the Project site and are often surrounded by homestead gardens and adjoining creek side vegetation.

Other residences on Mallee Lane and Dripping Rock Road would not be considered sensitive as they do not have views to the Project Boundary. Local roads would have low sensitivity as they are minor rural roads which are generally screened by vegetation

The visual effects in the Eastern View Sector are illustrated in a photomontage from Location 1 on Leard Forest Road for existing and Year 5 on **Figure 18** and Year 10 and 21 on **Figure 19**. There will be four types of visual effects experienced from this viewing location including:

- Views of the eastern face of the Northern OEA;
- Views of the temporary rehabilitation of faces of the OEAs;
- Additional height increase of Northern OEA by 40 m in later years; and
- Views of a small area of pre rehabilitated overburden in Year 21.

The visual effects from this viewing location are likely to initially be high, reflecting the contrast of the pre rehabilitated condition of the eastern face of the Northern OEA with the surrounding vegetation. After Year 5, this visual effect would be reduced to moderate / low as rehabilitation is completed.

Some impacts may be created by the temporarily rehabilitated faces of the inpit OEAs which will not be rehabilitated fully until mining within the Project Boundary is complete.

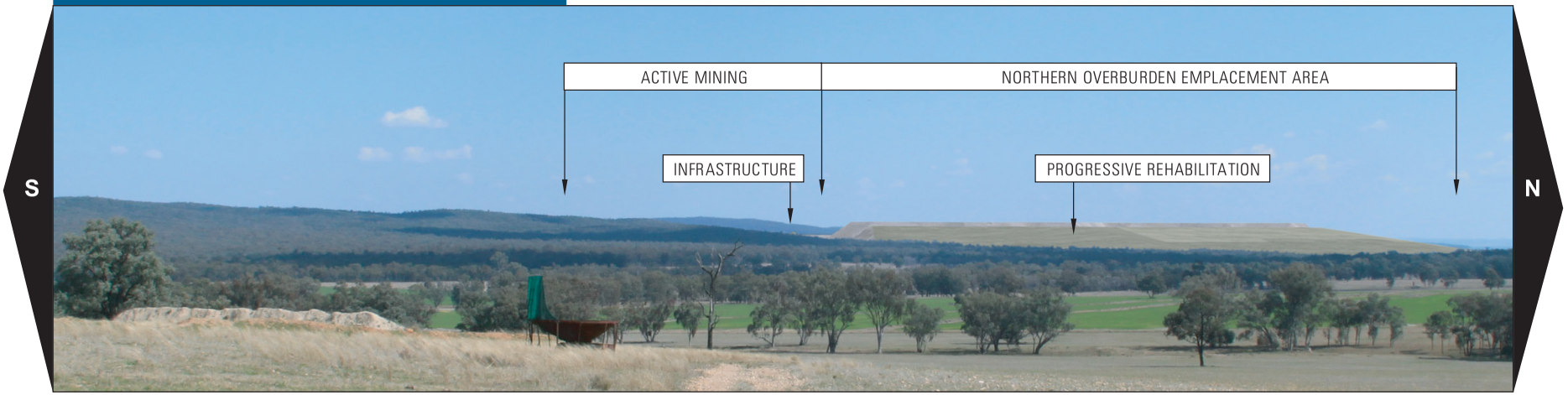
Where such impacts may occur, offsite treatments may be required, though they are considered unlikely to be necessary. This visual effect will continue to reduce except for a brief period during years 8-9 when an extra 40 m of overburden would be added to the Northern OEA.

The visual effects of the overburden in a pre rehabilitated state in Year 21 are likely to have high visual effects, however these will decrease substantially at locations further than 3 km from site.

The visual impacts for most viewing locations from this sector would be low following rehabilitation of the eastern face of the Northern OEA. There remains a potential for a high impact to be experienced from approximately five residences that may be within 7.5 km from the Project that have views to the Northern OEA in its pre rehabilitated condition. However, once rehabilitation of the Northern OEA occurs, visual impacts would be reduced to moderate to low. Residences along Dripping Rock Road and Mallee Lane are unsighted by topographic elements. As such there would be a low visual impact on these residences.

SITE 1: LEARD FOREST ROAD - EXISTING

SITE 1: LEARD FOREST ROAD - YEAR 5



Hansen Bailey

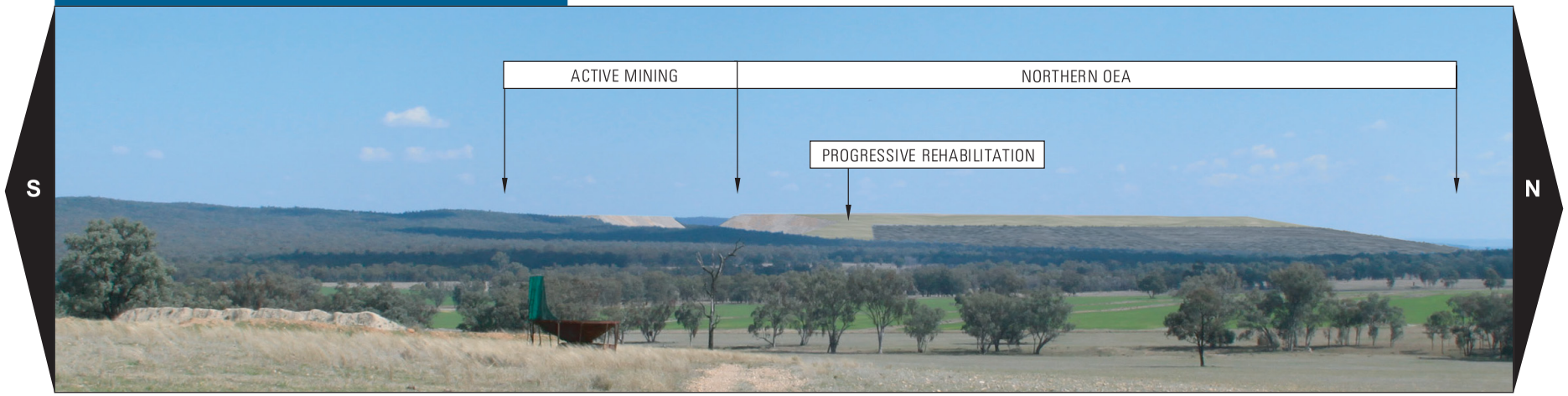
ASTON RESOURCES

MAULES CREEK COAL PROJECT

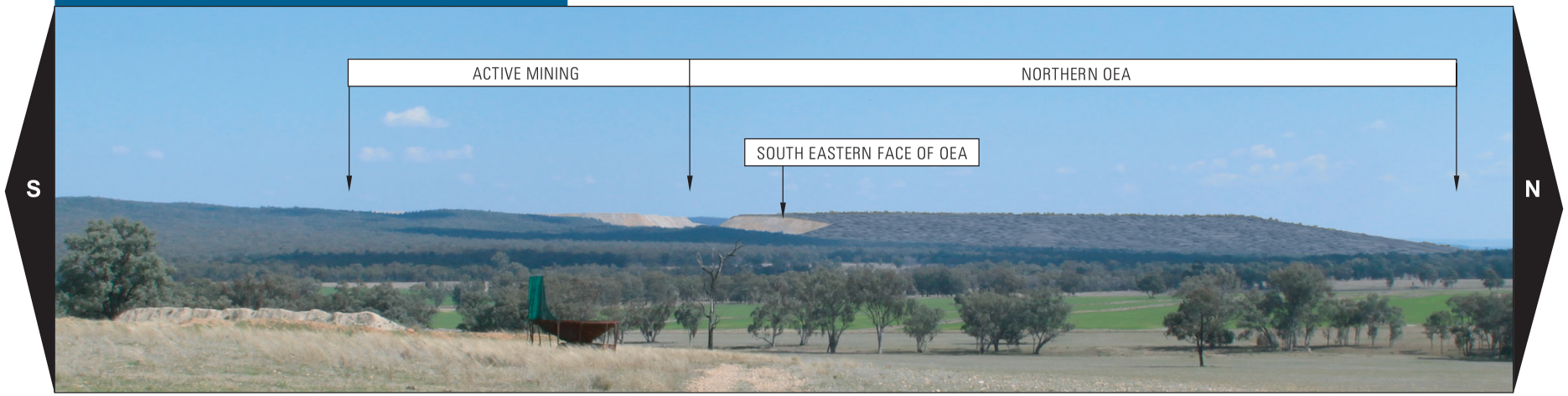
Photomontage Location 1
Leard Forest Road (Existing and Year 5)

File: MCR02 - 986 - MONTAGES EASTERN SECTOR.ai	Date: 21.01.11	Drawn: DP	Figure 18

SITE 1: LEARD FOREST ROAD - YEAR 10



SITE 1: LEARD FOREST ROAD - YEAR 21



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ASTON RESOURCES

MAULES CREEK COAL PROJECT

Photomontage Location 1
Leard Forest Road (Year 10 and Year 21)

File: MCR02 - 986 - MONTAGES EASTERN SECTOR.ai	Date: 21.01.11	Drawn: DP	Figure 19

Northern View Sector

The northern sector is dominated by rural lands. It includes parts of the cropping lands, slopes and foothills, rocky hills, and the surrounding ranges Visual Catchment Unit (VCU). The sector includes numerous rural residences, some local roads as well as the village of Maules Creek. Mt Kaputar National Park, Rusden and Deriah State Forests also occur within the Northern Sector.

The Maules Creek Village, rural residences, local roads and Mt Kaputar National Park are potentially highly sensitive viewing locations in this Sector if the Project is visible.

The Maules Creek Village is moderately sensitive as it is located 8 km to the north of the Northern OEA which is potentially the most visible Project component. However sensitivity generally is decreased due to the presence of vegetation in gardens and along the Creek and residences being located at a greater distance to the Project.

Any rural residences closer than 7.5 km would have a high sensitivity with a moderate sensitivity being ascribed up to 12.5 km, lowering past that. This includes two residences on Trantham Road, two on Ellerslie Road, six on Harparary Road and another four off other rural roads. The remainder of residences in this Sector would have a moderate sensitivity if there are views to the Project. While topographically many houses may have views, often house orientation, homestead landscape and vegetation in paddocks and creeks block these views, which would reduce sensitivity.

Any local roads are minor rural roads and would have a low sensitivity as they are all greater than 6 km away from the Project. While the Mt Kaputar National Park has a high visual sensitivity due to its land-use, most areas will be screened by vegetation blocking the direct line of sight. Any lookouts without vegetation or topographic screening will still have a low sensitivity as they are located at distances further than 20 km from the Project Boundary.

The visual effects in the Northern View Sector are illustrated using progressive photomontage images from Location 3 at Maules Creek Village for existing and Year 5 in **Figure 20** and Year 10 and 21 provided on **Figure 21**. There will be five types of visual effects experienced from this viewing location including:

- Northern OEA;
- Rehabilitated faces of Northern OEA;
- Additional 40 m of overburden on the Northern OEA in years 8 – 9;
- Pre rehabilitated eastern pit OEA; and
- Limited views of the open pit.

From Location 2, the visual effect of the Project would be moderate and from Location 3 and Location 4 the visual effect will be high as the Northern OEA is visible. However, the visual effect will quickly reduce by Year 5 the rehabilitation of the Northern OEA and the progressive establishment of forest cover will occur.

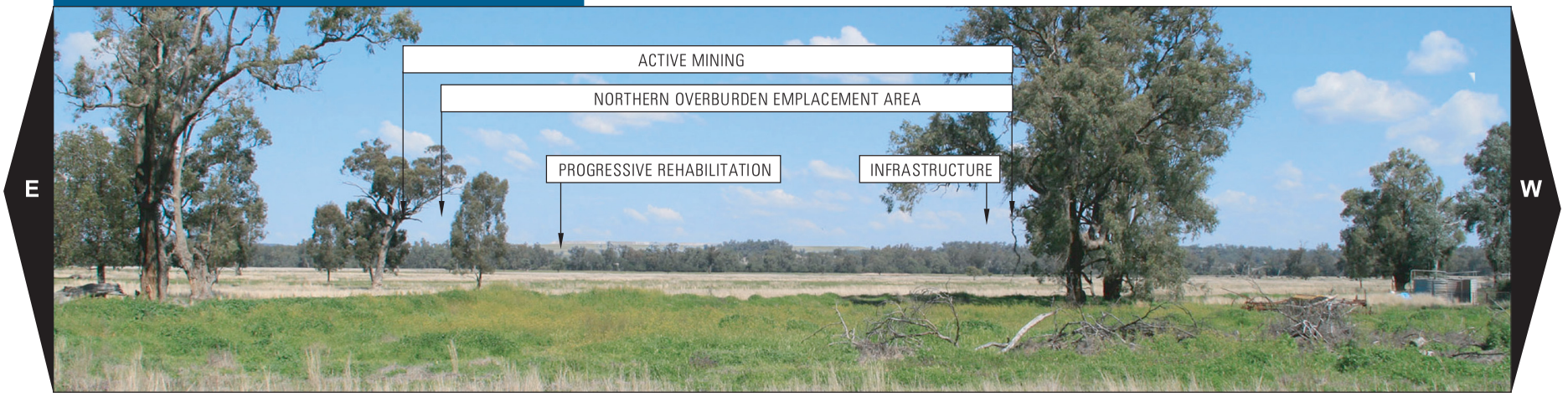
At all locations there would be a short period of heightened visual effect as an additional 40 m of overburden would be added to the top of the Northern OEA during years 8 – 9. However following rehabilitation, visual effects would return to low. From all locations in the northern sector, the visual effect of the pre rehabilitated eastern inpit OEA and open pit would range from moderate to low due to their limited scale and due to the screening effects of surrounding vegetation and the establishment of the Northern OEA. The visual effects from Location 4 are significantly reduced by vegetation along creeks and drainage lines as well as some topographic features to the north of the Project Boundary.

On the basis of the visual effect levels, sensitivity and likely visibility, a high visual impact may be experienced from a limited number of houses for a brief period if there are views to the Project. Generally it is considered that these conditions would not occur, reducing impact levels to moderate and low, especially as rehabilitation progresses. Higher impacts could occur for residences that are closer to the Project Boundary, especially for those houses on Ellerslie and Trantham Road. Any high to moderate impact, however, would only occur in the first five years of the mine life as the constant maturing of tree cover on the outer slopes of the Northern OEA would reduce effects and impact levels to low and insignificant.

The visual effects on local roads could be high for short periods of time prior to rehabilitation. However, when combined with the reduced sensitivity assigned to local roads, visual impacts would be low. Moderate impacts may be experienced for short periods of time if a high visual effect occurs on pre rehabilitated OEA. While Doug Sky Lookout in Mt Kaputar National Park may be a sensitive location, as it is located over 30 km away and has a low visual effect, it would result in a low visual impact level.

SITE 3: MAULES CREEK VILLAGE - EXISTING

SITE 3: MAULES CREEK VILLAGE - YEAR 5



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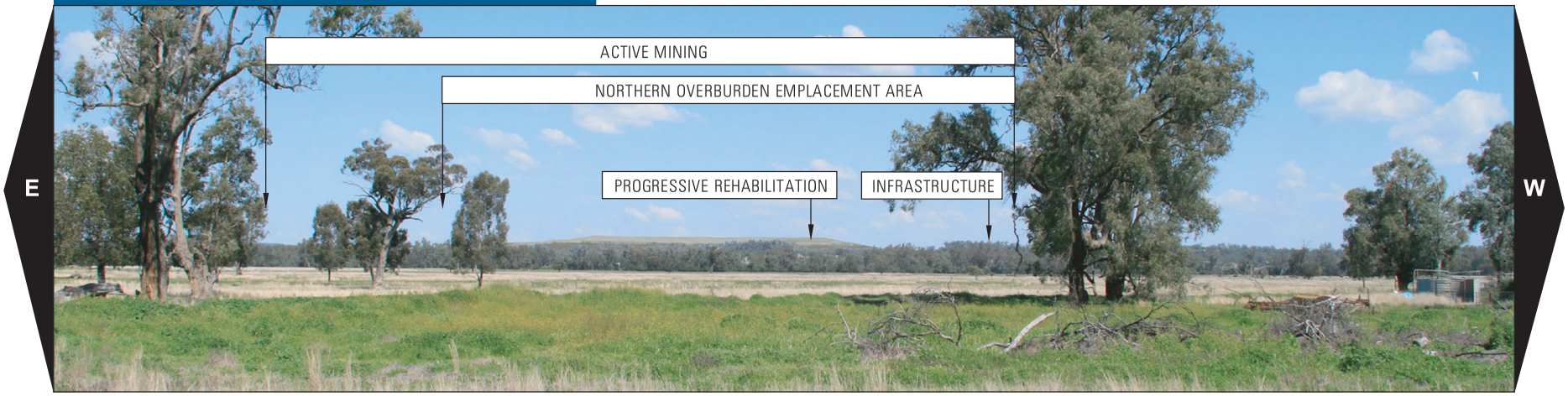
ASTON RESOURCES

MAULES CREEK COAL PROJECT

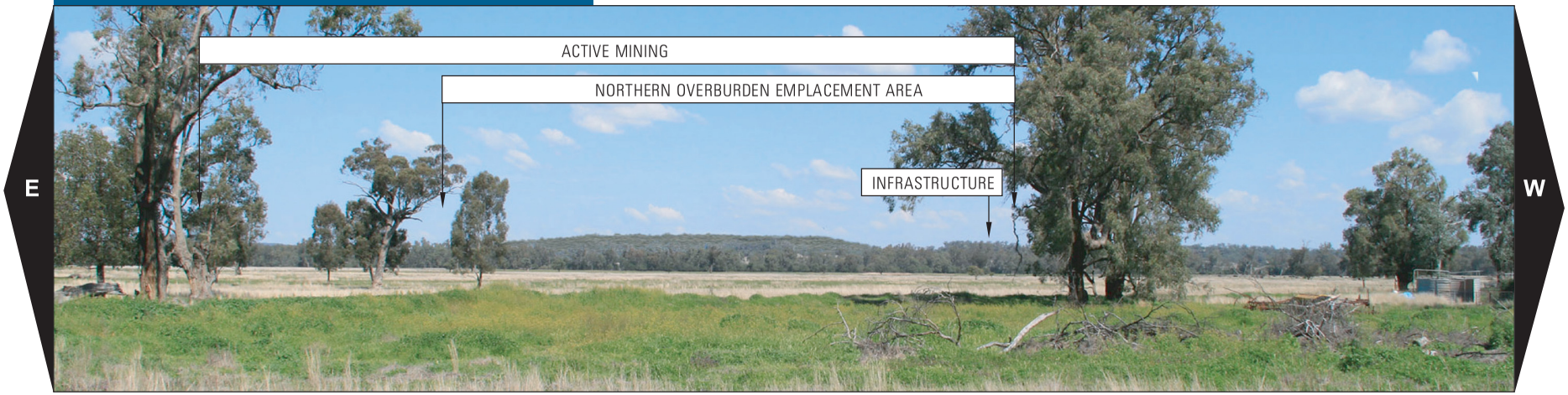
Photomontage Location 3
Maules Creek Village (Existing and Year 5)

File: MCR02 - 986 - MONTAGES NORTHERN SECTOR.ai	Date: 21.01.11	Drawn: DP	Figure 20

SITE 3: MAULES CREEK VILLAGE - YEAR 10



SITE 3: MAULES CREEK VILLAGE - YEAR 21



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MAULES CREEK COAL PROJECT

Photomontage Location 3
Maules Creek Village (Year 10 and Year 21)

File: MCR02 - 986 - MONTAGES NORTHERN SECTOR.ai	Date: 21.01.11	Drawn: DP	Figure 21

Western View Sector

The western sector is dominated by rural lands that include significant cropping land areas along the Namoi River. This sector contains the highest density of rural residences which reflects the intensive agriculture associated with the cropping lands adjacent to the Namoi River, as well as the village of Baan Baa, the Kamilaroi Highway and local rural roads. Views are screened by the topographic features of the Leard State Conservation Area. Only the elevated terrain of the rocky hills, in the vicinity of the Kamilaroi Highway, obtains views in this sector.

The most sensitive residences would be located on Ellerslie and Trantham Road / Teston Lane and a small section of Therribri Road. Residences would have a high sensitivity if views of the Project are possible, as they are within 7.5 km of the Northern OEA. Other residences outside this would have a moderate to low sensitivity. A number of the residences that are situated on Ellerslie and Trantham Roads / Teston Lane would have visibility based on topography, however sensitivity is reduced due to screening from riparian vegetation along Back Creek and local gardens. Other residences, further afield along Harparary Road, Browns Lane, Bellview Road, Roseville Lane and Maules Creek Road would have views across open cropping lands and to the north-west of the Leard State Conservation Area and Residences to the west of Leard State Conservation Area are screened from view.

Views from the Kamilaroi Highway are low sensitivity as they are restricted by topographic elements such as the Leard State Conservation Area. Any potential views are 10 km from the operational areas of the Project. Baan Baa has low sensitivity as it is screened from view by the adjoining Rocky Hill immediately west of the village.

The visual effects in the Western View Sector are illustrated using progressive photomontage images from Location 5 on Harparary Road for existing and Year 5 provided in **Figure 22** and Years 10 and 21 as illustrated on **Figure 23**. There will be two types of visual effects experienced from this viewing location including:

- Temporary rehabilitation of faces of the OEAs; and
- Pre rehabilitated face of the OEAs.

The visual effects of the Project from this viewing location are initially high for a distance of up to 5 km and a moderate visual effect up to a distance of 7.5 km due to the extent and scale of the pre rehabilitated Northern OEA and parts of the Inpit OEA. However in many situations the foreground filtering effects of vegetation would modify these visual effect levels. To the south-east are the forested hills and rocky hills associated with the Leard State Conservation Area which screens western views that are located further to the south than Location 5.

To the north-west, the pre rehabilitated western face of the Northern OEA and the north-western faces of the Inpit OEA would cause the visual effect to remain high until mining within the Project Boundary ceases.

A high visual impact until rehabilitation takes place will occur at approximately 14 residences within 7.5 km of the Project Boundary. Many of these residences would likely have garden landscapes and / or adjoining red gum woodlands that would screen or filter views. These residences are located on Trantham, Ellerslie, Therribri and Harparary Roads. Residences outside the 7.5 km distance would correspondingly generate lower visual impacts, however the actual impact experienced by various residences would vary and be totally dependent on foreground or middle-ground vegetation. Due to the low visual effect and low sensitivity, visual effects would also be low from the Kamilaroi Highway in this sector.

Southern View Sector

The Southern View sector includes parts of the forested hills, rocky hills, slopes and foothills, cropping lands and mine and infrastructure VCUs. The Sector is dominated by rural land uses, with mining occurring on the southern side of the Willow Tree Range. There are a number of rural residences, local roads, parts of the Kamilaroi Highway as well as Gins Leap roadside rest area in the Sector.

Receivers and local roads would have a low sensitivity as there are no views to Project components and they are further than 7.5 km away. Some sections of the Kamilaroi Highway such as Gins Leap would have some views to the Project however they are over 11 km away and would have a low sensitivity at this distance.

In the Southern view sector, no photomontage locations were developed as the Willow Tree Range and other coal mining activities screen views. Therefore there is a low visual effect for receivers, local roads and the Kamilaroi Highway in this Sector.

Visual impacts for rural receivers, local roads and the Kamilaroi Highway would be low within the Southern Sector as they have a low visual effect and a low sensitivity. This would reduce to very low and become insignificant to barely perceivable when rehabilitation is completed.

Night Lighting Impacts

The Project will operate 24 hours per day and will therefore require lighting for night time operations. Light effects may occur from both direct lighting and diffuse lighting.

Direct lighting would create a higher impact but is more limited in extent. The main light effects would be from intermittent lights associated with truck movements from the construction of the Northern OEA.

These elevated locations would negate the screening effect of surrounding vegetation and topography and create direct light effects. However the distances to sensitive receivers would mitigate these effects.

While the effects of diffuse lighting are considered to be low, the contrast of the lighting of the Project against the existing night sky will be noticeable. This will create a halo of light above the mine components that are the sources of the light. This halo of light will be seen from many locations all around the Project Boundary.

The Siding Springs Observatory is located approximately 125 km to the south-west of the Project Boundary. Diffuse lighting from the Project is unlikely to result in any significant impacts on this research centre.

Although evident, it is not considered that night lighting would create a significant visual impact due to a combination of large viewing distances, orientation of residences and the screening effects of topography and vegetation.

Lighting Impacts

The visual effect of lighting surrounding the Project Boundary would vary depending on locality of operations onsite, the relative level at which the viewing location is situated and the presence of any offsite barriers such as topographic features and / or vegetation. Lighting effects may be experienced if there is either a direct line of sight between a viewing location and the Project or from the general night–glow or diffuse light.

It is not predicted that any rural residents will be affected by direct light. Elevated, exposed lighting will be hooded and therefore direct light may only be caused by vehicles / train lights and open pit lighting. Direct lighting would create a higher impact however these would be significantly reduced due to the distances to sensitive receivers, screening and filtering effects of foreground vegetation, other buildings and the Northern OEA itself. During the first five years of the mine life, as the Northern OEA is constructed, direct lighting effects would be created by train movement along the rail spur, however, there are no sensitive receivers within this zone of influence. This light may be seen from some roads including Therribri Road and Kamilaroi Highway.

This glow would represent the indirect lighting effects of all the lights including machinery as well as lights around work areas and infrastructure elements. Generally, this glow would not create a significant visual effect but would be apparent from time to time.

Diffuse lighting effects in the night sky will be mostly screened from sensitive receivers by the Willow Tree Range, however diffuse light will be directly contributed to by both Boggabri Coal Mine and Tarrawonga Mine.

Night lighting impacts of the Project would be dependent on direct light and diffuse light effects. The visual effect of lighting associated with the Project would be at a similar level to that currently approved and experienced to the south at Boggabri Coal Mine and Tarrawonga Mine. It is not considered that the Project will create a significant visual impact, due to a combination of large viewing distances, blocking of light by the OEA and screening effects of topography and vegetation.

Cumulative Visual Impact

The Project would be the third coal mine within the vicinity of the Leard State Forest. Boggabri Coal Mine and Tarrawonga Mine are located in the southern parts of the forest, with the Project occurring to the north. The cumulative visual impact would depend on the amount of mine area that would be in a pre rehabilitated state and contrasting strongly with the surrounding forest.

Boggabri Coal Mine and Tarrawonga Mine are primarily enclosed within the semi circle of the Willow Tree Range that effectively isolates these mine areas from views to the north, east and west. These mines impact on a limited number of sensitive receivers in the southern sector of the Maules Creek PVC with even more limited receivers in the eastern sector. The potential exception would be the low visual impact of diffuse night light that would not be screened by the Willow Tree Range. As such, the cumulative visual impact of the three mining operations is considered to be minor.

7.5.4 Mitigation and Management

Mitigation measures proposed in relation to reducing visual impacts relevant to the Project include:

- Onsite treatments to reduce visual effects; and
- Offsite treatments at viewer locations to reduce visual sensitivity.

Onsite treatments will involve rehabilitation of landforms while offsite treatments could involve a range of treatments to screen views, filter views and or reorientate primary views should this be needed. Onsite treatments are already incorporated in the design and operating plans for the Project as they relate to the Northern OEA establishment and rehabilitation (see **Section 3.2.1**).

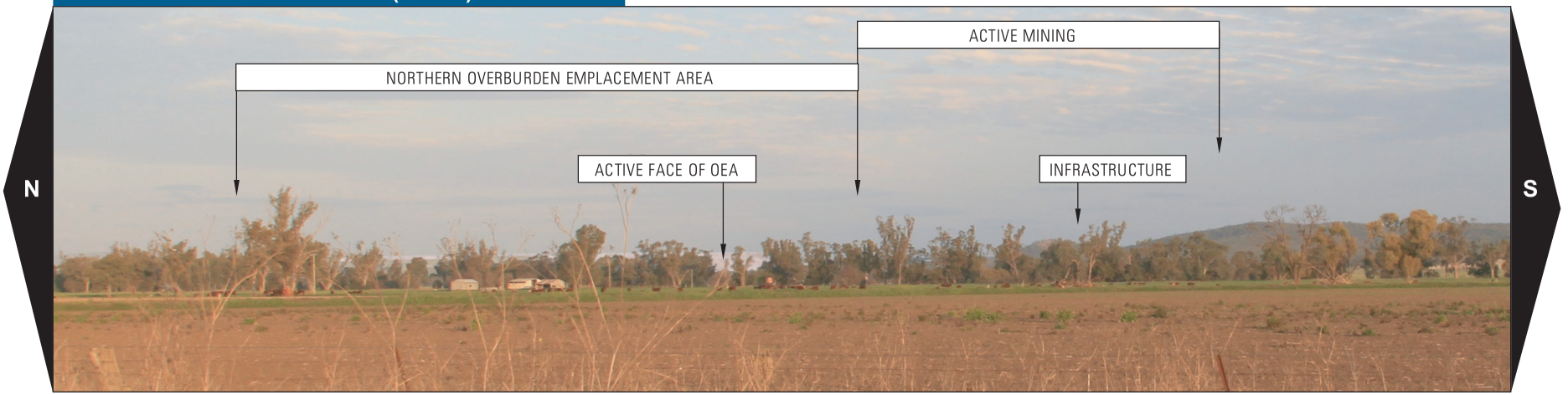
Onsite Treatments

Onsite treatments will be implemented to mitigate visual impacts of the Project including:

- Revegetating disturbed areas as soon as practicable after the completion of construction;
- Progressive rehabilitation and revegetation of the Northern OEA;

SITE 5: HARPARARY ROAD (WEST) - EXISTING

SITE 5: HARPARARY ROAD (WEST) - YEAR 5



Hansen Bailey

ASTON RESOURCES

MAULES CREEK COAL PROJECT

Photomontage Location 5
Harparary Road West (Existing and Year 5)

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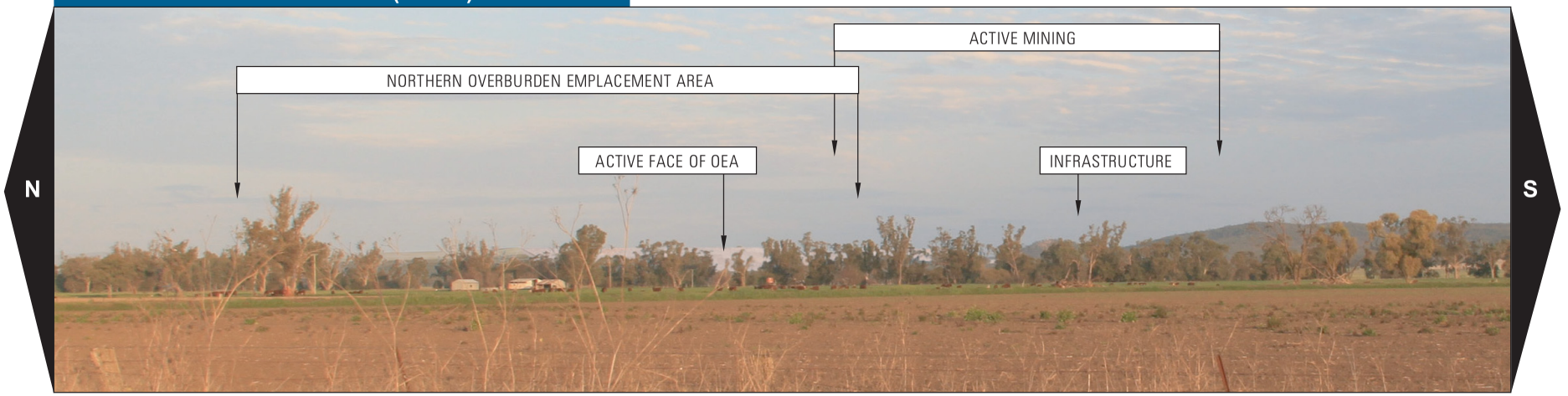
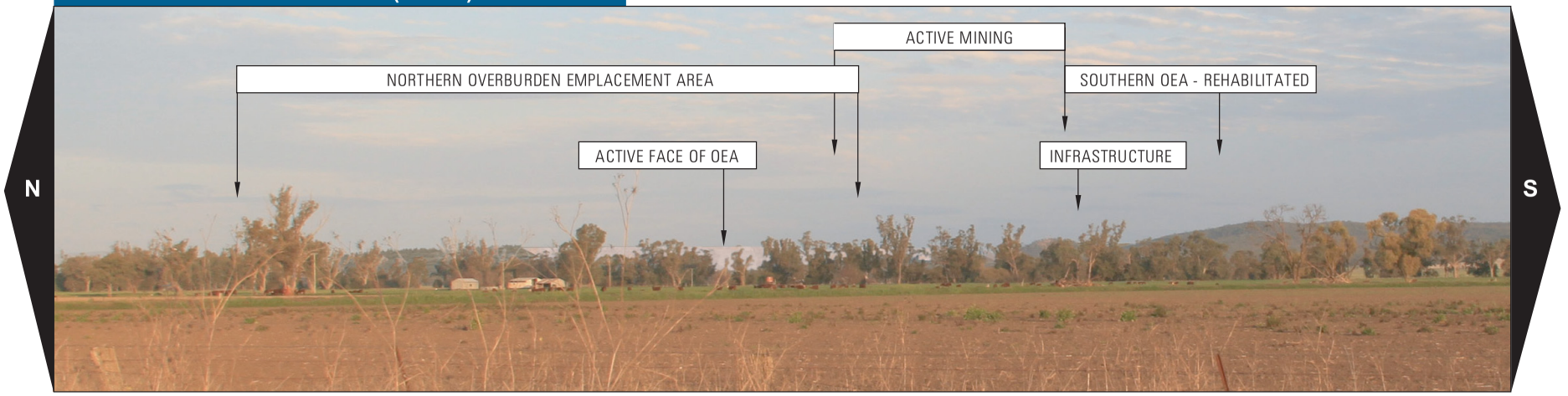
SITE 5: HARPARARY ROAD (WEST) - YEAR 10



SITE 5: HARPARARY ROAD (WEST) - YEAR 21



Hansen Bailey

ASTON RESOURCES

MAULES CREEK COAL PROJECT

Photomontage Location 5
Harparary Road West (Year 10 and Year 21)

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- Rehabilitation undertaken in consideration of the surrounding landscape patterns including existing forest colour and texture continuums in the landscape;
- Use of compatible tones for building and cladding colours, for example using tonal variations of existing colours in the surrounding landscape and avoiding discordant colours that stand out in the landscape; and
- Where practical place transmission poles in locations of high visual absorption.

Onsite treatments will be implemented to mitigate lighting impacts of the Project including:

- Low brightness lights will be used in the infrastructure areas where there is potential for direct lighting impact to sensitive receivers;
- Design of fixed night lighting to the minimum level necessary for operations and safety;
- Use of low flux lamps, horizontal floodlighting and direction of fixed lights toward the ground, where practical to minimise stray light;
- Implementation of work procedures related to the use of mobile lighting plants to avoid adverse offsite lighting impacts; and
- Where possible, conduct night operations behind noise / light barriers particularly on the Northern OEA, to reduce adverse offsite lighting impacts.

Offsite Treatments

Offsite treatments at existing private residences are not likely to be required however, should a landholder within 7.5 km of the active mining area consider they are experiencing high visual impacts, an assessment will be made at the individual residence and feasible and reasonable mitigation measures employed in consultation with the landholder and DP&I.

7.6 ECOLOGY

Cumberland Ecology Pty Ltd (Cumberland) has undertaken an Ecological Impact Assessment for the Project which is included in **Appendix I**. The assessment investigates the impacts of the Project on current biodiversity values, including Threatened species, populations and ecological communities protected under the *Threatened Species Conservation Act 1995* (TSC Act) and the *Fisheries Act*. The assessment also addresses impacts on Matters of National Environmental Significance (MNES) as listed under the EPBC Act.

Assessments have been undertaken in accordance with relevant NSW and Commonwealth legislation and planning policies relevant to the protection of biodiversity as discussed in **Section 4**.

7.6.1 Background

The Leard State Forest was subject to an ecological study by James Croft and Associates in the late 1970's for the Amax Iron Ore Corporation.

In the late 1970's and mid 1980's, the Project Boundary and surrounding area was subject to further study as part of large exploration and prefeasibility investigations preceding the Maules Creek EIS (KCC, 1989) that was prepared for the (then) approved Maules Creek Coal Project. The Maules Creek EIS prefeasibility studies were extensive and included a number of rehabilitation trials, vegetation surveys and fauna surveys. Significant time has lapsed since the surveys for the Maules Creek EIS, during which there have been many changes in Threatened species legislation.

In order to verify and update the results of the earlier surveys, Cumberland Ecology commenced work in 2008 (for the previous mining authority holders) to complete detailed baseline ecological studies over CL 375 and A 346 in line with contemporary legislation and policies. The objectives of that study were to update current knowledge of the Leard State Forest with reference to new legislation, and to bring the survey effort in line with contemporary survey guidelines.

The detailed baseline ecological surveys completed between 2008-2010 were undertaken in accordance with the *Threatened Biodiversity Survey and Assessment Guidelines for Development and Activities* (DECC 2004). Floristic sampling was designed to meet the SEWPaC (formally the Department of Environment and Heritage) guidelines for the identification of the EPBC Act listed CEEC White Box-Yellow Box-Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands (Box Gum Woodlands and Derived Grasslands).

The Box Gum Woodlands and Derived Grasslands community was recorded within the Leard State Forest in the Maules Creek EIS; however it was only gazetted as critically endangered in 2006 and as such was not identified as a significant issue at the time.

The study has since evolved into an ecological impact assessment that carefully considers the Project's impacts on terrestrial and aquatic flora and fauna, particularly Threatened species, populations and ecological communities.

The increasing importance placed by the government agencies on the conservation of CEECs and the changes in the Commonwealth's Protected Matters prompted the need for a highly accurate vegetation map over the Project Boundary and thus a large proportion of the most recent survey efforts have been dedicated to this purpose.

For this reason, matters such as the Weeping Myall Woodland, Swift Parrot and Regent Honeyeater were also the particular focus of investigation.

7.6.2 Methodology

Document Review

Extensive ecological survey work has occurred within the locality of Leard State Forest in recent times for baseline data by both government and industry. The contemporary studies completed within the Leard State Forest and locality were reviewed, including unpublished reports prepared for OEH on the flora and fauna of nearby National Parks and State Conservation Areas. Other existing information on the biodiversity values of the Project Boundary and its surrounds were obtained via interrogation of the OEH Atlas of NSW Wildlife and SEWPaC's EPBC Act Protected Matters Search Tool. The Protected Matters Search Tool provides a list of MNES that are predicted to occur based on the presence of suitable habitat, which was useful for informing Threatened species searches during field survey.

Field Survey

Field surveys took place over the 2008 Spring-Summer and 2010 Autumn-Spring periods and the respective survey effort is summarised in **Table 27**.

Much of the fauna work was concentrated in the warmer months; however the floristic surveys have been conducted throughout the survey period.

Additional to the above, field surveys were undertaken between September 2010 and May 2011 (totalling 20 days in the field) to identify suitable offset properties and to assess the quality of these properties being put forward for the Project.

Flora Survey Methods

Vegetation mapping completed for inclusion within the Maules Creek EIS (James B. Croft & Associates 1979) (Dames & Moore 1985) were used in the first instance to map the vegetation of the Project Boundary. The mapping was investigated in the field via the following methods:

- Quadrat sampling (20 m x 50 m) to characterise vegetation map units by their species composition and community structure;
- Meander transect surveys to obtain information on community distribution in the Project Boundary and surrounds; and
- Detailed surveys of vegetation units and recording boundaries using a handheld Geographical Positioning System (GPS) unit were undertaken.

The resultant information was synthesised using a Geographical Information System (GIS) to create a spatial database that was used to interpret and interpolate the data to produce a detailed vegetation map of the Project Boundary. Aerial, topographical and geological data were also used to interpret the survey data.

The EPBC Act Policy Statement for the identification and assessment of Box Gum Woodland and Derived Grasslands (DEH 2006) provides a prescriptive, detailed methodology for determining the presence of the CEEC and was used during the surveys.

Table 27 Ecological Survey Effort

SURVEY DATES	TASKS COMPLETED
1 - 3 July 2008	General flora and fauna reconnaissance
20 - 29 October 2008	Fauna trapping, vegetation mapping, targeted searches, quadrats
24 November - 4 December 2008	Fauna trapping
1 - 5 December 2008	Vegetation mapping, targeted searches, quadrats
15 April 2010	Vegetation random meander
18 - 20 May 2010	Vegetation random meander
8 - 9 June 2010	Vegetation mapping, boundary walks, meander transects
21 - 22 June 2010	Vegetation mapping, boundary walks, meander transects
14 - 15 July 2010	Vegetation random meander
2 - 3 September 2010	Vegetation mapping, boundary walks, meander transects
30 August - 4 September 2010	Koala Spot Assessment Technique (SAT), point searches, opportunistic observations
29 September - 1 October 2010	Vegetation mapping, boundary walks, meander transects
18 - 22 October 2010	Koala SAT, point searches, opportunistic observations
13-17 December 2010	Vegetation random meander, quadrats

The flora assemblage within the Project Boundary was recorded by quadrat sampling, random meander surveys and through targeted searches for Threatened species. A total of 38 quadrats were sampled in 20 x 50 metre plots as recommended by the EPBC Policy Statement (DEH 2006).

The locations of these quadrats were chosen so that sampling was conducted in areas most representative of the condition and composition of the vegetation patch. In each quadrat, the following information was recorded as a minimum:

- All vascular flora species present within the plot or directly adjacent to the plot;
- The stratum in which each species occurred;
- The relative frequency of occurrence of each plant species;
- Vegetation structural data (i.e. height and percentage cover of each stratum);
- A waypoint to mark the location of the quadrat (using a handheld GPS); and
- Photographs of the quadrat.

Fauna Survey Methods

Fauna surveys were conducted in accordance with the OEH working draft Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (DEC 2004). Surveys were undertaken over several survey sessions to increase the seasonal range of sampling to maximise detection.

The fauna survey work cumulated in over 6,000 trap nights and hundreds of person hours. The survey effort was conducted over numerous fauna survey sites and included:

- Microchiropteran bat surveys including anabat echolocation recordings and harp trapping;
- Reptile and amphibian surveys including funnel and pitfall trapping and active searches (diurnal and nocturnal);
- Bird surveys (diurnal and nocturnal);
- Small mammals (spotlighting, Elliott and cage trapping for arboreal species);
- Fauna habitat assessment;
- Systematic hollow-bearing tree assessment; and
- Systematic koala habitat assessment utilising a grid-based sampling protocol in accordance with the koala habitat utilisation pilot study (Biolink Ecological Consultants, 2009). Regular grid-based sampling was undertaken using the SAT methodology at each sampling point. There were 81 survey sites sampled within the Project Boundary.

Vegetation Communities

The majority of the Project Boundary is dominated by remnant vegetation communities of the Leard State Forest with high natural species diversity and relatively few exotic species. However, these vegetation communities have often been structurally simplified, reflecting a history of disturbances consistent with commercial timber harvesting and regular thinning.

The areas of the Project Boundary which are not within the Leard State Forest are characterised by highly disturbed communities affected by intensive agricultural land uses.

In broad terms, there are several associations that frequently occur within the Project Boundary:

- Ironbark / Cypress Pine (Eucalyptus crebra, E. melanophloia, Callitris glaucophylla and C. endlicheri);
- Red Gum / Ironbark (E. dwyeri and E. crebra);
- Pilliga Box / Poplar Box / Belah (E. pilligaensis, E. populnea and Casuarina cristata);
- White Box / Belah (E. albens and Casuarina cristata);
- White Box / Cypress Pine (E. albens and C. glaucophylla); and
- Yellow Box / Red Gum (E. melliodora and E. blakelyi).

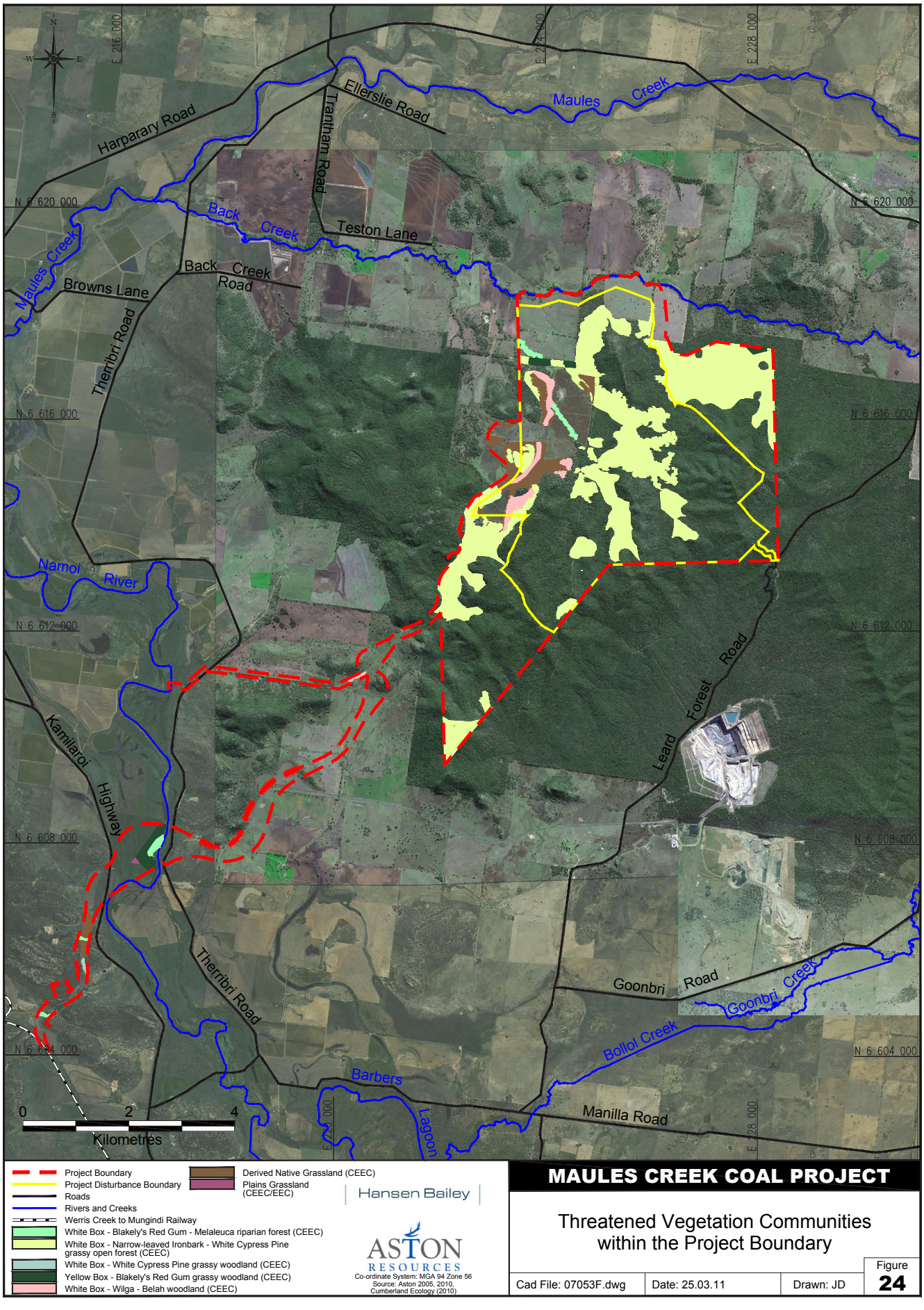
Table 28 lists the Threatened vegetation communities that have been identified within the Project Boundary and provides the status of each under the TSC or EPBC Act, as relevant. **Figure 24** illustrates the Threatened vegetation communities within the Project Boundary.

The distribution of vegetation associations is controlled largely by soil type and topography. Ironbarks and cypress pines are largely found on well-drained soils, particularly on ridges and rises, whilst the box species have an affinity with the lower-lying parts of the landscape on more fertile soil derived from colluvial wash off the sandstone hills in the Project Boundary.

Cultivated areas and grasslands derived from the clearing of native forests and woodlands have also been distinguished to provide an indication of the historical extent of native vegetation across the Project Boundary.

Flora

The Project Boundary supports vegetation containing a very high diversity of native species. Several hundred flora species have now been recorded within the Leard State Forest and the surrounding landscape, many of which have been recorded consistently over a number of ecological studies.



MAULES CREEK COAL PROJECT

Threatened Vegetation Communities within the Project Boundary

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Table 28 Vegetation Communities within the Project Boundary

SPECIFIC VEGETATION COMMUNITY NAMES	TSC ACT STATUS	EPBC ACT STATUS	AREA (ha)
Red Gum / Ironbark Forests			
Dwyer's Red Gum woodland	N/A	N/A	3.6
Dwyer's Red Gum - Ironbark woodland	N/A	N/A	159.7
Narrow-leaved Ironbark - White Cypress Pine shrubby open forest	N/A	N/A	1,008.1
Silver-leaved Ironbark healthy woodland	N/A	N/A	394.5
Rainforest Elements			
Cliff and scree Thickets (Rainforest Species)	N/A	N/A	0.1
Riparian Forests			
Melaleuca riparian forest	N/A	N/A	11.4
River Red Gum riparian woodlands and forests	N/A	N/A	11.9
White Box - Blakely's Red Gum - Melaleuca riparian forest	EEC	CEEC	17.2
White Box, Yellow Box, Blakely's Red Gum Woodlands			
White Box - Narrow-leaved Ironbark - White Cypress Pine grassy open forest	EEC	CEEC	766.8
White Box - Narrow-leaved Ironbark - White Cypress Pine shrubby open forest	N/A	N/A	261.4
White Box - White Cypress Pine grassy woodland	EEC	CEEC	1.3
Yellow Box - Blakely's Red Gum grassy woodland	EEC	CEEC	25.9
Belah Associations			
Belah woodland	N/A	N/A	4.2
Pilliga Box - Poplar Box - White Cypress Pine grassy open woodland	N/A	N/A	27.2
White Box - Wilga - Belah woodland	EEC	CEEC	34.1
Grasslands			
Plains Grassland	EEC	CEEC	0.9
Derived Native Grassland	EEC	CEEC	98.9
Derived Native Grassland (Low Diversity - Ironbark Woodland)	N/A	N/A	11.7
Derived Native Grassland (Low Diversity - White Box Woodland)	N/A	N/A	365.4
Derived Native Grassland (Low Diversity - with scattered Poplar Box trees)	N/A	N/A	167.8
Exotic grassland	N/A	N/A	63.5
Cultivated Areas			
Wheat Field (with scattered Ironbark trees)	N/A	N/A	14.2
Wheat Field (with scattered Poplar Box trees)	N/A	N/A	32.1
Wheat Field and Crop Land on basalt soil (with scattered White Box trees)	N/A	N/A	68.1

No Threatened flora species were identified within the Project Boundary during the survey periods for this ecological assessment. However, a suite of Threatened plant species are known to occur in the locality surrounding the Project Boundary.

Considering the availability of suitable habitat, Threatened flora species that are considered most likely to occur within the Project Boundary are listed in **Table 29**.

Fauna Habitat

Vegetation within the Project Boundary provides potential habitat for a range of native vertebrate species, including amphibians reptiles, birds, bats, and arboreal and terrestrial mammals. The review of the information collected during the field assessments has demonstrated that the vegetation within the Project Boundary only provides a *"stepping stone"* for highly mobile species, such as birds and bats.

Historical disturbance and surrounding agricultural development have resulted in the relative isolation of the Leard State Forest from other similar forest and woodland habitats.

Key habitat features that have been recorded during the current study included:

- Wetland riparian environments suitable for fauna species dependant on these habitats such as wetland birds, some frogs and reptiles;
- Groundcover, leaf litter, fallen timber, and rocky outcrops suitable as shelter for small terrestrial fauna species;
- Understorey vegetation which provides shelter for small mammals and woodland birds;
- Tree hollows suitable as shelter and breeding habitat for a range of hollow-dependant fauna;
- Blossom-producing trees suitable as forage for a range of nectarivores;
- Secondary Koala feed tree species; and
- Caves, culverts and other suitable shelter or breeding habitat for a range of cave-dependant fauna.

Fauna

Although the Project Boundary provides extensive forage, breeding and shelter habitat for a range of terrestrial and arboreal mammals, the results from a number of surveys since the late 1970's indicates a relatively low abundance and diversity of fauna groups. This may be the result of historical disturbance (forestry and agriculture) and relative isolation from the more extensive forest / woodland areas.

A total of 22 mammal species have been identified within or in the vicinity of the Project Boundary, which includes 11 terrestrial species, two arboreal species and nine bat species.

Previous and current surveys indicate that the forest / woodland communities within the Project Boundary support a high diversity of avifauna. This is to be expected given the extent of suitable and relatively intact habitat combined with the mobility of this fauna group.

A total of 132 bird species were identified within the Project Boundary and immediate surrounds during the field surveys undertaken during the history of surveys in the area. Several Threatened birds listed under the TSC Act and EPBC Act were either recorded in the locality or are considered to have potential habitat within the Project Boundary.

A total of eight frog species were detected in the Project Boundary, although none are listed as Threatened. Based upon database information and the types of habitats available, no Threatened frog species are considered likely to occur in the Project Boundary.

A total of 25 reptile species were recorded in the Project Boundary, including snakes, geckos and skinks. No Threatened reptile species were recorded during the survey period.

Eighty-one sites were assessed across the Project Boundary with neither any koalas nor signs of koala activity found on any of the grid areas. As this species is known to occur occasionally in the vicinity of the Project Boundary, the results indicate that koala density is extremely low and that the occurrences of koalas most likely represent occasional transient individuals.

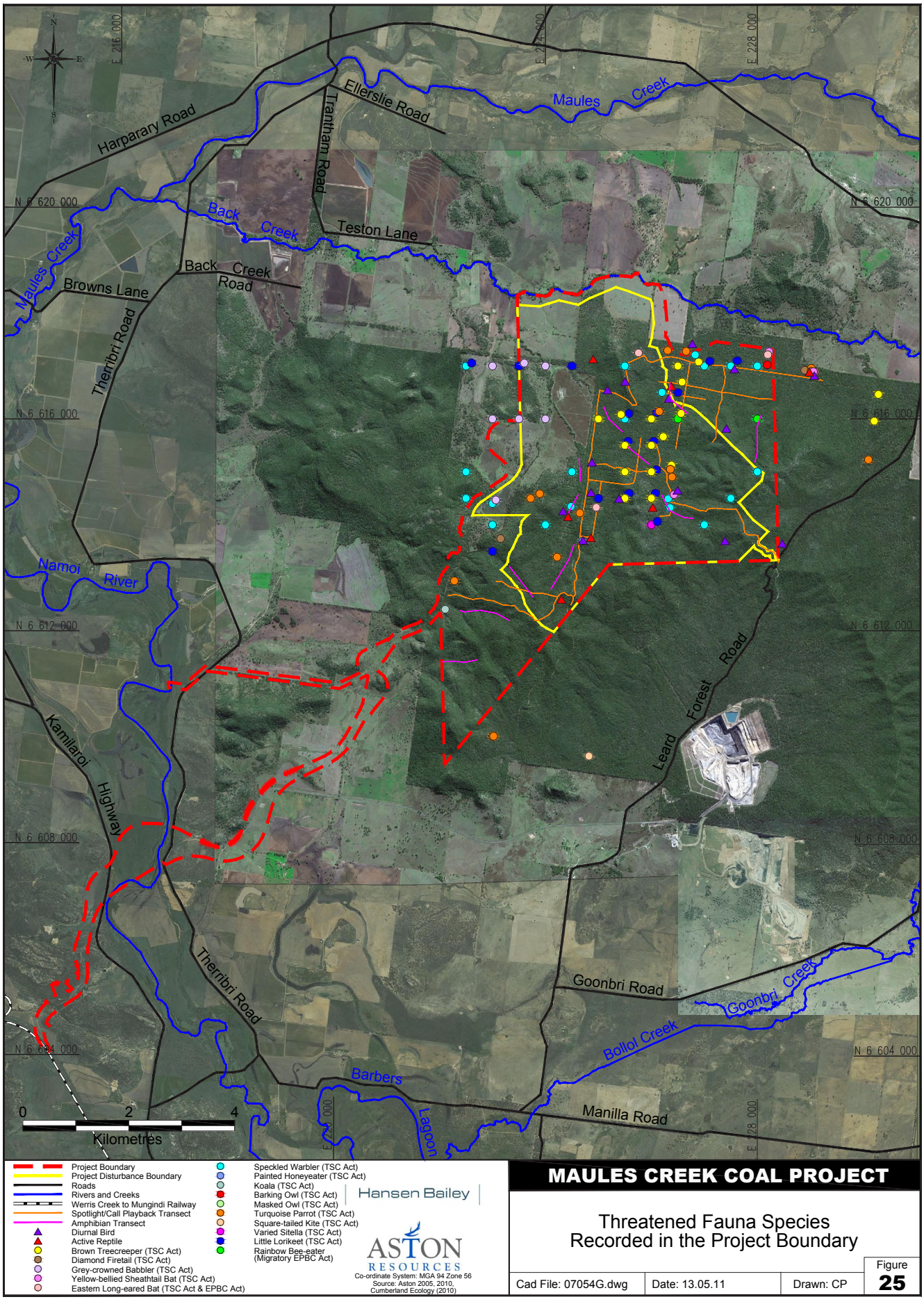
A list of Threatened fauna species recorded during the surveys or having a high potential to occur within the Project Boundary are included in **Table 30** and shown on **Figure 25**. A detailed list of all Threatened species known or likely to occur within the locality is included in **Appendix I**.

Table 29 Threatened Flora Species

COMMON NAME (*LATIN NAME*)	TSC ACT STATUS	EPBC ACT STATUS
Pultenaea setulosa	-	Vulnerable
Scant Pomaderris (*Pomaderris queenslandica*)	Endangered	-
Spiny Peppercress (*Lepidium aschersonii*)	Vulnerable	Vulnerable

Table 30 Threatened Terrestrial Fauna Species

COMMON NAME (*LATIN NAME*)	TSC ACT STATUS	EPBC ACT STATUS	RECORDED WITHIN PROJECT BOUNDARY (2008-2010)
Birds			
Speckled Warbler (*Pyrrholaemus saggitatus*)	Vulnerable	N/A	Yes
Spotted Harrier (*Circus assimilis*)	Vulnerable	N/A	Yes
Little Eagle (*Hieraaetus morphnoides*)	Vulnerable	N/A	Yes
Square-tailed Kite (*Lophoictinia isura*)	Vulnerable	N/A	Yes
Fork-tailed Swift (*Apus pacificus*)	N/A	Migratory	Yes
White-throated Needletail (*Hirundapus caudacutus*)	N/A	Migratory	No – likely to occur as suitable habitat is present within Project Boundary
White-browed Woodswallow (*Artamus superciliosus*)	Vulnerable	N/A	Yes
Black-necked Stork (*Ephippiorhynchus asiaticus*)	Threatened Species	N/A	No – unlikely to occur as little suitable habitat is present within Project Boundary
Brown Treecreeper (*Climacteris picumnus victoriae*)	Vulnerable	N/A	Yes
Diamond Firetail (*Stagonopleura guttata*)	Vulnerable	N/A	Yes
Painted Honeyeater (*Grantiella picta*)	Vulnerable	N/A	Yes
Black-chinned Honeyeater (*Melithreptus gularis gularis*)	Vulnerable	N/A	Yes
Rainbow Bee-eater (*Merops ornatus*)	N/A	Migratory	Yes
Satin Flycatcher (*Myiagra cyanoleuca*)	N/A	Migratory	Yes
Varied Sittella (*Daphoenositta chrysoptera*)	Vulnerable	N/A	Yes
Hooded Robin (*Melanodryas cucullata*)	Vulnerable	N/A	Yes
Grey-crowned Babbler (*Pomatostomus temporalis temporalis*)	Vulnerable	N/A	Yes
Little Lorikeet (*Glossopsitta pusilla*)	Vulnerable	N/A	Yes
Swift Parrot (*Lathamus discolor*)	Endangered	Endangered	No – likely to occur as suitable habitat is present within Project Boundary
Turquoise Parrot (*Neophema pulchella*)	Vulnerable	N/A	Yes
Barking Owl (*Ninox connivens*)	Vulnerable	N/A	Yes
Masked Owl (*Tyto novaehollandiae*)	Vulnerable	N/A	Yes
Mammals			
Yellow-bellied Sheathtail Bat (*Saccolaimus flaviventris*)	Vulnerable	N/A	Yes
Koala (*Phascolarctos cinereus*)	Vulnerable	N/A	Yes – occurs at low densities
Little Pied Bat (*Chalinolobus picatus*)	Vulnerable	N/A	No – likely to occur as suitable habitat is present within Project Boundary
Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)	Vulnerable	N/A	No – likely to occur as suitable habitat is present within Project Boundary
Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*)	Vulnerable	N/A	No – likely to occur as suitable habitat is present within Project Boundary
Eastern Long-eared Bat (*Nyctophilus timoriensis*)	Vulnerable	Vulnerable	Yes
Eastern Cave Bat (*Vespadelus troughtoni*)	Vulnerable	N/A	No – likely to occur as suitable habitat is present within Project Boundary and it has been detected on Boggabri Coal lease


Maules Creek
Harparary Road
Ellerslie Road
Tranthams Road
Teston Lane
Back Creek
Back Creek Road
Browns Lane
Therribri Road
Namoi River
Kamilaroi Highway
Leard Forest Road
Goonbri Road
Goonbri Creek
Bollol Creek
Barbers Lagoon
Manilla Road
N 6 620 000
N 6 616 000
N 6 612 000
N 6 608 000
N 6 604 000
E 216 000
E 224 000
E 228 000
0 2 4
Kilometres
Project Boundary
Project Disturbance Boundary
Roads
Rivers and Creeks
Werris Creek to Mungindi Railway
Spotlight/Call Playback Transect
Amphibian Transect
Diurnal Bird
Active Reptile
Brown Treecreeper (TSC Act)
Diamond Firetail (TSC Act)
Grey-crowned Babbler (TSC Act)
Yellow-bellied Sheathtail Bat (TSC Act)
Eastern Long-eared Bat (TSC Act & EPBC Act)
Speckled Warbler (TSC Act)
Painted Honeyeater (TSC Act)
Koala (TSC Act)
Barking Owl (TSC Act)
Masked Owl (TSC Act)
Turquoise Parrot (TSC Act)
Square-tailed Kite (TSC Act)
Varied Sitella (TSC Act)
Little Lorikeet (TSC Act)
Rainbow Bee-eater (Migratory EPBC Act)
Hansen Bailey
ASTON RESOURCES
Co-ordinate System: MGA 94 Zone 56
Source: Aston 2005, 2010, Cumberland Ecology (2010)
MAULES CREEK COAL PROJECT
Threatened Fauna Species Recorded in the Project Boundary
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Date: 13.05.11
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Figure 25

7.6.3 Impact Assessment

The Project will remove forest and woodland habitat, comprising non-listed forest and woodland communities and the listed CEEC Box Gum Woodland and Derived Native Grassland within the Project Disturbance Boundary (shown on **Figure 24**). These vegetation communities contain Threatened flora species or provide suitable habitat for Threatened fauna species. The predicted impacts upon the vegetation communities, Threatened flora and fauna, and groundwater dependent ecosystems are discussed in the following sections.

Vegetation Communities

Table 31 summarises the disturbance to vegetation communities within the Project Disturbance Boundary compared with that not proposed to be disturbed.

The areas to be impacted over the life of the Project consist of approximately 1,665 ha of forest and woodland and a further 513 ha of native grassland and crop land.

The vegetation communities to be impacted over the life of the Project include Red Gum / Ironbark Forests (1,053 ha), River Red Gum and Melaleuca riparian forest (11.7 ha with 10.1 ha of this corresponding to CEEC), White Box, Yellow Box, Blakely's Red Gum Woodland (552.8 ha with 416.4 ha of this corresponding to CEEC), Belah associations (47.4 ha with 31.5 ha of this corresponding to CEEC), Native grasslands (413.8 ha with 86.5 ha of this corresponding to CEEC) and other (98.8 ha).

The majority of the vegetation to be cleared will be from within the relatively intact areas of forest and woodland within the north-western portion of Leard State Forest. However other patches of vegetation will be cleared that occur on the southern side of Back Creek and in patches along the rail corridor.

The Project proposes the removal of significant areas of Box Gum Woodland and Derived Grassland, amounting to approximately 458 ha of Woodland and 86.5 ha of Derived Native Grassland. Further broad areas of other non-listed forest and woodland proposed to be disturbed will constitute a potentially significant loss of native vegetation from the locality.

The Project mine plan was modified from a previous version to avoid the disturbance of over 100 ha of CEEC which would have resulted from the development of an initial design of the Northern OEA as described in **Section 3.13**.

The ultimate design and construction of various infrastructure required for the Project will minimise the direct disturbance of CEEC, where possible.

In the absence of a suitable Biodiversity Offsets Package, the Project would have a significant impact on the White Box, Yellow Box, Blakely's Red Gum Woodlands and Derived Native Grassland community as listed as an EEC under the TSC Act and a CEEC under the EPBC Act.

In anticipation of such impacts, Aston has proposed an Offset Package that will result in significant net benefits to flora and fauna within the locality and region, including Box Gum Woodland and Threatened species. **Section 7.7** provides detail on the proposed Biodiversity Offset Package that will be implemented to compensate the impacts of the Project. It has the potential to decrease the level of fragmentation and isolation of forested areas in the vicinity within the medium to long term.

Table 32 provides a list of EEC and CEEC proposed to be disturbed as part of the Project.

Threatened Flora

Despite intensive surveys undertaken for the likely flora species to occur within the vicinity of the Project Boundary, only two Threatened plants, *Pomaderris queenslandica* and *Pultenaea setulosa*, have recently been found within the Leard State Forest as part of the Boggabri EA Ecological Impact Assessment (Parsons Brinckerhoff 2010). A third species, *Lepidium aschersonii*, is also known to occur from the nearby Leard State Conservation Area.

These flora species were not found within the Project Boundary during the field surveys. Suitable potential habitat exists for these plants and other Threatened plant species, however the intensive surveys have not identified any populations that may be impacted by the Project.

Table 33 provides a summary of the threatened flora and fauna and their habitats that are likely to exist within the Project Boundary and their potential impacts as a result of the Project. **Section 7.6.5** discusses how the impacts upon these species and communities will be managed.

Threatened Fauna

The open forest, woodland and derived grassland communities of the Project Boundary provide suitable habitat for a range of fauna; including some species that are listed as Threatened or migratory under the EPBC Act and / or the TSC Act (see **Table 33**).

Within the vegetation communities that exist within the Project Boundary, a range of habitat features provide foraging, shelter and breeding opportunities for fauna. The quality of habitat is dependent upon location and is very dependent upon past land use. Regrowth areas generally lack many habitat features, but some areas of good quality habitat were identified at several locations.

Table 31 Vegetation Disturbance within the Project Disturbance Boundary

VEGETATION COMMUNITIES	STATUS	TOTAL IN PROJECT BOUNDARY (ha)	TOTAL TO BE CLEARED AS PART OF THE PROJECT (ha)	PROPORTION TO BE CLEARED (%)
Red Gum / Ironbark forests				
Dwyer's Red Gum woodland	-	3.6	0.1	2.8
Dwyer's Red Gum - Ironbark woodland	-	159.8	123.6	77.3
Narrow-leaved Ironbark - White Cypress Pine shrubby open forest	-	1,008.1	594.8	59.0
Silver-leaved Ironbark healthy woodland	-	394.5	334.5	84.8
RF Elements				
Cliff and scree Thickets (Rainforest Species)	-	0.1	0.0	0.0
Riparian Forests				
Melaleuca riparian forest	-	11.4	0.0	0.0
River Red Gum riparian woodlands and forests	-	12.0	1.6	13.3
White Box - Blakely's Red Gum - Melaleuca riparian forest	EEC & CEEC	17.2	10.1	58.7
White Box, Yellow Box, Blakely's Red Gum Woodlands				
White Box - Narrow-leaved Ironbark - White Cypress Pine grassy open forest	EEC & CEEC	766.8	407.0	53.1
White Box - Narrow-leaved Ironbark - White Cypress Pine shrubby open forest	-	261.4	136.4	52.2
White Box - White Cypress Pine grassy woodland	EEC & CEEC	1.3	0.8	61.5
Yellow Box - Blakely's Red Gum grassy woodland	EEC & CEEC	25.9	8.6	33.2
Belah Associations				
Belah woodland	-	4.2	4.2	100.0
Pilliga Box - Poplar Box - White Cypress Pine grassy open woodland	-	27.2	11.7	43.0
White Box - Wilga - Belah woodland	EEC & CEEC	34.1	31.5	92.4
Total Forest and Woodland		**2,727.6**	**1,664.9**	**61.0**
Grasslands				
Plains Grassland	EEC & CEEC	1.0	0.0	0.0
Derived Native Grassland	EEC & CEEC	99.0	86.5	87.4
Derived Native Grassland (Low Diversity - Ironbark Woodland)	-	11.7	3.7	31.6
Derived Native Grassland (Low Diversity - White Box Woodland)	-	365.4	210.9	57.7
Derived Native Grassland (Low Diversity - with scattered Poplar Box trees)	-	167.9	112.7	67.1
Sub Total Grasslands		**645.0**	**413.8**	**64.2**
Other				
Exotic grassland	-	63.6	24.5	38.5
Wheat Field (with scattered Ironbark trees)	-	14.2	1.5	10.6
Wheat Field (with scattered Poplar Box trees)	-	32.1	16.5	51.4
Wheat Field (with scattered White Box trees)	-	6.5	2.5	38.5
Crop land on basalt soil (with scattered White Box)	-	61.6	53.8	87.3
Sub Total Other		**178.0**	**98.8**	**55.5**
TOTAL AREA		**3,550.6**	**2,177.5**	**61.3**
TOTAL EEC / CEEC		**945.3**	**544.5**	**57.6**

The Project will result in the clearance of vegetation and removal of some key fauna habitat features within the Project Boundary. This process results in numerous actions considered to be Key Threatening Processes by OEH, such as the Clearing of Native Vegetation (NSW Scientific Committee, 2004c), Loss of Hollow-bearing Trees (NSW Scientific Committee, 2006), Removal of Dead Wood and Dead Trees (NSW Scientific Committee, 2004d) Bushrock Removal (NSW Scientific Committee, 2004b) and the Alteration to the Natural Flow Regimes of Rivers, Streams, Floodplains and Wetlands (NSW Scientific Committee, 2004a).

The Project will result in the removal of forest, woodland and adjacent derived native grassland vegetation communities which provide for foraging, shelter and breeding habitat for the Threatened woodland birds known to occur in the area.

Aston proposes to rehabilitate the landscape progressively during the mining process, replanting to forest and woodland species that currently exist. This will assist bird species to maintain their presence in the locality in the medium to long term. Owl species also have a requirement for nesting in large trees with hollows, which will be lost from the Project Boundary. It is possible that these species, particularly Masked Owl, could lose actual or potential nest sites within the Project Boundary, although no nest sites have been identified to date.

No records exist to show that the Regent Honeyeater occurs within the Leard State Forest, however this species has been observed in areas adjacent to the Nandewar Ranges. Since the migratory Rainbow Bee-eater travels around Australia, the abundance of suitable foraging habitat in the locality and the absence of suitable breeding habitat within the Project Boundary, it is unlikely that the Project will result in any significant impacts on this species.

The Project is likely to have an impact on tree roosting species of microchiropteran bats and to a lesser extent, cave roosting species within the locality including the Little Bentwing Bat and Eastern Bentwing Bat.

Large areas of contiguous known habitat for these species will be retained within the remaining areas of the Leard State Forest and Leard State Conservation Area and throughout the subregion and region.

The Project is likely to provide a barrier to ground dwelling fauna species and further fragment woodland habitats within the region. Remnant vegetation will remain largely to the east and west of the Project Boundary within the Leard State Forest and Leard State Conservation Area, maintaining a fragmented wildlife corridor. The majority of land along the proposed rail spur alignment has been significantly disturbed by previous land uses such as agriculture. There are some areas of this corridor that will result in some minor additional fragmentation and isolation of remnant vegetation that will result from the clearing of remnant vegetation for the rail spur.

Table 32 Direct Loss of EEC / CEEC

VEGETATION COMMUNITIES	TOTAL IN PROJECT BOUNDARY (ha)	TOTAL TO BE CLEARED AS PART OF THE PROJECT (ha)	PROPORTION TO BE CLEARED (%)
Riparian Forests			
White Box - Blakely's Red Gum - Melaleuca riparian forest	17.2	10.1	58.7
White Box, Yellow Box, Blakely's Red Gum Woodlands			
White Box - Narrow-leaved Ironbark - White Cypress Pine grassy open forest	766.8	407.0	53.1
White Box - White Cypress Pine grassy woodland	1.3	0.8	61.5
Yellow Box - Blakely's Red Gum grassy woodland	25.9	8.6	33.2
Belah Associations			
White Box - Wilga - Belah woodland	34.1	31.5	92.4
Total Forest and Woodland EEC / CEEC	**845.3**	**458.0**	**54.2**
Grasslands			
Plains Grassland	1.0	0.0	0.0
Derived Native Grassland	99.0	86.5	87.4
Total Grassland EEC / CEEC	**100**	**86.5**	**86.5**
TOTAL AREA EEC / CEEC	**945.3**	**544.5**	**57.6**